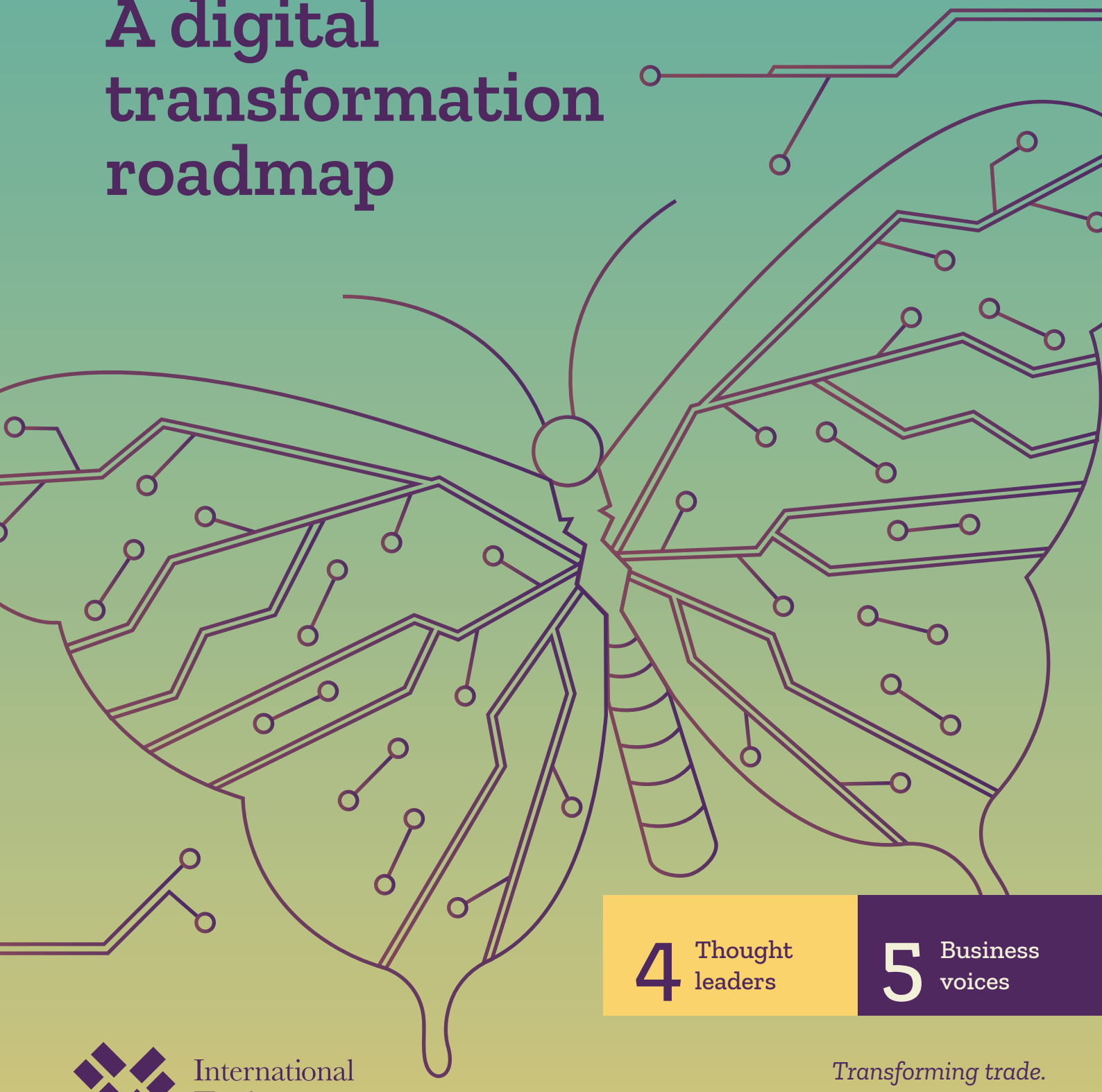
SME COMPETITIVENESS OUTLOOK 2025

A digital transformation roadmap



4 Thought leaders

5 Business voices

International Trade Centre

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A digital transformation roadmap

About the Report

This *SME Competitiveness Outlook* sets out what a digital transformation looks like for small and medium-sized enterprises. Featuring insights from the International Trade Centre's new Enterprise Digital Transformation Index, a metric that assesses how firms are adopting new technologies, it shows what challenges or circumstances may hold these businesses back in an increasingly digital age.

The report also identifies the key enablers for firms to digitally transform – infrastructure, skills and regulations – while setting out what they can do when these enablers are absent.

The report unveils a Digital Transformation Action Plan at the national and international levels. This roadmap provides a menu of options that decision makers can adopt depending on a country's needs and circumstances – and reflects the key elements that must be in place to ensure that firms can benefit fully from the digital economy, and that no one is left behind.

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Weaving the future with technology

Acronyms

Unless otherwise specified, all references to dollars ($) are to United States dollars.

AI	Artificial intelligence
ASEAN	Association of Southeast Asian Nations
BSO	Business support organization
e-DTI	Enterprise Digital Transformation Index
EU	European Union
GATS	General Agreement on Trade in Services
GDP	Gross domestic product
ICT	Information and communication technology
ILO	International Labour Organization
IMF	International Monetary Fund
IT	Information technology
ITA	Information Technology Agreement
ITC	International Trade Centre
ITU	International Telecommunication Union
LDC	Least developed country
LLDC	Landlocked developing country
MSME	Micro, small and medium-sized enterprise
NRI	Network Readiness Index
OECD	Organisation for Economic Co-operation and Development
SDGs	Sustainable Development Goals
SIDS	Small Island Developing States
SMECS	SME Competitiveness Surveys
SMEs	Small and medium-sized enterprises
UN	United Nations
UN-OHRLLS	United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Development States
WTO	World Trade Organization

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Foreword

In today's world, it seems that not a day goes by without a new technological change promising to transform the way people work and the way people live. Terms like artificial intelligence (AI) and blockchain – once limited to the realm of scientists, engineers and economists – have now gained common currency, with the creators behind them often becoming household names. These technologies are changing what is possible in sectors as varied as agriculture and healthcare, even as newer versions of these technologies appear continuously on the horizon.

For the small and medium-sized enterprises (SMEs) that ITC serves, going digital is no longer a 'nice to have'. It is a necessity so these firms can grow, compete and trade. It can also help them become more productive, efficient and resilient to shocks, as crises like the COVID-19 pandemic have reinforced. But whether they end up riding the wave of digital transformation – or are instead left paddling or even stuck in the sand – depends on several factors, including, critically, if the country where they operate is digitally ready.

Being digitally ready means having the right infrastructure, regulations and skills. That is where governments and institutions come in and where international cooperation is essential. When these enablers are in place, firms large and small, regardless of whether they are led by women or men, youth or older individuals, find themselves operating on a largely level digital playing field.

When they are not, youth-led, women-led and smaller firms often struggle to achieve the same level of digital transformation as their peers – but fortunately, there are actions they can take to help make up for what the environment lacks.

By now, the fact that we are riding a wave of digital transformation that far exceeds the pace of its predecessors is not breaking news. But what is increasingly urgent is the risk of inaction. Namely, that by deferring decisions on how to make digital technologies available to everyone, we could witness the emergence of a far more unequal world, one where the gulf between the digital 'haves' and 'have nots' grows deeper by the day, and where goals such as environmental sustainability and social inclusion fall further out of reach. The consequences could be devastating, far-reaching and hard to undo.

With the 2030 Agenda for Sustainable Development now in its final years, the world has precious little time left to finally bring to an end some of society's most pernicious ills, such as poverty, hunger and inequality. The warning bells from the climate crisis are also growing louder by the hour, while the global economy remains on treacherous footing. The role of digital technologies in making this agenda's 17 goals and 169 targets possible cannot be overlooked. Governments recognize that and are laying the groundwork to better define the future of digital transformation, together.

The Pact for the Future adopted by United Nations member states at the Summit of the Future makes clear the stakes and signals some of the potential solutions, as does the endorsement of a Global Digital Compact. The compact sets out the urgency of finding shared pathways for the digital economy and expresses a clear international commitment to cooperate more closely in the digital space – spanning areas from the digital divide to interoperability to the governance of AI. It is an important step in the right direction. What matters now is what comes next.

This edition of the SME Competitiveness Outlook is part of ITC's contribution to these efforts. Its insights from Thought Leaders and Business Voices show the breadth and depth of what digital transformation has to offer, along with the very real challenges that small businesses must overcome. Its Enterprise Digital Transformation Index makes it possible to see how the digital transformation is playing out for individual firms – providing valuable benchmarks for assessing progress and correcting course where needed.

Finally, its Digital Transformation Action Plan provides a menu of options that decision makers can choose from, and thus help ensure that the digital transformation leaves no one behind.

Pamela Coke-Hamilton

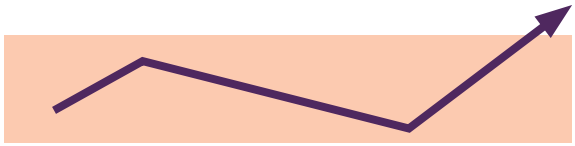
Executive Director
International Trade Centre

DIGITAL TRANSFORMATION

A CASE FOR ACTION

Digital transformation drives efficiency

Among companies using digital technologies



87% increased sales

84% cut costs

Not all firms benefit equally

Compared to emerging users, expert users are:

12 times more likely to cut costs

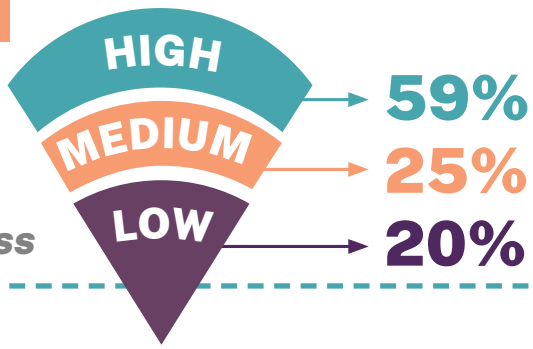
5 times more likely to increase sales

2 times more likely to innovate or improve quality

The environment shapes firms'success

Percentage of expert users by level of country digital readiness

Country Digital Readiness



Size and leadership matter in unsupportive environments

Differences almost disappear in countries with high digital readiness

Large firms are 2.5 times...

Youth-led firms are 2 times...

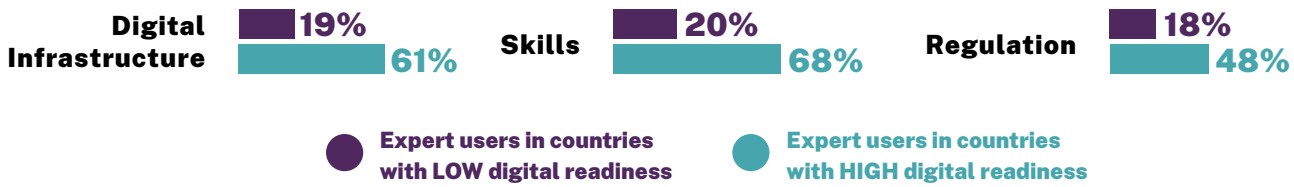
Men-led firms are 1.5 times...

more likely to be expert users than their counterparts

A PLAN FOR ACTION

Make countries digitally-ready

Digital readiness requires infrastructure, skills and regulations



Make firms more competitive

What firms can do to make up for gaps in the environment

Improve financial management
to make up for infrastructure inefficiencies

Connect with BSOs
to navigate complex regulations

Enhance training and recruitment
to make up for skills shortages

A plan to leave no one behind

	Public Sector	Private Sector	International Community	Small Business
Infrastructure	Increase availability and affordability through direct investment, partnerships and (fiscal and non-fiscal) incentives	Develop innovative market-based solutions and socially responsible initiatives	Offer concessional financing and support data collection efforts to pinpoint gaps and needs	Improve financial management and access to finance
Skills	Integrate digital skills in educational curricula, allow entry of foreign talent and strengthen social safety nets	Share information on demanded skills, provide training and transfer know-how	Support educational and training institutions to upgrade curricula	Professionalize recruitment and provide training to improve skills matching
Regulations	Update/build the regulatory toolbox for the digital age and ensure cross-border interoperability	Engage in digital strategy-, policy- and rule-making, as well as implementation	Champion and facilitate regulatory alignment and crossborder governance mechanisms	Engage with business support organizations to obtain information and advocate for SME-friendly rules

Executive Summary

In a world still shaken from the COVID-19 pandemic, and with crises from climate change to conflicts becoming more acute, the calls for new solutions to some of society's most entrenched challenges are growing stronger in both frequency and fervour. As governments, institutions, civil society, academics and businesses look for answers, many are turning to the current wave of digital transformation as a promising way to emerge from a crisis-driven, and crisis-ridden, period.

The international community concurs. When it was adopted by United Nations member states in 2015, the 2030 Agenda for Sustainable Development recognized the value that the spread of information and communication technology (ICT) and global interconnectedness could have in delivering on its vision for a fairer, more inclusive and more connected society.

More recently, the Pact for the Future and Global Digital Compact adopted by United Nations member states in September 2024 made clear that these technologies are key for closing the gap between where the world stands on the Sustainable Development Goals (SDGs) and where these efforts must go in the coming years.

But this wave of digital transformation is unlike any technological revolution before it – and without a concerted effort to make sure it benefits everyone, it also runs the risk of making many of today's environmental, social and economic problems even harder to solve. This is a challenge, but also an opportunity – especially for the micro, small and medium-sized enterprises (MSMEs) that drive the global economy.

For companies looking at what the digital transformation could mean for them, the potential benefits are legion. Notably, these **digital technologies hold the key to boosting firm productivity**, which can help reignite economic growth, increase living standards and achieve many of the SDGs. These technologies are already transforming how businesses interact with one another, along with their workers and consumers.

Digital technologies matter for firm productivity

Digital technologies benefit almost all companies. More than 80% of firms that use digital technologies report higher sales and lower costs, a new ITC survey of some 7,400 companies in 78 countries shows.

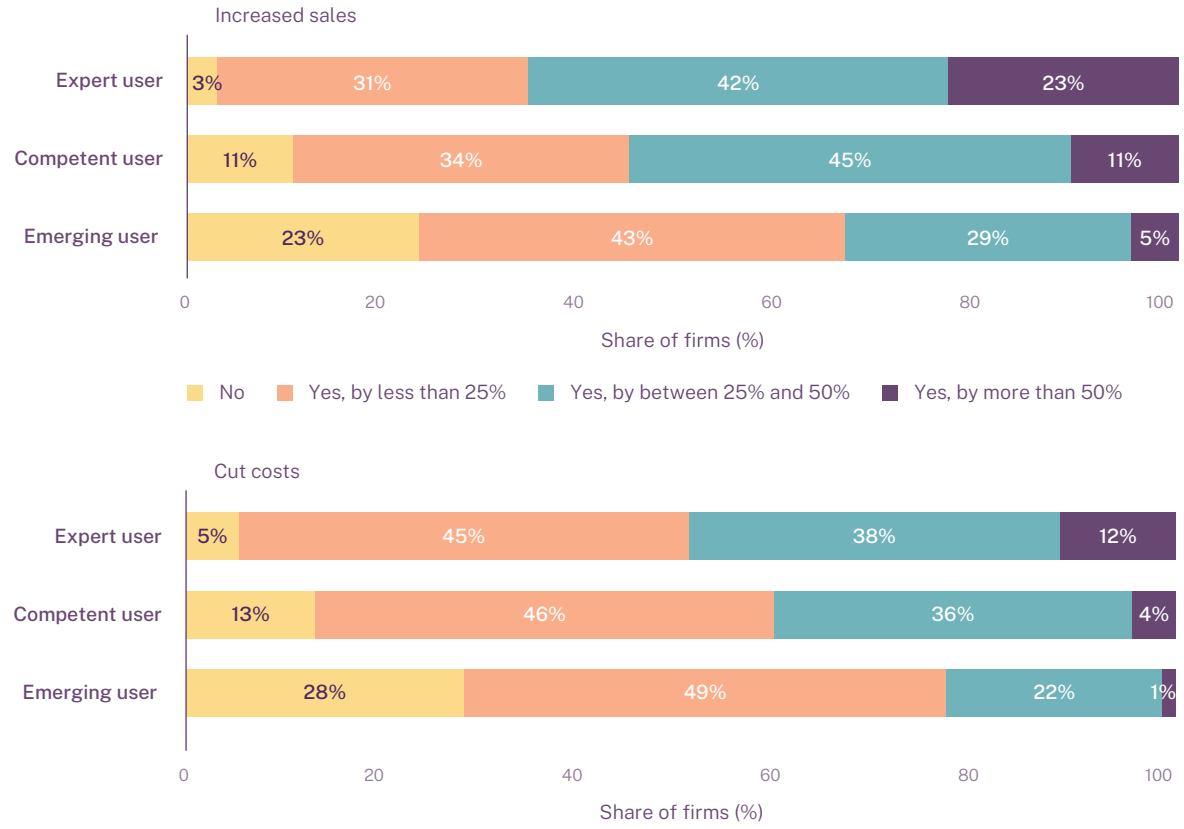
Those that use technologies more extensively benefit the most. Firms that use digital technologies intensively, which ITC dubbed expert users, were almost five times more likely to report a boost in sales by more than 50% than those with less extensive use, classified as emerging users. Similarly, 12% of expert users reported reduced costs by more than 50%, compared to 1% of emerging users.

Expert, competent and emerging users of digital technologies: How do companies fare?

To assess whether, how and to what ends firms use digital technologies, ITC surveyed 7,402 firms in 78 countries. These companies were assigned a score under the Enterprise Digital Transformation Index (e-DTI) and classified as either expert, competent or emerging users of digital technologies. This new metric assesses how firms apply digital technologies, providing useful feedback that decision makers can use when determining what actions to take.

- Expert users of digital technologies have the highest e-DTI values. Nearly all expert users have a comprehensive digital strategy and are always updated on the latest trends in digital technologies. Many allocate more than 25% of their operational expenses to digital solutions and use computers with greater computation power and fixed broadband. These companies tend to use digital technologies for advanced processes.
- Competent users fall within the middle tertile of the e-DTI distribution. They tend to have a digital strategy and a majority is always updated on digital technology developments. They spend slightly more on digital tools, but usually less than 25% of their operational expenses, and make greater use of personal computers or tablets than emerging users. A majority deploys digital solutions for more advanced processes.
- Finally, emerging users of digital technologies are those scoring within the lowest tertile of the e-DTI across countries. Most of these companies lack a digital strategy and are not updated on new developments in digital technology. They tend to spend very little on digital solutions, relying primarily on smartphones and mobile broadband. As a result, digital tools are mostly used for basic purposes such as communication.

Expert users, greater benefits



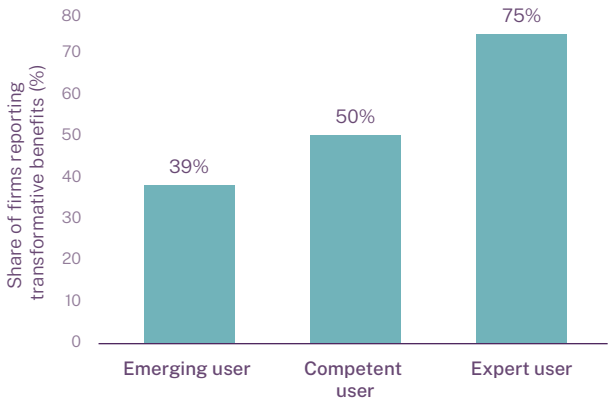
Source: ITC, based on ITC Digital Transformation Survey.

The advantages of adopting digital technology go beyond productivity gains. On the one hand, emerging users reported mostly operational gains, such as improved efficiency and timeliness of production and delivery, as well as communication-related improvements, including access to new customers.

On the other hand, three out of four expert users reported that digital technology helped transform their businesses, in addition to improving operations and communications. They have more opportunities for innovation and have improved the quality of their products and services, which often translates into higher prices. Some of these 'transformative' benefits tend to be associated with cutting-edge technologies, such as AI, cloud computing, blockchain and three-dimensional (3D) printing.

Artificial intelligence helps firms optimize their production processes and become more efficient. This enables them to focus on areas that add the most business value, further boosting productivity. AI-powered predictive analytics allow for improved demand forecasting, production planning, resource allocation and logistics. Similarly, data-driven insights enable firms to better manage financial and other risks.

Expert users, transformative benefits



Source: ITC, based on ITC Digital Transformation Survey.

Cloud computing allows small businesses to scale. Through the cloud, SMEs can access additional processing power, storage capacity and software based on their needs, with much lower upfront investments and regular maintenance expenses. Businesses with limited resources can then adapt quickly to market demands and compete more effectively in the digital economy.

Blockchain technology reduces supply chain risk, increasing visibility and boosting trust across a complex ecosystem. Distributed ledger technology and blockchain can help SMEs integrate into supply chains, become more efficient by eliminating errors, increasing transparency, reducing the need for physical documents and ensuring consistency across information sources.

Three-dimensional printing can help level the playing field between small and large companies with cheaper, quicker and more accurate manufacturing solutions compared to traditional methods. By allowing rapid prototyping and manufacturing of small-volume products and components, 3D printing minimizes set-up costs and encourages innovation.

Many technological innovations, including extended reality, the Internet of Things and Big Data, enable businesses to innovate and transform their operations by enhancing efficiency, scalability and customization. They also open new avenues for value creation and competitive advantage in the digital era. The four technologies highlighted in this report are those that are more accessible to and used by small businesses.

Need and location influence whether firms adopt digital technologies

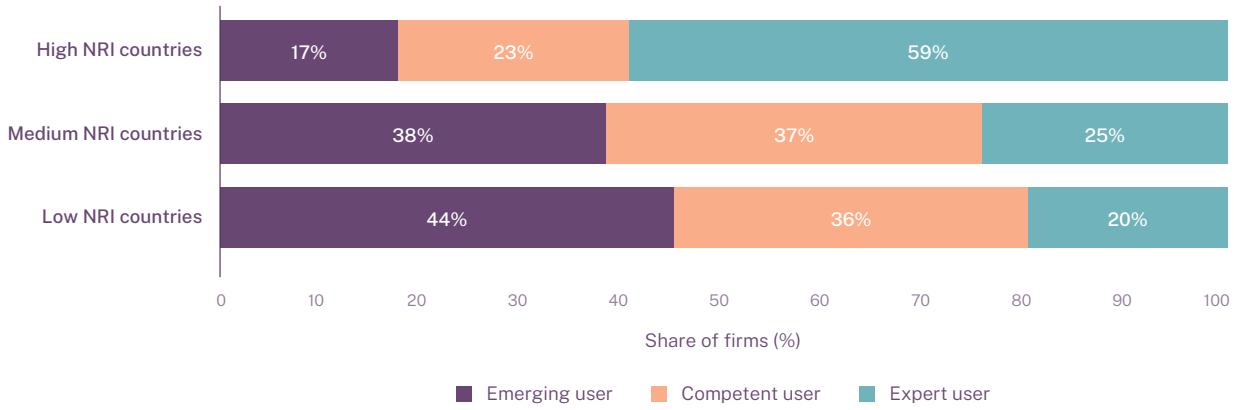
Several factors – including business need and the environment in which firms operate – determine whether companies adopt cutting-edge technologies and become expert users.

Business needs vary across sectors and business lines. The digital needs of an agricultural firm are very different from those of a company in the digital services sector, for instance. One in five agricultural firms do not use the internet at all, compared with less than one in 10 in the connected services sector.[1] Most agricultural companies are emerging users of digital technologies, while connected services companies are largely expert users.

Businesses also adopt and use digital technologies when the countries where they operate are 'digitally ready'.

The higher the country's digital readiness, the higher the level of digital transformation of firms. In countries with high digital readiness, nearly 60% of firms are expert users – three times more than in countries that are less ready.

Digitally ready countries have three times more expert users



Source: ITC, based on ITC Digital Transformation Survey and NRI from Portulans Institute.

High, medium and low digital readiness: How do countries fare?

To assess how far countries are in the process of digital transformation, this report uses the Network Readiness Index (NRI), developed by the Portulans Institute. The NRI provides disaggregated indicators for the most fundamental dimensions – or enablers – of digital readiness at the country level: access, individuals and regulations.

'Access' evaluates the technological infrastructure that a country needs to engage in the global economy. 'Individuals' captures the proficiency, inclusivity and adeptness of a nation's population and entities in using technological assets. 'Regulations' assesses whether the right structures are in place to invigorate the networked economy and how far these structures reach.

Based on their NRI scores, ITC categorized countries into three groups: high, medium and low digital readiness.

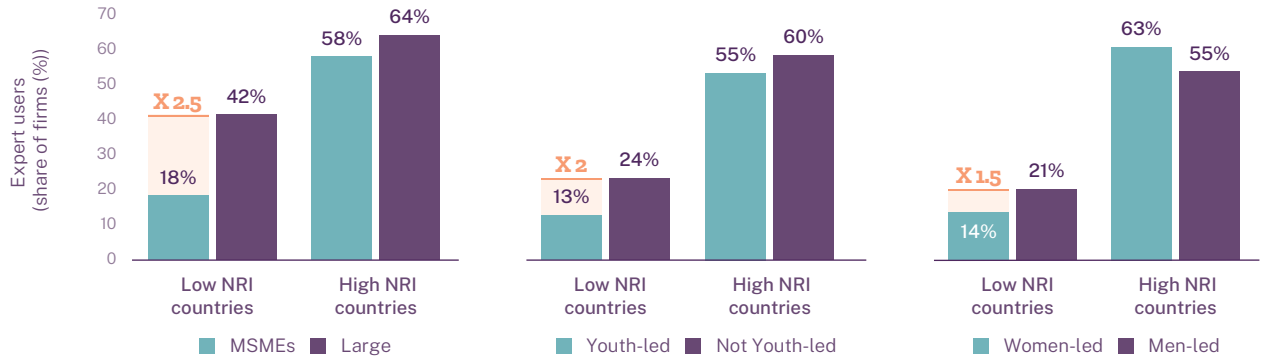
- Countries with 'high digital readiness' have enablers that place them at a more advanced stage of digital transformation.
- Countries with 'medium digital readiness' have an adequate provision of critical enablers, or at least some of them.
- Finally, countries with 'low digital readiness' have low levels of critical enablers and are lagging behind in their digital transformation.

Firms, especially the most vulnerable, struggle when operating in countries where digital enablers are lacking. In these contexts, large firms are 2.5 times more likely to be expert users than small firms. Similarly, non-youth-led businesses are twice as likely to be expert users than those led by young people, while companies led by men are 1.5 times more likely to be experts than those led by women.

The message is clear: **size and ownership matter, but mostly in unsupportive environments**. Small businesses in countries where enablers are in place are as well positioned as their large counterparts to adopt new technologies. In similar fashion, the gap between youth- and non-youth-led companies is virtually non-existent in countries with high digital readiness. Strikingly, the share of women-led firms at the expert level is higher than that of men-led ones in countries that are digitally ready.

The issue is how to provide an enabling environment that spurs digital transformation.

Gaps grow wide in digitally unsupportive environments



Source: ITC, based on ITC Digital Transformation Survey and NRI from the Portulans Institute.

Enabling the environment for digital transformation

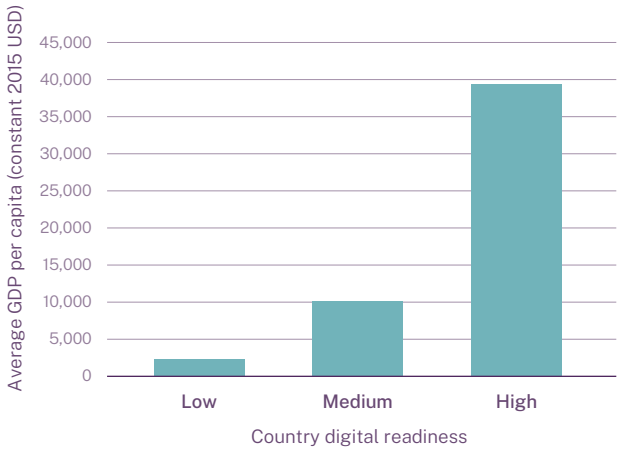
To boost the digital transformation of companies and economies, countries must be digitally ready. They must ensure access to reliable digital infrastructure, invest in skills development and provide firms with a supportive regulatory framework.

A country's digital readiness is largely correlated with income. High-income economies are surfing the peak of the digital wave while others are paddling – and low-income economies are stuck in the sand. A country's level of income partially determines how much it can provide the digital enablers that firms need for their digital transformation.

The concentration of technology in high- and upper middle-income countries could limit the benefits of digital transformation. An estimated 2.6 billion people, representing one-third of the global population, were still offline in 2023 and unable to participate in the digital economy. Low-income countries lag far behind in terms of internet use, with only 27% of their populations online on average, compared to 93% in high-income countries.

Digital infrastructure enables internet access, connecting individuals, businesses and governments to the global digital economy. Digital access fundamentally depends on electricity and connectivity infrastructure and services, as well as internet-enabled devices and software, which must be reliable, affordable and of high-quality. Despite progress in electrification and internet use, divides persist in both, across and within countries, limiting the ability of firms to digitally transform.

Digital readiness and income are related

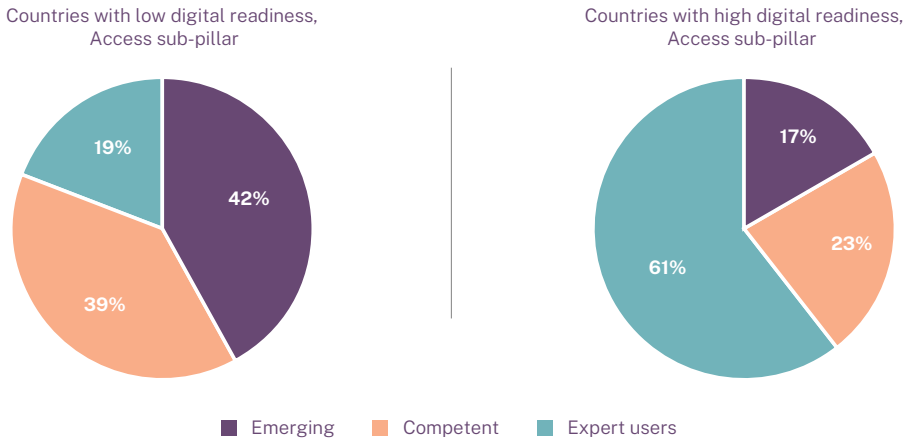


Source: ITC, based on World Bank World Development Indicators and NRI from Portulans Institute.

In countries that provide access to high-speed, affordable internet and internet-enabled devices, firms are further along the digital transformation path. Specifically, in countries that score at the top of the NRI's 'access' sub-pillar, 61% of firms were classified as expert digital users, contrasting sharply with a mere 19% in low-scoring countries.

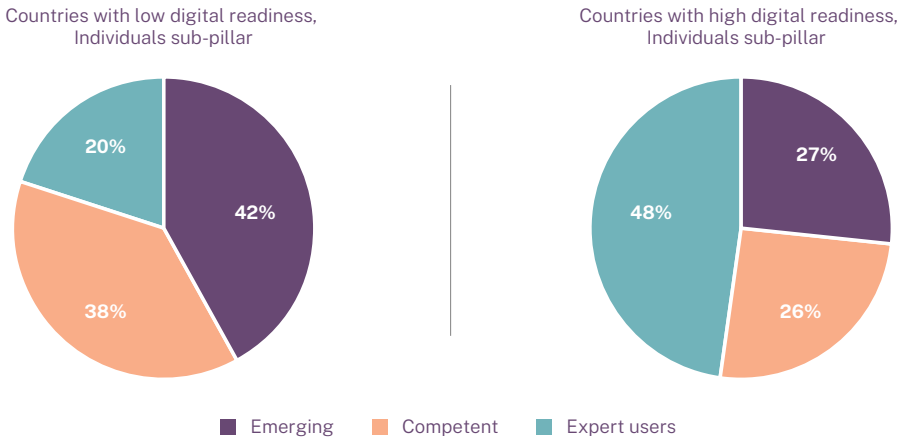
Digital infrastructure is necessary, but not enough. **Unless individuals have the skills required to take advantage of access, connectivity is meaningless.** Nearly half of businesses in countries that score high in the NRI's 'individuals' sub-pillar (an indicator of general educational quality) are expert digital users, contrasting sharply with just 20% in countries that score low in the same sub-pillar.

More expert users with advanced digital infrastructure



Source: ITC, based on ITC Digital Transformation Survey and NRI from Portulans Institute.

Expert users flourish in countries with digital skills



Source: ITC, based on ITC Digital Transformation Survey and NRI from Portulans Institute.

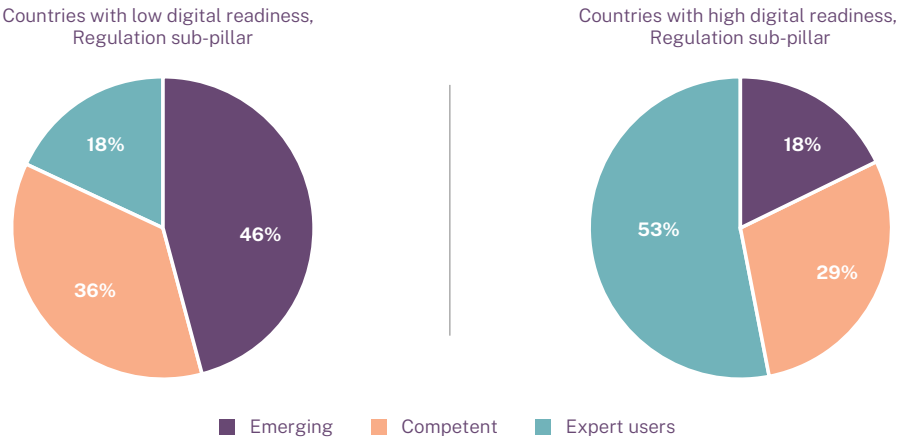
The share of digitally skilled individuals is particularly important for small businesses. Just as firms differ by size, productivity and degree of digital transformation, so too do they differ in their ability to pay high wages. When digital skills are widespread in a population, small businesses can more easily hire people with those skills without paying a large wage premium, which they often cannot afford.

Finally, **regulations are at the core of digital transformation**. Regulations determine whether the right environment is in place for digital infrastructure and skills to develop, or if these will fail to emerge. What regulations are in place also affects whether firms can attract the necessary investments and digital talent, if they can engage effectively in digital services markets and how they will interact with other firms locally and internationally in the digital economy.

In countries with a more digitally supportive regulatory ecosystem, as measured by the NRI's 'regulations' sub-pillar, 53% of firms are expert digital users. This stands in sharp contrast with 18% in countries displaying low regulatory readiness.

Regulating the digital economy presents unique challenges that require great collaboration and agility. In other words, **governments must think not just about 'what' to regulate, but 'how' to regulate, including how to ensure interoperability across sectors and borders.**

Expert users thrive under good regulation



Source: ITC, based on ITC Digital Transformation Survey and NRI from the Portulans Institute.

Making up for what the environment lacks

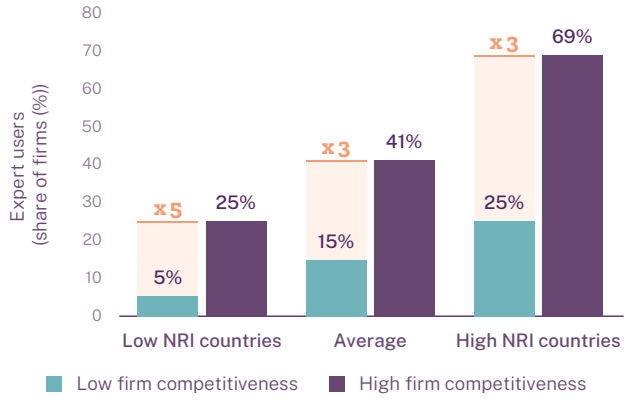
These key enablers are critical for digital transformation to take place. Still, companies do not sit idle waiting for the environment to improve. **Firms can and must act to make up – at least partially – for what the environment lacks.**

In general, pre-existing **competitiveness** factors strongly influence a firm's **digital transformation**, especially in countries with low digital readiness. Just 5% of the least competitive companies, as measured by ITC's competitiveness framework, are classified as expert users in countries with low levels of digital readiness. However, if they act to increase their competitiveness, they raise by fivefold their chances of becoming experts. In other words, even in unconducive digital environments, one in four companies manages to be an expert user – but only if it is highly competitive.

The actions that make a winner in a challenging environment fall into three camps. Firms that are expert users:

1. **Improve their financial management**, helping them afford the higher cost of internet connectivity where digital infrastructure, the first enabler, is limited or lacking.
2. **Identify and train staff**, which helps firms find and upgrade talent in labour markets with a limited supply of digital skills, the second enabler.
3. **Engage with strong business support organizations (BSOs)**, which help firms foster connections and obtain the information and tools they need to navigate complex regulatory ecosystems. BSOs can also help shape regulations, the third enabler.

Competitive firms, expert users



Source: ITC calculations, based on ITC SME Competitiveness and Digital Transformation Surveys of 1,210 firms in Cambodia, Colombia, Philippines and Togo.

A plan to leave no one behind

The Digital Transformation Action Plan proposed by ITC outlines key actions for making the digital transformation of firms possible. It sets out what must happen at the international and country levels – closing infrastructure, skills and regulatory gaps – and the steps smaller firms can take themselves, even when operating in challenging environments. In parallel, the Enterprise Digital Transformation Index can help assess firms' digital transformation, providing useful feedback that decision makers can use when determining what actions to take next.

Defining competitiveness

There is a long-standing tradition of defining and measuring competitiveness at the country level. However, such measures are of limited relevance for understanding business dynamics. Competitiveness is also not just a country feature, but a firm-level phenomenon.

ITC defines competitiveness as 'the demonstrated ability to design, produce and commercialize an offer that fully, uniquely and continuously fulfils the needs of targeted market segments'. The firms connect with and draw resources from the business environment and achieve a sustainable return on the resources they use.

Based on this definition, ITC has developed an analytical framework to understand firm competitiveness and how it improves over time. The framework is built around the three pillars of compete, connect and change. It also operates on three levels: firm capabilities, the business ecosystem and the national environment. More details are available in the Annex.

The action plan is not prescriptive: countries face different circumstances and have different needs. It instead shows what has worked well under specific conditions to inspire ideas for closing the digital gap. Not all actions apply everywhere and priorities must correspond with economies' state of digital readiness. All measures must be underpinned by sustainability, inclusivity and ethical considerations, so that benefits outweigh risks and no one is left behind.

While every country must decide what the right path is, it is clear that inaction is not an option in this increasingly digitally driven world. Otherwise, the digital economy risks becoming even more fragmented and its opportunities limited to those who can afford, access and make use of it. This means that not only might economic disparities grow, but social ones too, particularly for women and youth.

Lastly, concerns are mounting that some of the same digital technologies that can help firms and individuals lower their carbon footprint are also highly energy-, water- and resource-intensive – which could counteract many of their environmental benefits and create lasting environmental harm, unless steps are taken right now to improve them.

Digital Transformation Action Plan

	Public Sector	Private Sector	International Community	Small Business
Infrastructure	Increase availability and affordability through direct investment, partnerships and (fiscal and non-fiscal) incentives	Develop innovative market-based solutions and socially responsible initiatives	Offer concessional financing and support data collection efforts to pinpoint gaps and needs	Improve financial management and access to finance
Skills	Integrate digital skills in educational curricula, allow entry of foreign talent and strengthen social safety nets	Share information on demanded skills, provide training and transfer know-how	Support educational and training institutions to upgrade curricula	Professionalize recruitment and provide training to improve skills matching
Regulations	Update/build the regulatory toolbox for the digital age and ensure cross-border interoperability	Engage in digital strategy-, policy- and rule-making, as well as implementation	Champion and facilitate regulatory alignment and crossborder governance mechanisms	Engage with business support organizations to obtain information and advocate for SME-friendly rules

Source: ITC.

CHAPTER 1

Leveraging digital for development

Digital transformation is the latest wave of technological change. As with previous episodes of profound technical progress, it is spurring rapid growth while creating winners and losers. It is also redefining how we consume, produce and interact with one another, for better and for worse.[2]

The timing of this wave coincides with the final years of the 2030 Agenda for Sustainable Development and its 17 SDGs. The growth ignited by this digital transformation can create net societal gains that bring these goals closer within reach. It could also deepen inequalities, disproportionately benefiting those with access and skills, while leaving individuals, businesses and countries behind.

What sets this new wave fundamentally apart from its predecessors is its speed, scale and nature. These characteristics are what risk widening economic gaps within and among countries, while raising complex issues for regulators and for society at large.

Technologies are advancing at lightning speed and their diffusion is quicker than before, partially due to falling costs. But the spread is uneven. While some countries and businesses are riding this new digital wave, others are stuck in the sand. An accelerating pace for the 'haves' makes it harder for the 'have nots' to catch up.

Digital transformation also touches a wider swathe of the economy. Mature technologies, such as mobile broadband, and newer technologies, such as AI, can be deployed on a massive scale across nearly all sectors. As technology adoption becomes ubiquitous, the degree of economic change is potentially higher. While this can mean more growth, it can also lead to greater distributional imbalances.

Finally, the unprecedented nature of change introduces new threats and challenges, from individual privacy concerns to data and power monopolies and environmental pressures. The fast pace of technological development, adoption and dissemination challenges societies' ability to anticipate risks and set proper guardrails in a timely manner.

Against this backdrop, this *SME Competitiveness Outlook* addresses how to enable digital transformation and leverage its benefits, while setting up safeguards that mitigate its costs and 'leave no one behind'.

The digital transformation of firms is vital to the digital transformation of economies. However, to integrate digital technologies effectively into processes, products and services, businesses – especially small ones – must operate in environments where a set of enablers is present. These include adequate digital infrastructure, a skilled workforce and balanced, inclusive regulations. While placing digital transformation into a broader historical context, this first chapter shows the intricate connection between country readiness and firm digital transformation.

If countries are digitally prepared – with appropriate infrastructure, skills and regulations – businesses are more likely to access and use digital technologies. As firms digitally transform, they propel countries to higher levels of digital readiness, feeding a virtuous cycle of innovation and progress, of business growth and economic development. Chapter 2 explores the critical role of each enabler in spurring digital transformation, alongside the challenges in making these enablers available everywhere, to everyone.

Where enablers are lacking, firms can still act and leverage new technologies for increased productivity and transformative outcomes. But only a few seem able to do so, considerably widening gaps. Chapter 3 highlights the benefits of new technologies, particularly for small businesses, and identifies three areas in which firm action is more effective in making up for what the environment lacks: properly managing finances, identifying and training staff, and engaging with business support organizations.

Finally, governments, large firms and the international community must help small companies to digitally transform by enhancing enablers, smoothing distributional imbalances and managing emerging risks. Chapter 4 provides an action plan to help these stakeholders lay a digital path to sustainable, inclusive growth.

Digital transformation: Riding the waves

Technological change is a staple of the modern era. Since the Industrial Revolution, the world has gone through several (often overlapping) waves of technological change, from the steam engine to automobiles.[3] What sets digital transformation apart from these earlier waves is its lightning-fast speed, immense scale and its very nature. This poses new and hard-to-predict risks, making it tougher for individuals, businesses and governments to adapt and respond in time.

The waves of technological change

The origins of today's digital transformation can be traced to the mid-20th century, when the first computers transformed handwritten notes into information that could be more efficiently processed, analysed and shared.[4] The home computer boom in the 1980s marked a critical shift, as technologies exclusively used by scientists became household staples, though mostly in developed countries.[5] Now mature technologies such as voice telecommunications (fixed and mobile), computers and broadband networks revolutionized access to information and altered how people communicated and connected.[6]

The subsequent phase of digital platforms and cloud computing catalysed business-to-business and business-to-consumer communication, ushering in a new era of connectivity and transforming how workers, businesses and consumers interact. The most recent phase of digital transformation is characterized by the development of digital technologies, such as AI, blockchain and 3D printing. These newer technologies are also integrating technologies from prior phases into how they work (Table 1).[7]

Table 1: The phases of digital transformation

Digital innovation	Development	Adoption	Social and economic impact
Computers, broadband, mobile telecommunications	1950–1975	1960–2000	1990–2010
Internet platforms, cloud computing	1970-1990	1995-ongoing	2005-ongoing
Artificial intelligence, blockchain, 3D printing, etc.	1980-ongoing	2010-ongoing	2020-ongoing

Source: ITU, 2017.

Box 1: Advanced technologies spur digital transformation

Technological change is happening quickly and new tools seem to emerge overnight – though their development may have taken years or decades. In late 2022, the world was taken by storm by the launch of OpenAI's ChatGPT, which reached a million users in just five days, generating excitement and fear.

This report focuses on technologies that, globally, hold the greatest promise and risks for small businesses: AI, cloud computing, blockchain and 3D printing. This report acknowledges that the extent to which new technologies are applied varies across different regions of the world and income levels. It also recognizes that other technologies that could revolutionize the business landscape may still be on the horizon.

Artificial intelligence is when machines can execute tasks that would normally require cognitive abilities, such as perceiving and recognizing images and speech, translating texts and taking decisions. Related subfields include machine learning and deep learning. Generative AI can create original content by applying patterns, using complex algorithms and methods of learning inspired by the human brain.

AI-powered tools are spreading quickly, from basic chatbots in hospitality and tourism that offer 24/7 customer service[8] to more advanced applications in the financial services and tech, media and telecom sectors.[9]

Blockchain is a distributed ledger technology that allows for more secure record-keeping among multiple users. These records feature transactions and other inputs, stored in separate blocks across different computers in a network. Once incorporated into a block, these inputs cannot be altered and are visible to everyone involved. These blocks are connected sequentially in a chain, and any new inputs to form an additional block must be verified and validated.

The result is a clearly linked set of secure records that participants can use and share. This creates greater trust and transparency, and the information can be used more easily in supply-chain management and digital identity, among other applications.

Cloud computing is the on-demand delivery of computing resources over the internet, such as servers, storage, databases, software and analytics. It enables users to access these resources without needing to store and process them on local devices – saving them costs and computer space – as these resources are instead stored and provided through an online network.

Three-dimensional printing (3D printing), also known as additive manufacturing, involves the creation of three-dimensional physical objects from digital files. This technology enables the production of complex shapes and structures using materials such as plastics, metals and ceramics. 3D printing is becoming increasingly commonplace across fields as varied as healthcare, transport and construction.[10]

Sources: (ECLAC, 2021; Krings & Schwab, 2021; WEF, 2023).

Digital transformation draws from two interrelated processes: digitization and digitalization.[11] Digitization entails converting analogue data and processes into digital format. It involves capturing information from a physical source, such as a customer order form, and storing it electronically in a computer system or database.

Digitalization refers to the use and reuse of data to enhance business processes. For example, certain electronic data collected by governments are made available to and used by the private sector in designing and delivering services, or data reported for administrative compliance once are used to fill in other forms automatically.

Digital transformation, in turn, is more widespread. It builds on both digitization and digitalization to disrupt modes of production or ways of doing business. Telemedicine shows the continuum of digitization, digitalization and digital transformation in action. Digitization allows a doctor's handwritten patient records to be stored as digital files, such as PDFs or images. This process does not change how the records are used, but makes them accessible in digital form.

Electronic health records are an example of digitalization: they are used to register patient information, allowing doctors to search, update and share data. Digital transformation applies digital technology to create entirely new ways of delivering value: for instance, telemedicine platforms allow doctors to perform virtual consultations with patients and make faster preliminary diagnoses, thus making healthcare more accessible, personalized and efficient.[12]

A digital path to growth

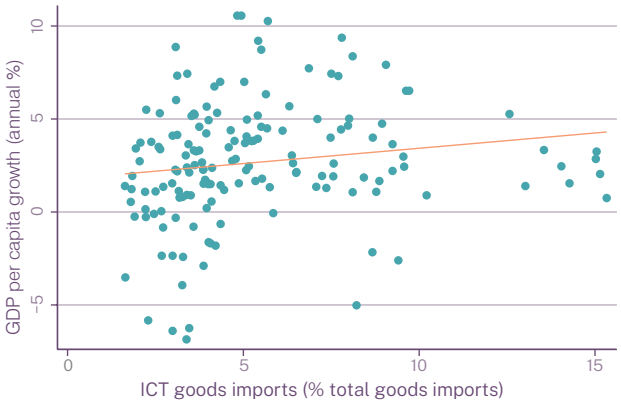
As new technologies and tools are developed to underpin digitization and digitalization, new economic and societal implications emerge. From a purely economic standpoint, digital transformation can support increases in per capita income, driving higher living standards. Socially, digital transformation has the potential to change the nature of jobs, creating new ones and destroying others (see Box 2).[13]

The 2030 Agenda for Sustainable Development recognizes that the rapid spread of today's digital technologies in this increasingly interconnected world has 'great potential to accelerate human progress, to bridge the digital divide and to develop knowledge societies'.[14] In practice, the relationship between digital transformation and the SDGs is more complex, influenced by various social, economic and policy-related factors. The former does not necessarily lead to the latter.[15]

Nonetheless, the underlying technologies of today's digital transformation have a recognized potential to help address global challenges such as poverty and environmental harm. They spur productivity and give individuals, businesses and governments new tools to make better, more informed decisions.

None of the SDGs is specifically about ICT, but several targets refer to these technologies. SDG 9 (Industry, innovation and infrastructure), specifically target 9.c, calls on countries to increase access to ICTs and strive to provide universal and affordable access to the internet in least developed countries (LDCs).[16] This reflects the idea that making digital technologies more available can help power growth. Indeed, imports of ICT goods – one way to increase access – are linked to subsequent growth in per capita incomes (Figure 1).

Figure 1: Countries importing ICT goods subsequently grow faster



Source: ITC, based on World Bank World Development Indicators.

Box 2: The future of labour markets in an increasingly digital age

Contributed by the International Labour Organization

Artificial intelligence and digitization are reshaping labour markets by automating tasks, creating new roles and transforming industries. While this leads to more demand for high-skilled roles in certain sectors, it can threaten the security of low-skilled jobs, risking greater unemployment among vulnerable groups.

The ILO's 2023 report *Generative AI and Jobs* estimates that the introduction of AI generates demand for high-skilled roles in data science, machine learning and AI system management, along with related sectors such as AI ethics and regulation. There will also be a greater need for roles that emphasize creativity, critical thinking and interpersonal skills. Routine and manual jobs, such as those of data entry clerks, assembly-line workers and cashiers, are increasingly susceptible to automation.

The shifting demand for skills is reshaping wage structures and risks. High-skilled roles in AI-related and creative sectors are likely to see higher wages, unlike those jobs in sectors susceptible to automation. Women are also 2.5 times more affected by automation than men, which may exacerbate gender-based wage inequalities. These developments underscore the need for policies that support upskilling and reskilling so workers can benefit from emerging opportunities.

Finally, AI and digitization are slated to reshape working conditions and job quality in different sectors. While digital tools facilitate remote and flexible work, which can improve work–life balance, the rise of gig and platform economies has led to precarious employment with limited access to social protection, benefits and job security. Effective social protection systems and policies are critical to protect workers.

Policymakers should act decisively to promote labour-friendly technologies that support workers, rather than replace them. Training programmes to upskill workers for emerging digital roles, coupled with robust digital infrastructure, are vital for inclusion. Finally, policies should prioritize workers' protection against the downsides of digitalization, with social protection systems, social dialogue and workers' organizations all having an essential role to play.

The ILO provides research, policy advice and capacity building so that governments and social partners can navigate this shifting digital landscape effectively and make the most of these new opportunities. It fosters dialogue among governments, employers and workers to address related challenges, while working with constituents to establish effective employment policies and social protection systems.

Source: (Berg et al., 2023).

Faster growth and higher incomes can accelerate progress towards other SDGs. Evidence links broadband internet penetration with GDP growth and poverty alleviation, supporting the achievement of SDG 1 (No poverty).[17] For example, household surveys from rural China indicate that higher internet usage decreases the likelihood of households falling into poverty.[18] In sub-Saharan Africa, studies conducted in 2010–2019, or pre-COVID, revealed an indirect yet generally positive relationship between the use of telephones and mobile phones and poverty reduction.[19]

Digital technologies can also improve development outcomes through better use and processing of information. With higher levels of digitalization, countries can harness data-driven insights to inform policymaking, optimize public services and address societal challenges more effectively. For instance, AI can identify geographical concentrations of poverty, potentially transforming poverty monitoring and alleviation efforts in developing countries.[20]

Digital tools are successfully deployed in education as well. For example, they have been used to identify at-risk students in Colombia, enhance English learning for Thai students and develop virtual teaching assistants for science education in West Africa.[21] These directly contribute to SDG 4 (Quality education) while laying the foundation for more skilled workers in the future, supporting SDG 8 (Decent work and economic growth).[22]

New technological advancements support the attainment of SDG 2 (Zero hunger). For instance, in rural areas, technologies that enable precise tracking and data collection for individual plants are transforming how producers monitor their crops.[23] This optimizes agricultural yields, minimizes resource use, allows for early disease detection and boosts agricultural productivity.

In a world increasingly affected by climate change, digital technologies also generate vital climate-related data and increase operational efficiencies that reduce greenhouse gas emissions, helping fight environmental crises and meet SDGs 13 (Climate Action), 14 (Life Below Water) and 15 (Life on Land). For example, AI can identify desertification trends across extensive areas, enhancing planning, decision-making and environmental management.[24]

Smart manufacturing practices such as virtual manufacturing, customer-centred production, circular supply chains and smart services are poised to further decrease emissions. These practices could lead to an estimated saving of 2.7 gigatonnes of carbon dioxide equivalent (Gt of CO2e), representing a 4.5% reduction of global CO2e emissions by 2030, holding emissions at 2015 levels.[25]

Finally, immersive technologies including virtual reality offer digital experiences that minimize physical impacts on tourist attractions, preserving places of historical and natural significance and reducing pollution.[26] Enterprises such as Mata Technologies, a *Business Voice* in this chapter, are changing how customers experience the beauty of remote places, making tourism more sustainable.

This is in line with SDGs 11 (Sustainable Cities and Communities) and 13 (Climate Action), while also being more inclusive of individuals with disabilities, in line with SDG 10 (Reduce inequality within and among countries).

These examples show that digital transformation can make a substantial difference in achieving the SDGs. What matters now is figuring out how to use these technologies to make these outcomes possible, while ensuring the right safeguards are in place.

BUSINESS VOICE

Virtual reality for inclusive and sustainable tourism

A pioneer in the Philippines, Mata Technologies creates immersive virtual maps showcasing the country's natural beauty and cultural heritage, making tourism sustainable and accessible to all.

Erika Dell P. Sancho

CEO
Mata Technologies
Philippines

'The Philippines is a country of undisputed beauty, but many can only imagine it. We created Mata Technologies in 2022 to turn imagination into reality. Our goal was to transform the way people experience our country, whether in person or virtually.

The tourism industry is very important to the Philippines. It employs over 5 million people and generates $3 billion to $5 billion in revenue. Our company was the first to incorporate virtual technologies in tourism services. We created virtual reality maps and tours of destinations across the country and gamified these "virtual islands", making the experience more interactive and immersive.

We invested in these technologies to make tourist destinations in the Philippines more accessible to those who cannot travel. Whether because of disabilities or other restrictions, we wanted to make sure that our services were inclusive of all, fostering the UN's Sustainable Development Goal 10, which calls for reduced inequalities within and among countries.

The use of such technologies also makes tourism more sustainable. Our offerings, for example, promote sustainable travel options, which can help achieve SDG 11 on sustainable cities, as well as SDG 13 on climate action.

Creating and operating a business such as ours, however, is not without challenges. One obstacle we faced at the starting line was obtaining the necessary equipment. We had to import virtual reality headsets and cameras using our personal network, as they were not available in the Philippines at the time.

Another challenge was reaching international clients. Fortunately, assistance from governmental institutions such as the Department of Trade and Industry, and our partnerships with the Cebu and European chambers of commerce, have been invaluable in opening international opportunities to us.

Similarly, ITC has been very helpful in connecting us to international markets and bringing our products and services to the global stage. With this support, and the networks we created, we look forward to expanding our offering to new destinations in the Philippines and fostering economic development through sustainable and inclusive tourism.'

The European Union (EU) funds the ARISE Plus Ye! Boost Accelerator programme in the Philippines. The programme aims to support and enhance the capacities of youth-led businesses to internationalize. It is part of the wider ARISE Plus Philippines project, whose goal is to foster inclusive economic growth through improved international trade performance and competitiveness, as well as economic integration.

New technologies spread wide and fast

Mature technologies such as mobile broadband, and new ones such as AI, 3D printing, cloud computing and blockchain, have the potential to be deployed on a massive scale. Many already are. The scalability of each technology depends on overcoming challenges related to cost, speed, regulation, integration and performance.

From automating routine tasks to revolutionizing customer interactions and streamlining supply chains, the scalability of digital technologies has far-reaching implications. Unlike previous waves, the current one is characterized by an unprecedented level of global connectivity, where devices, systems, individuals, governments, businesses and organizations are deeply interlinked across geographical and sectoral boundaries.

Digital transformation is spreading quickly, at least for the most mature technologies. This pace is often faster than that of prior waves of technological change, due partly to falling costs. For instance, the share of people with access to the internet in low- and middle-income countries grew three times faster between 2000 and 2021 than that of people with access to electricity (Figure 2).

Electricity access in these countries rose by 10 percentage points in 2011–2021, while internet access surged by 36 percentage points.[27] In 2023, about 67% of the world's population, or 5.4 billion people, were online, representing a significant increase from the 4.9 billion recorded in 2021.[28]

If digital technologies spur deep and quick changes, but do so unequally, digital gaps could widen both within countries and across the globe. This possibility is already playing out in practice.[29] Many countries are yet to ride the previous waves of technological change, leading to gaps in productivity.

Rapid digital transformation also has a major environmental footprint. The production and disposal of a growing number of devices are taking a toll on the planet, as is the heavy demand for water and energy to power these new technologies and tools.[30]

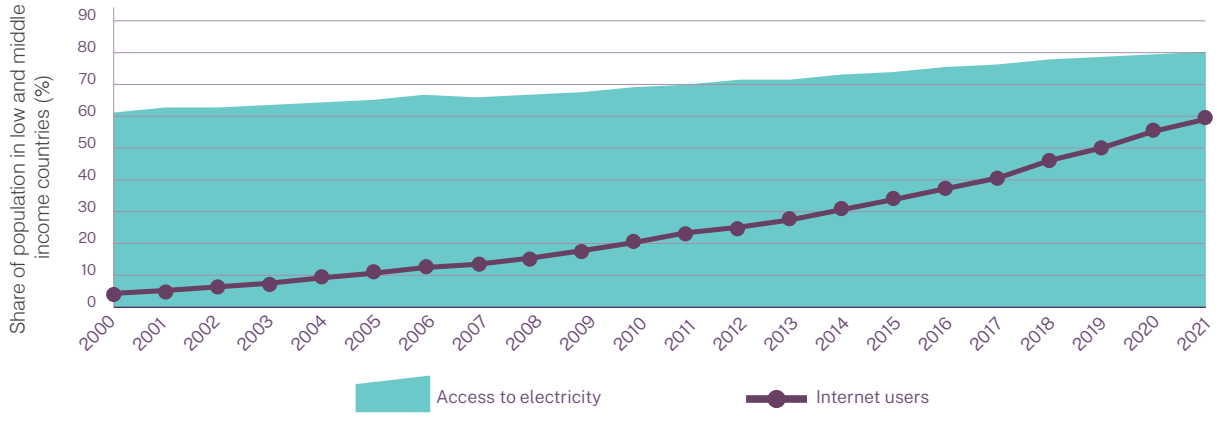
Data centres are among the most energy-intensive components of digital infrastructure, whose share of electricity consumed worldwide more than doubled from 0.5% in 2000 to roughly 1% to 2% in 2022.[31] This is higher than the energy use of France, the 10th-largest electricity consumer.[32]

The rapid turnover of electrical and electronic devices contributes to electronic waste (e-waste), which risks harming the environment and damaging human health if not treated, disposed of and recycled correctly.[33] In addition, greater digital use has led to extensive extraction of natural resources such as copper and lithium.[34]

Digital advancements also reinforce concerns about privacy, freedom of expression and discrimination due to cyber threats, data breaches and biased AI algorithms. Social media platforms, for instance, are sometimes linked to the incitement of hatred and violence, including against minorities and women, and to the spread of disinformation.[35]

Similarly, digital technology's ability to harness vast datasets means that control over these data can become a powerful tool for influencing policy, diplomacy and market dynamics. This can perpetuate discrimination and lead to further marginalization of vulnerable populations such as women and girls, Indigenous Peoples, minorities and people with disabilities.[36]

Figure 2: Digital technologies spreading fast in low- and middle-income countries



Source: ITC, based on the World Bank World Development Indicators and International Telecommunication Union data.

Going digital: Mind the gap

Countries must be digitally ready to leverage digital transformation for development. This requires investing in digital infrastructure, together with skills development within a supportive regulatory framework. Many countries, notably high-income economies, are surfing the peak of the digital wave, while others are paddling, and those at the low end of the income distribution are stuck in the sand.[37]

Firms will only digitally transform when countries are ready. When digital enablers are in place at the country level, firms are more likely to adopt new technologies, with their associated benefits, according to ITC research. As firms digitally transform, they propel countries to higher levels of digital readiness, feeding a virtuous cycle of innovation and progress, of business growth and socioeconomic development.

Not all countries are ready

Digital transformation has many facets. There is no single way to categorize countries in terms of how far they are in the process.

Country-wide digital transformation happens when enough businesses adopt digital technologies to improve processes, products and services, adding value to customers. Firms must benefit from a core set of enablers to do so, namely infrastructure, skills and regulations. Measuring the presence or absence of these enablers can show how ready a country is to power its firms' digital transformation. The Network Readiness Index, developed by the Portulans Institute,[38] provides such a summary of a country's position (Box 3) and is used in this report to assess the state of these three enablers.[39]

Box 3: Is my country ready for a digital transformation?

To measure a country's digital readiness, this report follows the Network Readiness Index, a composite index with three levels.

The first level consists of four pillars that make up the fundamental dimensions of network readiness: technology, people, governance and impact.

- **Technology** assesses a country's technological infrastructure required to take part effectively in the global economy.
- **People** reflects how much individuals in a given country are proficient and adept in using technological assets, while also assessing inclusivity.
- **Governance** evaluates those structures that drive and underpin the networked economy, both in terms of their establishment and in how far their reach extends.
- **Impact** gauges how taking part in the network economy contributes to holistic growth and benefits society.

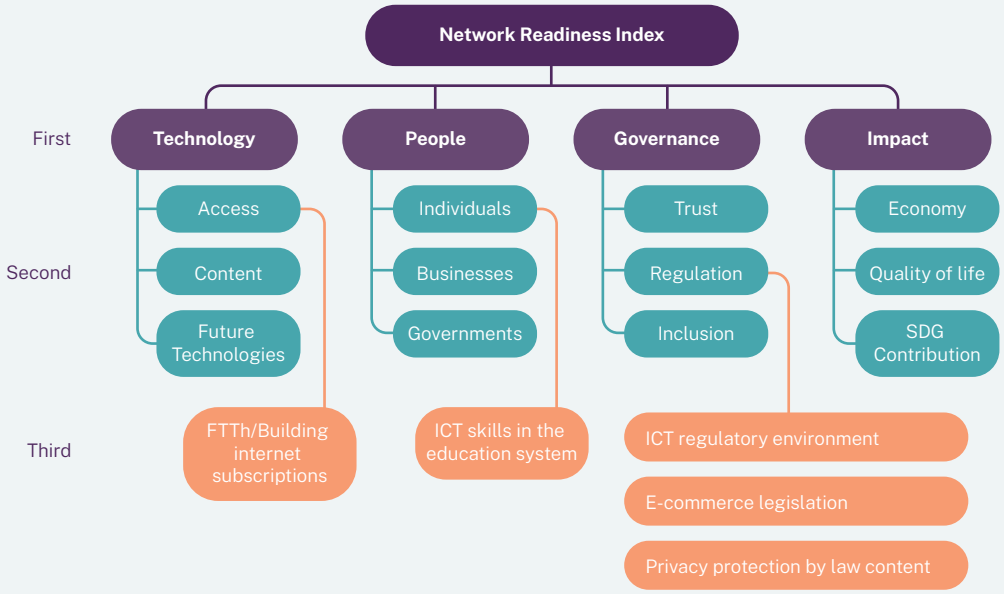
As the 'impact' pillar identifies the socioeconomic outcome of being digitally ready, it is not included in the assessment of digital enablers.

The second level of the NRI consists of the individual sub-pillars under the four pillars. Three of these sub-pillars are of particular interest in this report, as they provide the proxies for assessing how well countries perform under each enabler:

- **Access** (technology pillar) considers how much individuals can access ICT, at a basic level, looking at factors such as communications infrastructure and cost-effectiveness. This allows for assessing the infrastructure enabler.

- **Individuals** (people pillar) analyses individuals' use of technologies and how much they can take part in the networked economy. This corresponds to the skills enabler.
- **Regulation** (governance pillar) evaluates how much governments foster a networked economy, namely through the development of regulatory measures, strategies and foresight. This aligns with the regulatory enabler.

The third level involves 58 indicators that fall within various sub-pillars. This report uses some of these indicators. To make the indicators comparable for data aggregation, a normalization method is used to ensure that the values range between 0 and 100, with higher values denoting better outcomes.



Source: Dutta and Lanvin, 2023.

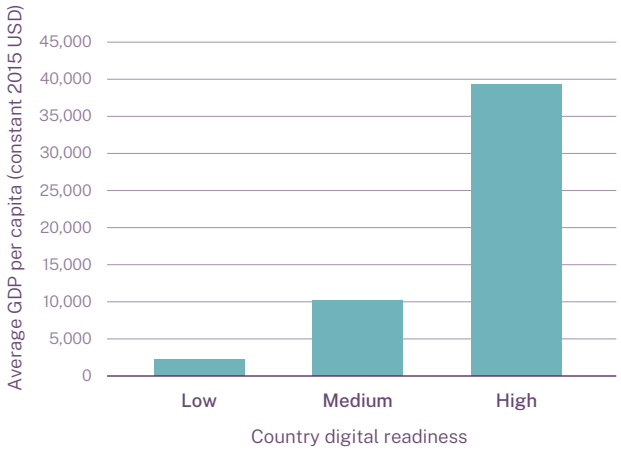
ITC classified countries in three groups – low, medium, and high digital readiness – in this report, based on their score on network readiness under the aggregated index, or under individual sub-pillars. Countries with 'low digital readiness' have low levels of critical enablers, hindering their digital transformation. Countries with 'medium digital readiness' have adequate provision of some or all critical enablers. Finally, countries with 'high digital readiness' are those where enablers are readily available.

Digital readiness, by this metric, is largely correlated with income, albeit with some exceptions, as shown in Box 4. A country's income level partially determines whether it can provide the digital enablers that firms need to transform. High-income countries tend to display high digital readiness, while low-income countries tend to lag behind (Figure 3).

Technological learning and technical advancements in LDCs mainly occur by using and enhancing technologies from advanced economies, which must be adapted to suit local conditions.[40] Global production and exports, however, remain concentrated in high- and upper middle-income countries (Figure 4).

These countries, which hold the bulk of ICT-related intellectual property rights, receive most global royalty payments, reinforcing their dominance in ICT production and exports.[41] This creates barriers for lower-income countries, limiting their access to crucial technologies and hindering their ability to compete in the global ICT market.[42]

Figure 3: Digital readiness and income are related



Source: ITC, based on World Bank World Development Indicators and NRI from Portulans Institute.

The concentration of technology could lead to some world regions benefiting less than others from digital transformation. An estimated 2.6 billion people, representing a third of the global population, were still offline in 2023 and unable to participate in the digital economy.[43] Low-income countries lag far behind in terms of internet use, with only 27% of their populations online, compared to 93% in high-income countries.[44]

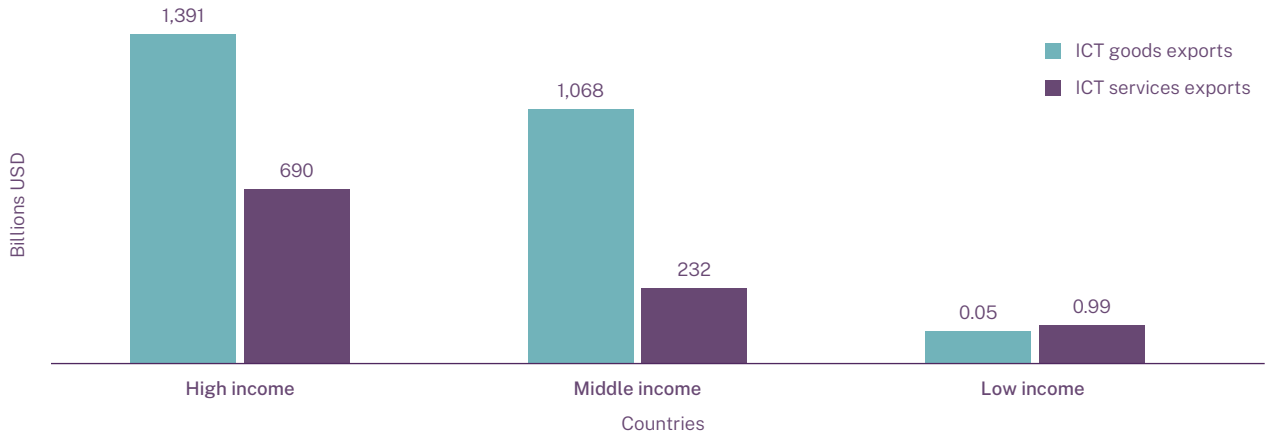
On the upside, the fact that digital technologies can be deployed in nearly all sectors can spur further decentralization of production, with potentially widespread benefits. This differs from previous waves of technological change, which affected a smaller number of sectors and disproportionately benefited – in the short run – countries with a comparative advantage in those sectors.

Shifting to 3D printing has reduced production costs, boosting demand and trade, one study shows.[45] While early innovators, mostly developed countries, remain the top exporters, some middle-income countries have increased their market share, as illustrated by the examples of Mexico and Viet Nam in the hearing aid industry. Exports may therefore rise even with the deployment of such technologies and may not necessarily become more concentrated in the top producing countries.[46]

Digital technologies also transcend geographical boundaries, broadening opportunities for businesses and consumers in previously disadvantaged locations. In East Africa, for example, AI technology is being used to help farmers diagnose diseases in staple crops, including maize, cassava and potatoes.[47] Online marketplaces can connect rural areas and other isolated regions to global markets, helping reduce regional income inequalities.[48]

While overall levels of technology differ across countries, these examples show that some companies in low- and middle-income countries can adopt and use new technologies. What differs is the pace and scale of this adoption. Still, in an environment of rapid and profound technological change, closing these digital gaps now is critical for businesses and societies to thrive.

Figure 4: ICT exports concentrated in higher-income countries



Source: ITC, based on World Bank World Development Indicators.

Box 4: Digital transformation in Rwanda: A success story

Rwanda stands out as success story of digital transformation among low-income countries, defying the observed correlation between digital readiness and income level (Figure 3). The NRI score ranks Rwanda well above its income peers and as top performer in Africa, demonstrating how deliberate government action and innovation can drive digital transformation.

Recognizing ICT as crucial for growth, especially for a landlocked country with few natural resources, Rwanda has invested extensively in digital infrastructure and skills training as part of its Vision 2020 strategy. These efforts aimed at shifting the economy from agrarian to knowledge-based, establishing Rwanda as a technological hub in Africa.

As of 2021, mobile phone penetration in Rwanda had reached 73% – more than double the share seen in 2011. The 4G network now covers 96% of the country. International bandwidth access increased tenfold between 2014 and 2019, driven by the Government's rollout of a fibre-optic broadband network.

Rwanda's digital readiness stems from decades of government initiatives, public–private partnerships and investments across multiple sectors of the economy. From the deployment of the first National Information and Communication Infrastructure plan in 2000 to the current Smart Rwanda Master Plan and the 2018–2024 ICT Sector Strategic Plan, the Government has made a concerted push to integrate ICT throughout all economic sectors.

Public–private partnerships have been key, especially in digital infrastructure. For example, a 2,300 kilometre fibre-optic backbone was built with the World Bank's support, and Korea Telecom facilitated the rollout of 4G infrastructure, which now covers over 95% of the country's territory.

With this digital infrastructure in place, the Rwandan Government launched the e-portal Irembo in 2017, an online platform aimed at delivering government services to businesses and citizens. The portal hosts 96 services across six government agencies.

As investments in digital infrastructure reach maturity, initiatives such as Kigali Innovation City assert Rwanda's status as an ICT hub. The Government is now focusing on skills training and cyber security, adopting Africa's first national strategy for the responsible and inclusive use of AI.

Rwanda's experience underscores the importance of aligning national development goals with digital strategies, which ensures that governments implement and support policies, public–private partnerships and investments consistently.

Sources: (CNBC Africa, 2024; GIZ, 2023; Government of Rwanda, n.d.-a; n.d.-b; 2015; Harguth, 2022; Portulans Institute, 2023; Razavi, 2018; UNDP, 2024).

Firms adopt if countries enable

Within countries, each firm treads its own path to digital transformation. Their paths are nonetheless shaped by the digital readiness of the countries where they operate, according to ITC analysis.

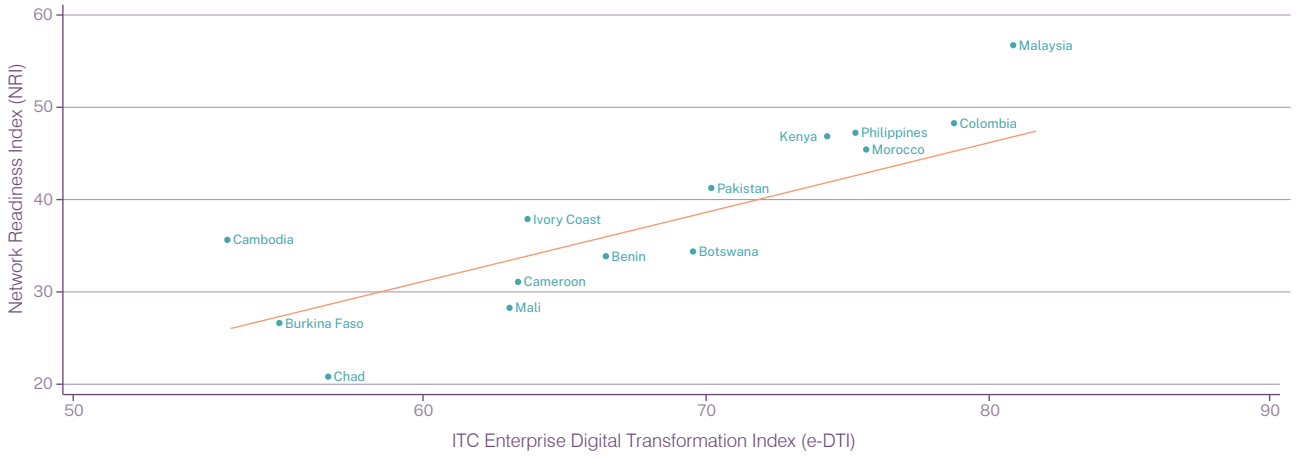
Based on data collected on firms' access to and use of digital technologies, ITC developed an indicator known as the Enterprise Digital Transformation Index (Box 5). Based on their scores in the e-DTI, firms were classified in one of three groups: emerging, competent or expert user of digital technologies.

- Emerging users of digital technologies are those scoring in the lowest tertile of the e-DTI across countries. Most of these companies report not having a digital strategy nor being up to date on new developments in digital technology. They tend to spend very little on digital solutions and rely primarily on smartphones and mobile broadband. As a result, these firms use digital tools mostly for basic purposes such as communication.
- Competent users fall within the middle tertile of the e-DTI distribution. These firms tend to have a digital strategy and a majority is always up to date on digital technology developments. They spend slightly more on digital tools, but usually less than 25% of their operational expenses, and make greater use of personal computers or tablets than emerging users. Their connectivity is supported by both fixed and mobile broadband, and a majority deploys digital solutions for more advanced processes such as selling on e-commerce platforms, storing data on the cloud, making digital payments and accessing government services provided electronically.
- Expert users of digital technologies encompass firms with the highest e-DTI values, falling within the top tertile of the distribution. Almost all companies in this category have a comprehensive digital strategy and are always up to date on the latest trends on digital technologies. Many allocate more than 25% of operational expenses to digital solutions and use laptops and computers with greater computing power. These companies also have access to more reliable fixed broadband and nearly all use digital technologies for advanced processes.

The higher the country's digital readiness, the higher the average firm's level of digital adoption (Figure 5). Strikingly, in countries that are less digitally ready, the share of firms that report not using the internet for business operations is as high as 20% – twice as many as in digitally ready countries.

A country's digital readiness explains both the proportion of unconnected firms and the extent to which firms undergo digital transformation (Figure 6). In countries with low digital readiness, nearly half of firms (44%) are emerging digital users, at the low end of the scale. In countries with high digital readiness, most firms (59%) are expert users.

Figure 5: Country readiness shapes firm digital transformation



Source: ITC, based on ITC Digital Transformation Survey and NRI from Portulans Institute.

Box 5: ITC's Enterprise Digital Transformation Index

Country-level measures of digitalization, such as the Network Readiness Index, can shed light on a country's digital readiness. These aggregate indicators, however, do not show how adoption rates vary across firms.

Businesses coexist at various stages of digital transformation within the same country. Firms' levels of digital adoption differ even when, theoretically, they can access the same infrastructure and skills and operate under similar regulations. Some of these differences are partially due to need – in some sectors, firms are born digital, while in others, they may operate with only basic technological deployment.

But need alone does not explain all the observed differences. Some are due to firm characteristics or actions, as explored in Chapter 3.

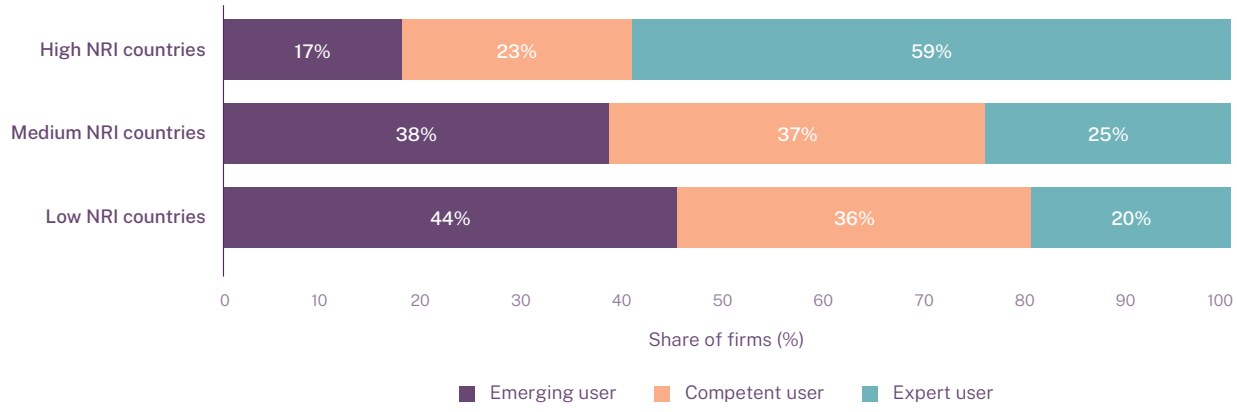
That is why ITC collected data from 7,402 firms of different sizes and sectors in 78 countries, covering information such as whether the business has a digital strategy and its management is aware of the available tools, along with how much they spend on digital tools and how they use them.

Based on firms' responses, ITC developed an index of firm-level digital adoption, the Enterprise Digital Transformation Index. Like the NRI, and to facilitate comparison, scores range from 0 to 100, with higher values indicating that firms are further ahead in their digital transformation path (see Annex for more details on the e-DTI).

Preparing a country for digital transformation is therefore fundamental so more firms can adopt digital technologies and do so effectively. To ensure digital transformation can serve as a catalyst for achieving the 2030 Agenda for Sustainable Development, countries must make digital readiness a priority.[49] This requires investing in digital infrastructure and tackling the digital divide to ensure equitable internet access, together with promoting skills development within a supportive regulatory framework. These efforts are key to fully harnessing the benefits of digital transformation for all.

The next chapter elaborates on the key enablers – digital infrastructure, skills and regulation – in which countries must invest to spur a digital transformation.

Figure 6: Digitally ready countries have more expert users



Source: ITC, based on ITC Digital Transformation Survey and NRI from Portulans Institute.

THOUGHT LEADER

Leaving no one disconnected

Rabab Fatima

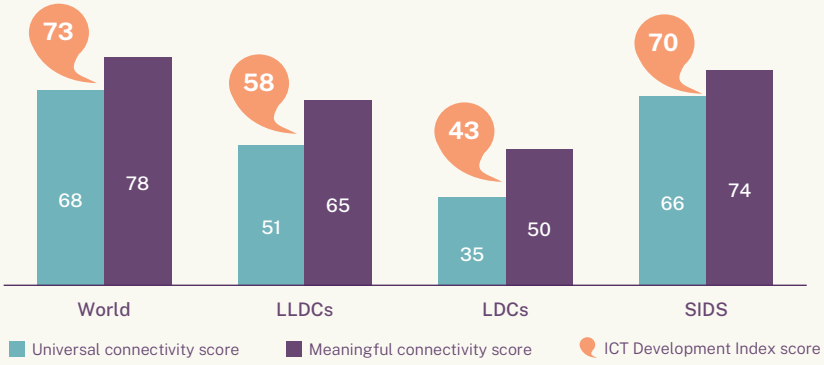
High Representative and United Nations Under-Secretary General Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States

The principle of 'leaving no one behind' lies at the heart of the United Nations 2030 Agenda and Sustainable Development Goals. As digital transformation becomes increasingly vital to achieving these goals, it is essential to expand this principle to 'leaving no one disconnected'.

Nowhere else is bridging the widening digital divide more critical than in the 92 most vulnerable countries in the world – LDCs, landlocked developing countries (LLDCs) and Small Island Developing States (SIDS).

In these countries, digital connectivity, affordability and quality are severely limited. Each of these three country groups falls short of the world average in universal and meaningful connectivity, when measured by the ICT Development Index (IDI). LDCs and LLDCs, in particular, lag behind considerably.

ICT Development Index scores: LLDCs, LDCs and SIDS lag behind



Note: All group aggregate scores are simple, unweighted means of the IDI score of the countries composing the group.

Source: Calculations by the United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States based on ITU World Telecommunication/ICT Indicators database 2023 (Accessed June 2024).

Infrastructure, governance and skills

To address these challenges effectively, it is necessary to enhance digital infrastructure, governance and skills.

First, substantial investment in infrastructure is essential. A major proportion of the population still lacks access to electricity (45% in LDCs, 41% in LLDCs and 33% in SIDS). Moreover, many of these countries have limited internet infrastructure. LLDCs and SIDS face extra challenges, such as high transit costs for undersea cables or reliance on expensive satellite connections.

Second, digital governance remains a critical issue. Fewer than half of LDCs, LLDCs and SIDS meet the ITU benchmarks for digital policy and governance frameworks. Most lack a comprehensive national e-commerce strategy, which hampers their digital economic potential.

Lastly, these three groups of countries have few basic ICT skills, with only a small percentage of people proficient in tasks such as word processing (12% in LDCs, 14% in LLDCs and 24% in SIDS). Even fewer possess advanced skills, such as creating electronic presentations (1% in LDCs, 6% in LLDCs and 14% in SIDS).

Greater support is needed

Small businesses, crucial to these economies, struggle to bridge the digital divide – a challenge heightened by advances in technologies such as generative artificial intelligence. To ensure that these countries can keep pace with the evolving global business landscape, it is imperative to enhance support to them.

As a result, it is necessary to make digital transformation in these 92 most vulnerable countries a global priority. My office is dedicated to this mission, tasked with mobilizing and coordinating the United Nations system to implement the respective 10-year programmes of action for LDCs, LLDCs and SIDSs.

The Doha Programme of Action for Least Developed Countries (2022–2031) prioritizes science, technology and innovation, with a strong emphasis on digital infrastructure and literacy. Similarly, the new 10-year programmes for LLDCs and SIDS highlight the critical role of digitalization in their development.

These frameworks already involve tangible measures. For instance, the UN Technology Bank for Least Developed Countries works with many governments to improve capacities in science, technology and innovation to adopt and scale up digital technologies. Initiatives such as the proposed Online University in the Doha Programme of Action will further bolster scientific and digital skills essential for transformation in LDCs.

For SIDS, a major achievement is the launch at the SIDS4 Conference of a Centre of Excellence featuring a SIDS Data Hub and a technology and innovation mechanism. Similarly, the new programme of action for LLDCs includes actions on science, technology and innovation in sectors such as agricultural and digital trade.

These new programmes of action provide clear targets, commitments and deliverables to bridge digital divides and maximize the benefits of digital transformation. Effective international policy coordination is now of paramount importance, alongside support for technology transfer through trade and foreign direct investment. It is equally vital to redouble efforts to reverse the recent decline in development assistance for ICT infrastructure and to ensure that aid doesn't falter when these countries need it most.

Much of the developed world already lives in a digital future, out of reach for too many people and businesses in LDCs, LLDCs and SIDS. Everyone must be given equal opportunities to thrive in that new digital world. The office that I lead is committed to fostering the widest possible coalition of global partnerships, including public–private collaborations, to connect the furthest behind first and ensure that no one is left disconnected.

CHAPTER 2

Enabling a digital transformation

The world is digital. For many, this is an undeniable fact, raising hopes that a new development era is on the horizon. Yet, for billions of people, millions of companies and many developing economies, digital transformation remains elusive and its potential benefits unattainable.

Digital transformation of firms is closely linked to countries' digital readiness, as shown in Chapter 1. National readiness, in turn, depends on key enablers: digital infrastructure, skills and regulations. Boosting the digital transformation of firms, therefore, requires providing or reinforcing these enablers at the national level.[50]

First, people and businesses need digital infrastructure to use the internet. This means they must have access to reliable and affordable energy and connectivity infrastructure and services, along with appropriate devices. In many countries, digital infrastructure is absent, unreliable or unaffordable for large swaths of the population, perpetuating multiple digital divides.

Second, access to the internet is only effective if the workforce has digital skills. While different types of businesses require varying qualifications, firms will have a better chance at finding and affording the right employees for their needs if there is a digitally skilled labour force. Widespread gaps in education and digital skills make it difficult for firms to find and pay for the right talent, deepening digital gaps.

Finally, striking a regulatory balance is crucial, but particularly challenging in the digital economy. Too little regulation lowers confidence and fails to create a level playing field or address emerging risks. Too much regulation stifles experimentation and innovation. Countries must focus on agile, inclusive and interoperable regulatory structures to provide the most suitable responses in a fast-changing environment. In other words, it is not just about the 'what', but also about the 'how' to regulate.

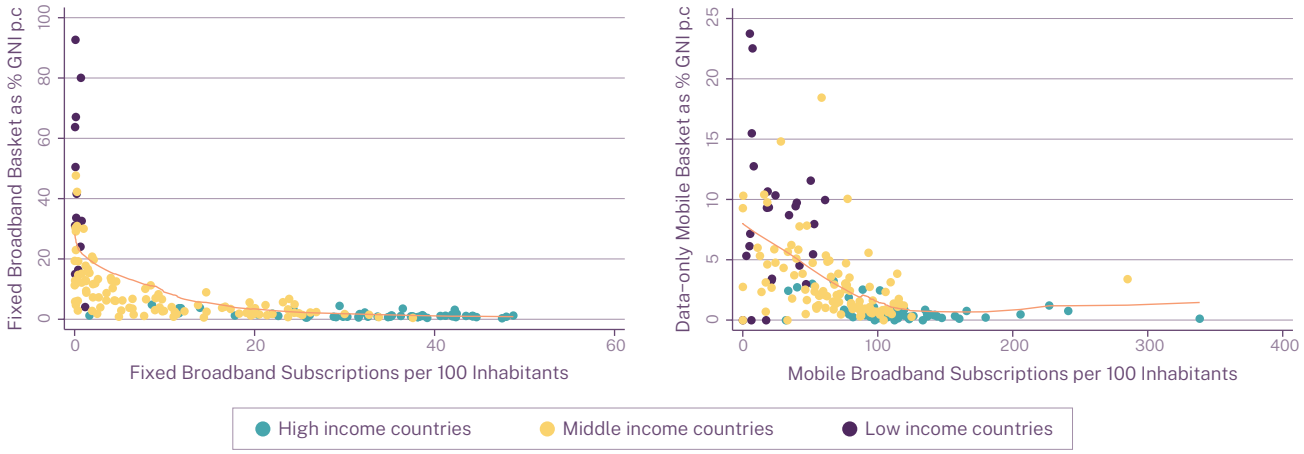
All three enablers are essential for digital transformation, but how important they each are depends on the context. Infrastructure is the backbone of digital transformation, providing the necessary foundation for deploying digital technologies. However, skills are crucial to use these technologies and the supporting infrastructure in an effective, meaningful way.

Regulations also play a key role – directly by setting the rules of the game for digitally enabled interactions, and indirectly by influencing the development of infrastructure and skills. Together, these enablers are vital for achieving comprehensive digital transformation. As countries are at different stages of digital development, each might need to prioritize one enabler over the others based on its respective needs and progress.

Infrastructure expands access

Digital infrastructure enables internet access, connecting individuals, businesses and governments to the global digital economy. Access fundamentally depends on electricity and connectivity infrastructure and services, as well as affordable internet-enabled devices and modern software solutions (digital products). Despite progress in electrification and internet use, divides persist across and within countries, hurting firms' ability to digitally transform.

Figure 7: Lower cost, greater use



Source: ITC, based on ITU.

If you build it, they will use it

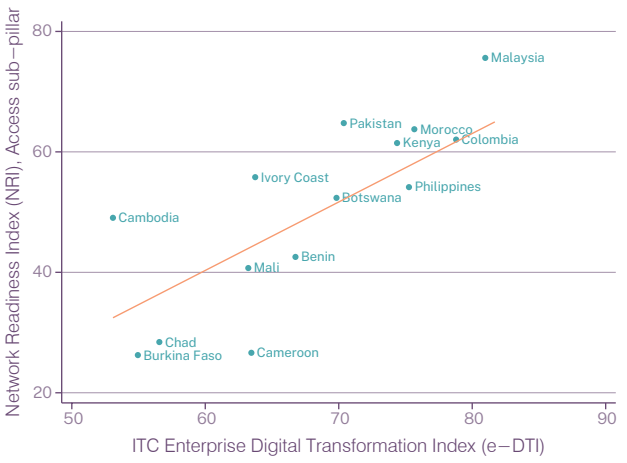
Digital infrastructure is indispensable to digital transformation: it determines whether digital tools and technologies are even available and what they cost.

This infrastructure comprises the physical structures, services, equipment and digital products (such as software) that allow people and firms to get online. More digital infrastructure generally means cheaper access, and therefore more widespread use. In countries where the cost of internet subscriptions is a lower share of per capita income, the share of the population with a fixed or mobile broadband subscription is higher. These are mostly high-income countries, which tend to have better quality physical infrastructure and related services (Figure 7).

In the case of digital infrastructure, quantity and quality appear linked. Fewer firms complain about the quality of internet services in countries with many fibre-to-the-home/building internet subscriptions.[51] Only 25% of companies in countries with abundant fibre subscriptions reported having low internet quality, while 50% of companies reported internet quality issues in countries with few fibre subscriptions.

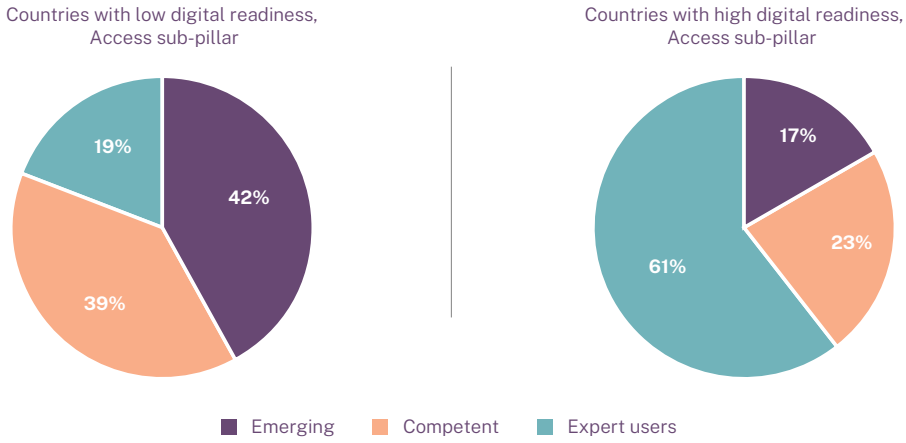
Higher internet quality leads to more productive use. Firms are further along the digital transformation path in countries that offer people and businesses access to high-speed, affordable internet and internet-enabled devices, ITC analysis finds (Figure 8).

Figure 8: Access fuels digital transformation



Source: ITC, based on ITC Digital Transformation Survey and NRI from the Portulans Institute.

Figure 9: More expert users with advanced digital infrastructure



Source: ITC, based on ITC Digital Transformation Survey and NRI from Portulans Institute.

Access to the internet is the cornerstone of digital transformation.[52] Regions with faster internet speeds tend to have a higher share of digital firms, according to a study focused on European enterprises.[53] These findings are reflected in ITC's analysis in developing countries. Specifically, in countries that score at the top of the NRI's *access* sub-pillar, 61% of firms were classified as expert digital users, contrasting sharply with a mere 19% in low-scoring countries (Figure 9).

Giving firms access to affordable and high-quality internet connections is the first step in enabling their digital transformation. This is reflected in the United Nations Secretary-General's Roadmap for Digital Cooperation, which called on countries to ensure safe, affordable internet access and meaningful use of digitally enabled services for every person by 2030. Achieving this goal starts with boosting the components of digital infrastructure and closing their provision gap across and within countries.

Closing the digital infrastructure gap

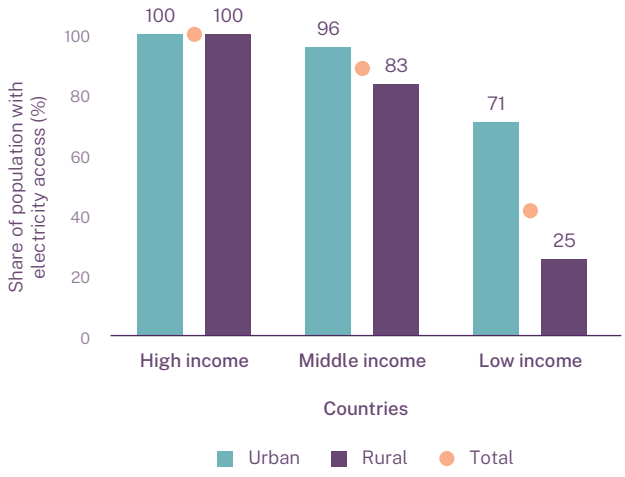
The condition of digital infrastructure is often the defining feature that sets more digitally advanced countries apart from their less digitally advanced counterparts. Closing this gap requires universal access to electricity and physical infrastructure and services for connectivity, while increasing the availability of more advanced internet-enabled devices and software.

Electricity: Universal and sustainable

Electricity is the backbone that powers digital infrastructure, enabling the deployment, operation, maintenance and expansion of digital technologies. From powering data centres that store and process vast amounts of information, to sustaining the devices that connect individuals and businesses globally, electricity breathes life into the digital landscape.

The energy and digital transitions are intertwined.[54] As the UN 2030 Agenda for Sustainable Development reached its midpoint in 2024, progress toward achieving affordable, reliable, sustainable and modern energy for all, as per SDG 7, is faltering. Access to electricity varies considerably according to both income level and geographical location within countries. While essentially universal in high- and middle-income countries, it is limited in low-income countries, particularly in rural areas within them (Figure 10). As of 2021, electricity remained out of reach for 675 million people, with the vast majority of them living in sub-Saharan Africa – roughly 8 people out of every 10.[55]

Figure 10: Access to electricity is not universal



Source: ITC, based on World Bank World Development Indicators.

Bridging the electricity access divide is a first step in bridging the digital access divide and is key for enabling inclusive digital transformation. This work must be paired with a transition towards clean energy sources, as connecting people, businesses and governments will require more infrastructure and devices. This will boost demand for scarce energy resources, while driving emissions even higher unless there are targeted interventions to diversify the source of energy in favor of renewables and keep greenhouse gas emissions in check.[56]

Connectivity: Fix(ed) the problem

Connectivity is the lifeblood of the digital economy, enabled by fixed and mobile broadband infrastructure and services. Mobile broadband has been spreading particularly fast, with 24 subscriptions per 100 inhabitants in low-income countries, compared to only 1 in 100 for fixed broadband (Figure 11, left).

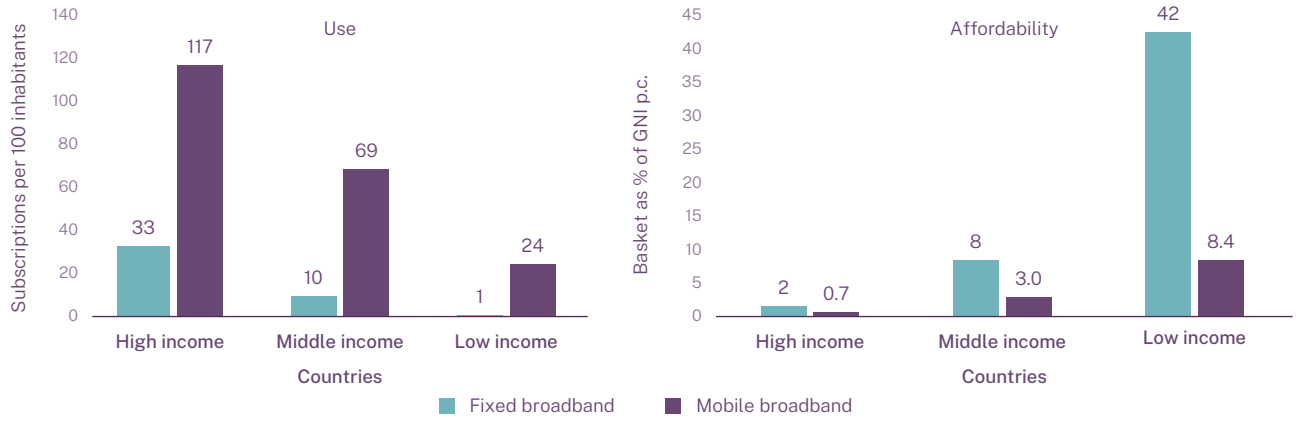
Affordability helps explain the difference in fixed and mobile broadband use. Fixed broadband is significantly more expensive than mobile across all income levels, due partially to the high cost of rolling out national infrastructure and connecting it to international ones, such as submarine cables. According to the ITU, in 2023, 60% of economies met the Broadband Commission affordability target of 2% of gross national income per capita with respect to the data-only mobile broadband basket, while only 40% of economies met the target with regard to the fixed broadband basket.[57] Costs can be prohibitively high in low-income countries, where a fixed broadband basket averages 42% of gross national income per capita, compared to 8.4% for mobile broadband (Figure 11, right).

Even though mobile is more affordable then fixed broadband, it remains expensive in low-income countries. The UN Broadband Commission, for instance, targets an entry-level cost of less than 2% of gross national income per capita.[58] The price of both fixed and mobile broadband subscriptions is below this threshold in high-income countries, but above it in middle-income countries, and is much higher in low-income economies (Figure 11, right).[59]

Fixed and mobile broadband technologies are not interchangeable. Fixed networks are crucial for supporting the enhanced speeds and broader capacity demands of advanced digital technologies.[60] In high- and middle-income countries, 95% of the population has 4G coverage or above. In contrast, only 39% of the population in low-income countries has access to 4G, with 3G remaining the dominant and often the only available technology to connect to the internet.[61] This prevents them from accessing the transformative benefits that come from using more advanced tools, as will be shown in Chapter 3.

Disparities in affordability and quality contribute to a persistent connectivity divide across and within countries. Globally, around 67% of the world's population is now online. However, universal connectivity is elusive in LDCs and in LLDCs, with only 35% and 39% of their populations online, respectively.[62] Those without internet access are disproportionately women. Globally, women are 21% less likely to be online compared to men; in least developed countries, they are half as likely.[63] There also remains a wide internet use gap between rural and urban areas: 81% of urban dwellers were online in 2023, compared with 50% of the population in rural areas.[64]

Figure 11: Mobile broadband more affordable and used



Source: ITC, based on ITU.

Devices: Phones are smart, but not enough

Personal and commercial devices as well as software are the final element required for greater uptake and usage of digital technologies. In addition to computers and cellular phones, devices also include the Internet of Things, such as sensors, voice-activated devices, geospatial instruments, machine-to-machine communications and vehicle-to-vehicle communications.[65]

Hardware and software are essential tools for digital engagement, with access to computers and smartphones playing pivotal roles in a firm's digital trajectory. In low- and lower-middle-income countries, the predominant device for business operations is an internet-enabled phone, used by 77% and 85% of firms surveyed by ITC, respectively (Figure 12). In higher income countries, nearly all firms use computers, which have greater computational power, but also cost more.

Figure 12: Smartphones widely used in low-income countries

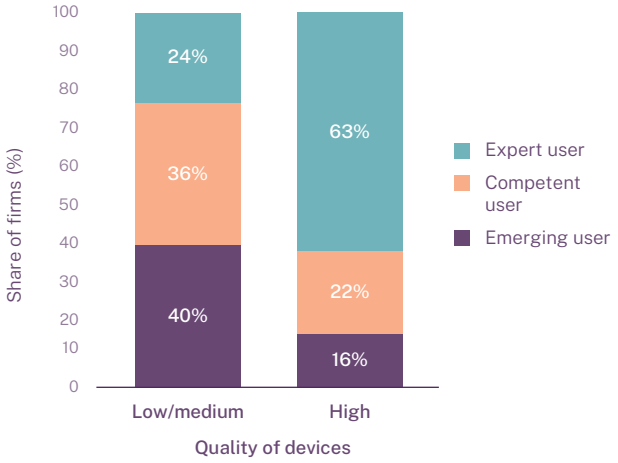
Source: ITC, based on ITC Digital Transformation Survey and World Bank World Development Indicators.

What devices a user can afford depends on various factors, such as production and trade costs, consumer preferences, tax policy and the average income in a country.[66] Quality also matters, as more sophisticated devices are more expensive. The high cost of advanced devices may leave businesses stuck with less-than-ideal tools. Only 14% of surveyed companies in low-income countries report using good-quality devices, compared with 73% of firms in high and upper-middle income countries.

There is a symbiotic relationship between device quality and digital transformation. Among firms reporting high device quality, 63% are expert users, compared with 24% of those dissatisfied with their device quality (Figure 13).

Firms that wish to expand will usually need more advanced tools. A basic, inexpensive smartphone may be enough to start with, but will lack the computational power and memory to support a business effectively as it grows. An online retailer, for instance, will eventually need more advanced devices to photograph products professionally and attract more customers.[67]

Figure 13: Device quality essential for expert use



Source: ITC, based on ITC Digital Transformation Survey and World Bank World Development Indicators.

Skills boost use

Digital infrastructure is necessary, but not enough.[68] Individuals must also have the right skills or digital transformation will remain out of reach, ITC analysis reveals. Businesses in countries with better ICT education are more likely to report an ample supply of digitally skilled workers. Having a fully digitally skilled workforce is, in turn, essential for firms aiming to digitalize their operations. Despite growing demand, digital skills are still hard to come by, even at the basic level.

More skills, deeper transformation

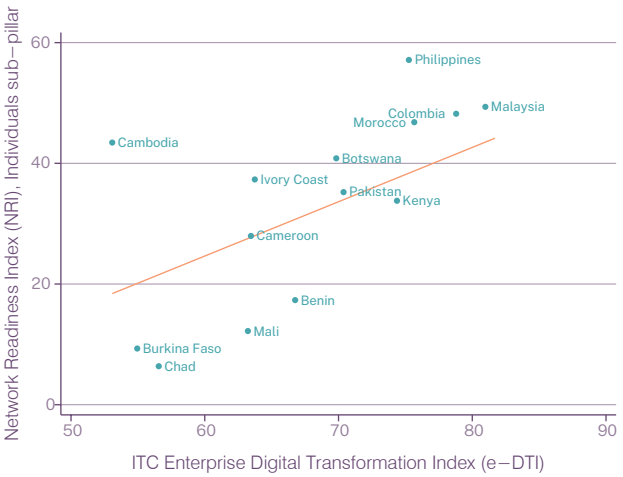
Having a well-educated workforce is crucial for higher productivity and greater profitability—and, in turn, growing a business. Companies with qualified employees are generally more likely to design and implement efficient business strategies and engage in effective decision-making.[69] The same creativity extends to their business practices and other innovations,[70] which is particularly relevant in a fast-changing

environment.

Qualified workers can support a firm's digital transformation, regardless of the type of skills they have. This is because they tend to learn faster, and more aptly adjust and adopt new ways of doing things.[71] The NRI's *individuals* sub-pillar encompasses traditional education indicators, such as adult literacy rates, as well as more digitally oriented ones such as AI talent concentration, which is incipient in most places. Still, this indicator of general educational quality is directly linked to the firms' level of digital transformation, as measured by the ITC e-DTI. In other words, businesses located in countries with higher educational levels are further along the digital transformation path (Figure 14).

Firms need access to a talent pool where digital skills are widespread and well developed. This depends on how countries have integrated ICT training in their education systems. In countries with high digital readiness in the *individuals* sub-pillar, 48% of firms are expert digital users, contrasting sharply with the 20% in low-readiness countries (Figure 15). Where the level of ICT skills integrated in educational systems is high, nearly four out of five firms said they had a fully digitally skilled workforce. By comparison, three in five firms reported the same in countries with a low level of ICT skills in education.

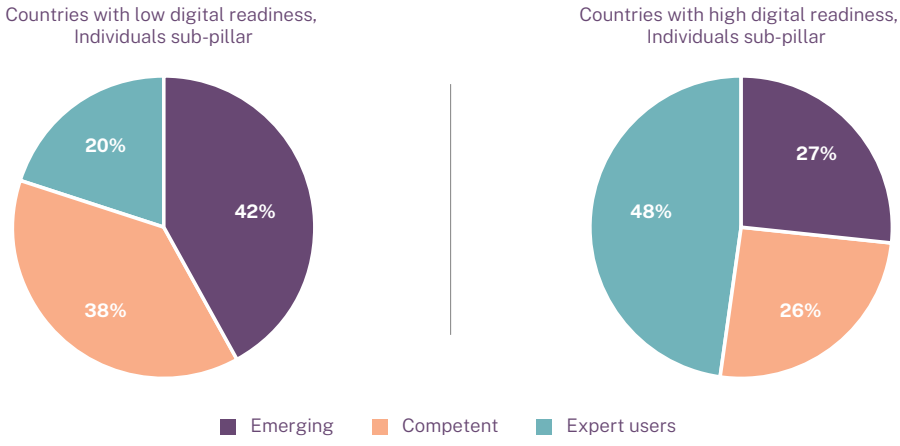
Figure 14: More skills, greater digital transformation



Source: ITC, based on ITC Digital Transformation Survey and NRI from the Portulans Institute.

The share of digitally skilled individuals is especially important for small businesses.[72] Just as firms differ by size, productivity and degree of digital transformation, so too do they differ in their ability to pay high wages. The more universal digital skills are in a population, the easier it is for small businesses to acquire those skills without paying a large wage premium, which they often cannot afford, as attested by the owner of Coco Canela, a *Business Voice* in this chapter.

Figure 15: Expert users flourish in countries with digital skills



Source: ITC, based on ITC Digital Transformation Survey and NRI from Portulans Institute.

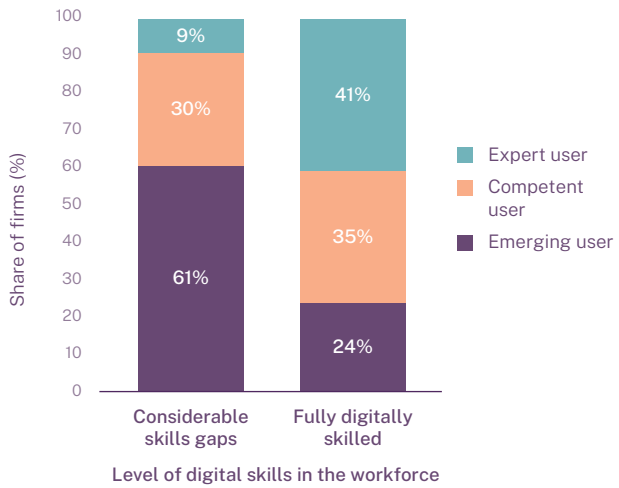
Having a digitally skilled workforce is essential for firms aiming to digitalize their operations. Companies that said 'Yes' to having a fully or almost fully digitally skilled workforce were almost five times more likely to be expert users of digital technologies, compared with those in countries with considerable skills gaps (Figure 16).

Digital talent mobility policies can help close some of these digital skills gaps. The same applies to policies that make it easier for foreign firms to establish a commercial presence locally, if these measures also enable the transfer of knowledge to the domestic market.

For instance, in Timor-Leste's services commitments at the World Trade Organization, foreign suppliers of computer and related services with a commercial presence in the country are granted the same treatment as their domestic counterparts – known in WTO rules as national treatment – provided they transfer skills and knowledge to local employees.[73]

Digital skills empower individuals to participate in the digital economy not only as workers, but also as consumers. In countries where digital skills are more widespread, there might be greater demand for digital tools, driving further digital transformation.[74]

Figure 16: Digital skills push digital transformation



Source: ITC, based on ITC Digital Transformation Survey.

A range of digital skills

Digital skills exist on a spectrum.[75] Basic skills help people participate in the digital economy as consumers. They include the ability to use a computer and mobile phone, connect to and navigate the internet, and use digital applications. Intermediate skills encompass the ability to use ICT to perform work-related tasks, such as using word processing software, spreadsheets and databases. Finally, advanced skills are those needed for creating ICT systems and software, along with keeping them going and improving them over time.

There is an overlap between the available digital skills and the phases of digital transformation. The first phase, associated with the introduction and adoption of what are now mature technologies, requires basic digital skills. The second phase, which entails the diffusion of the internet and platforms, requires workers with analytical, interactive and problem-solving skills to evaluate technology critically and use it in work-related functions.[76]

Finally, as newer technologies spread and routine tasks are automated, demand for professionals with advanced skills, such as computer programmers and network managers, is growing quickly.[77]

The supply of digital competencies varies strikingly across countries.[78] Even in countries with high digital readiness, there is a considerable distance to go before all types of digital skills are universal. In less digitally ready countries, all types of digital skills remain relatively uncommon (Figure 17).

Digital transformation is reshaping the nature of work, requiring workers across sectors to perform more digital-related tasks, regardless of whether they are employed in digital industries. If the skills and flexibility demanded by employers and the capabilities of the workforce do not match, then digital transformation can slow or fail.

Digital transformation will inevitably put pressure on some workers and create opportunities for others. Job polarization is a possible outcome, as lower-paid jobs that typically require routine manual and cognitive skills could become automated, while jobs requiring non-routine cognitive skills are likely to grow in demand, as digital technologies complement rather than replace these skills.[79]

BUSINESS VOICE

Skilling to go digital

The family business Coco Canela was born out of a desire to create something unique: personalized shoes. Being online allowed the company to go the distance.

Kryssia Quintanilla

Chief Executive Officer
Coco Canela
El Salvador

'My sister and I wanted to create a market for something that did not exist in El Salvador – personalized, handmade shoes, handbags and wallets. Our unique designs are crafted by Salvadoran artisans.

Initially, we relied solely on social media to attract customers. These platforms have been great for growth, offering excellent returns on a modest investment of $100 to $150 per month in advertising. The pandemic also brought more customers online, making our social media presence even more profitable and necessary.

Going online allowed us to expand internationally. Today, most of our online sales go abroad, while domestic sales are still predominantly in-person. Our biggest market for e-commerce is the United States, but we also have customers in Europe and Central America.

Maintaining our website, however, is costly in El Salvador, as it requires digital skills to manage plugins, provide updates and monitor internal content. Hiring such expertise is expensive, so we outsource to an IT specialist. While I would like to provide training to my employees to learn these skills, the costs are also high.

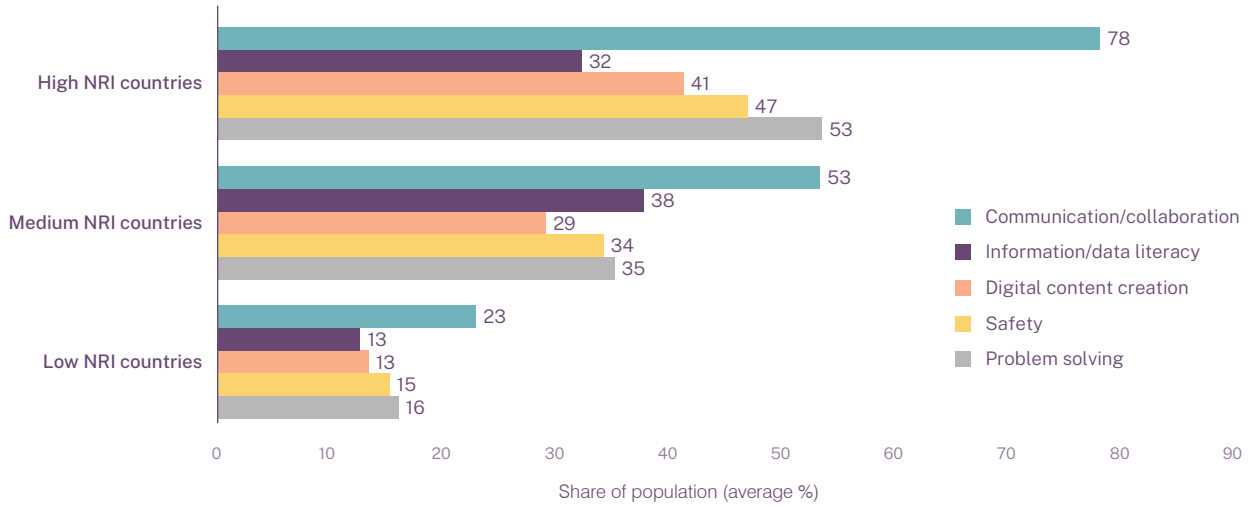
Digital skills will become even more important as we adopt more advanced digital technologies, like AI chatbots, to facilitate sales. The support we received from business support organizations, including the Exports and Investment Promotion Agency of El Salvador (PROESA) and InvestElSalvador, has been invaluable in helping us navigate the digital landscape. We benefited, for example, from training they provided in digital tools.

But finding this support was difficult in the beginning, as the information is not easily available. This is why we created a network, also online, with other business owners to share information and get help. Collaborating with other business owners and government agencies has been instrumental in reducing costs and accessing new markets.

ITC also helped us build an online presence. It assisted in setting up our company's website with its own e-commerce marketplace and created a promotional video to market our products. Our site is now comprehensive and includes everything from privacy policies to our company's history, as well as e-commerce catalogues.'

The project Linking Central American Women Business Enterprises with the Global Gifts and Home Decoration Market was funded by the EU and implemented between 2018 and 2021 by ITC in collaboration with the Secretariat for Central American Economic Integration (SIECA) and national organizations. It aimed to link Central American women-led businesses in the handicraft sector with markets to improve their export performance.

Figure 17: Most digital competencies are still rare



Source: ITC, based on NRI from the Portulans Institute and ITU ICT Skills indicators for the latest year available.

The latest digital technologies, such as generative AI, are more likely to complement or augment work – automating certain tasks in occupations while freeing up time for others – rather than fully automating entire jobs.[80] What this means for jobs varies widely across country income groups, given the types of jobs that are concentrated in different economies. The impact of automation is also highly gendered, with women disproportionately affected, given that clerical jobs represent a major source of employment for women (as discussed in Box 2).[81]

If digital transformation follows the patterns of prior technological waves, job destruction should be stronger in the short and possibly medium term, while job creation will prevail in the longer term.[82] Beyond the quantity of jobs, digitalization is also transforming how work is conceptualized and performed. Non-traditional forms of employment relations, such as casual work and remote work, have become common. Given the speed and scope of change, labour markets will be forced to adapt more quickly to build the digital skills required for a fast-approaching future.

Coordination improves regulation

Digital transformation requires an entire ecosystem of coordinated and interoperable regulation, founded on collaborative, agile and responsive policies and structures.

Not an environment, but an ecosystem

Regulations play a crucial role in structuring how actors in the digital economy interact, both domestically and across borders, and what opportunities they have for digital transformation. The scope of what these regulations can cover ranges widely, spanning everything from what firms need to go digital – such as their ability to access and afford ICT infrastructure, equipment and software, or develop and attract digital skills – to how they conduct their daily operations once online.

First, certain regulations underpin the deployment of digital infrastructure for expanding internet access. For instance, these regulations can involve policies and measures that facilitate domestic and foreign investment in the physical components of electricity and telecommunications systems. These regulations can also help attract more operators to the associated services markets, increasing competition and lowering costs. Regulations can also serve to reduce the price of internet-enabled devices[83] and software.

Second, regulations can spur the development of digital skills. For instance, regulations can inform learning and innovation efforts taken within the country. Also, countries that welcome foreign direct investment and multinational corporations facilitate the spread of new technologies and know-how from international to domestic firms and local workers.[84] Similarly, governments can make it easier for foreign talent to cross borders, boosting skills in the domestic labour market when national talent is scarce.[85]

Third, balanced regulations build trust and ensure safety in the digital economy.[86] Among the regulations that are particularly relevant for the digital economy are those

that pertain to algorithm transparency, legal acceptance of electronic transactions, cybersecurity, privacy, data governance, technological neutrality and interoperability. Lately, regulations have taken shape which focus on digital innovation, including data innovation; labour protection of workers in digital trade; and digital inclusion.

Fourth, governments are responsible for putting in place guardrails to protect individuals and businesses from the risks inherent to technological change – such as disinformation and income losses resulting from a changing labour market or unfair online commercial practices – and for regulating new forms of work in the platform economy.

Finally, since digital transactions cross borders more easily than transactions in physical goods, making sure different countries' regulations can interact seamlessly with one another – what is known as interoperability – is crucial. Achieving this happens gradually, and may involve governments testing out different approaches to see what works best. The result is often a mix of binding rules and non-binding commitments agreed between countries. To be effective, these mechanisms must be designed with the feedback and participation of SMEs themselves.

Leading agencies like the International Telecommunication Union[87] and the United Nations Commission on International Trade Law[88] are already setting out evidence-based guidance for governments as they consider which policies and laws best serve their digital goals. Policymakers are also developing rules on digital trade in various settings, from negotiating bilateral agreements to crafting mega-regional treaties.

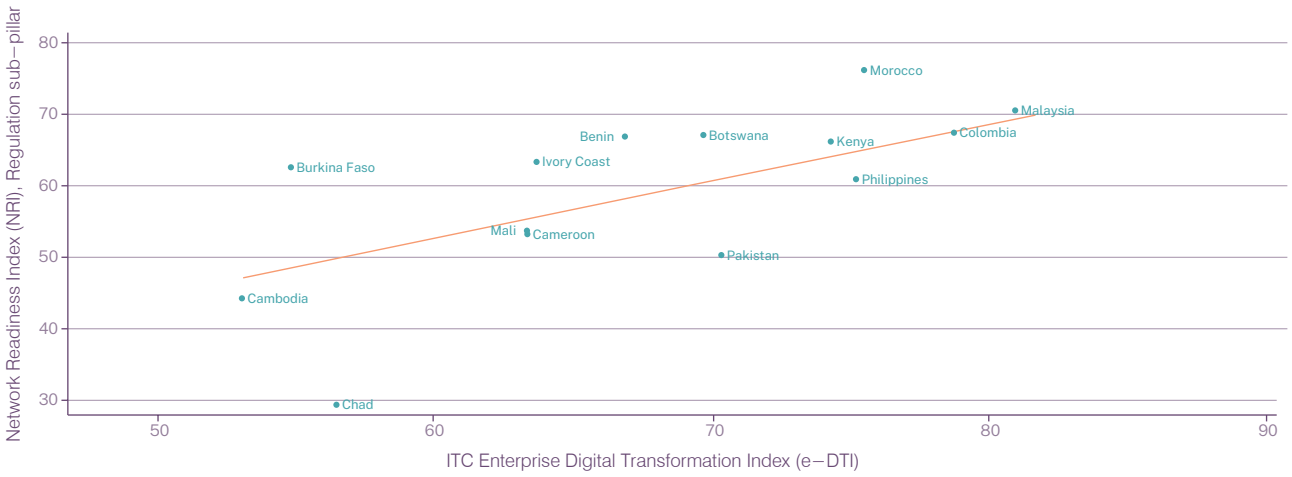
Getting the regulatory ecosystem right at the national level is key so that more businesses can digitally transform. In countries with a more robust regulatory framework, the digital transformation of firms is more advanced, ITC analysis shows (Figure 18).

Individual components of an enabling regulatory ecosystem matter too. For instance, in economies with more mature telecommunications markets, a lower share of firms perceives the cost of internet connection as high: 47%, compared with 65% of those operating in places with a less mature telecommunications market.[89] In countries with enacted or draft legislation in more than three areas relevant to the digital economy, 46% of firms were very satisfied with e-commerce platforms, nearly double the share of those operating in jurisdictions without such laws (25%).[90]

Countries with a more digitally supportive regulatory ecosystem, as measured by the NRI's *regulations* sub-pillar, have a greater share of expert digital users: 53% of firms, as opposed to a mere 18% in countries displaying low regulatory readiness (Figure 19).

The uneven realization of digital transformation's potential across firms underscores why a robust regulatory ecosystem is critical.[91] Getting it right is, however, a very complex endeavor that requires a whole-of-society approach. These efforts also cannot happen in a domestic vacuum: this regulatory ecosystem must account for relevant international best practices, especially as these will evolve over time. Policymakers must be aware of what regulatory developments are emerging in other countries and across different international forums, along with what these mean in practice.

Figure 18: Robust regulations boost digital transformation



Source: ITC, based on ITC Digital Transformation Survey and NRI from the Portulans Institute.

More than what, how

The sheer number of policies and regulations that governments must get right can be overwhelming. Regulators and policymakers must make quick decisions in the face of new, unprecedented situations. In a rapidly evolving digital landscape, the continuous emergence of new technologies, from generative AI to advanced robotics, is making it increasingly difficult for the public sector to keep pace with technological change and put in place the appropriate guardrails.

Regulating the digital economy thus presents unique challenges that require greater regulatory collaboration and agility. In other words, governments must think not just about 'what' to regulate, but also about 'how'.

First, regulation must be founded on domestic consultation and coordination.[92] A broad spectrum of government agencies must be involved in the regulation of digital tools and technologies, as these have applications that transcend sectoral boundaries and affect areas as diverse as infrastructure, commerce, competition, transportation, health, education and finance. While countries may have in place a ministry or agency responsible for digital matters, they must coordinate with other sectoral entities.

Government agencies and industry stakeholders must also work closely together, as the public-sector often lacks the knowledge and foresight of leading private-sector companies. Similarly, partnerships with research institutions can greatly enhance regulators' understanding of current trends and new developments. Civil society organizations and consumer groups also play a crucial role in this process by ensuring that policies prioritize inclusivity and the public interest.

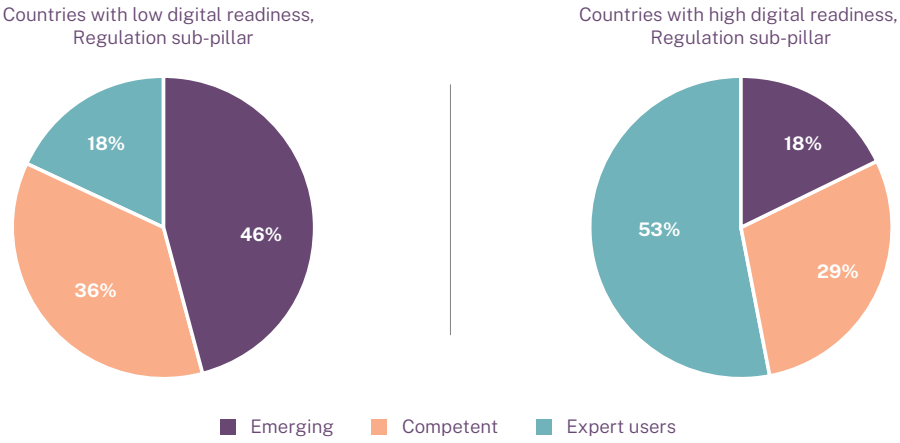
Finally, and importantly, regulatory efforts must factor in small businesses' needs and constraints. On paper, regulations do not necessarily distinguish firms by size. In practice, they can affect small businesses more heavily, both as producers and consumers of digital technologies. Indeed, small firms view regulatory obstacles as a major challenge. In Viet Nam, Ghana, Niger and Bahrain, for example, 50% of ICT services firms reported regulatory obstacles to exporting, according to ITC's Non-Tariff Measures Business Surveys in 2019 and 2020.[93]

Many countries have created consultative mechanisms for designing and implementing national digital strategies. Slightly more than half of all countries have digital strategies covering multiple economic sectors.[94] Such roadmaps often articulate a high-level political vision, with specific milestones and timelines to put it into practice, while keeping everyone aligned.

Mexico's ICT regulator, the Instituto Federal de Telecomunicaciones, has more than 30 collaboration agreements with organizations in the academic, public and civil society sectors, and has since reinforced its 2021–2025 strategic roadmap for digital ecosystem development.[95]

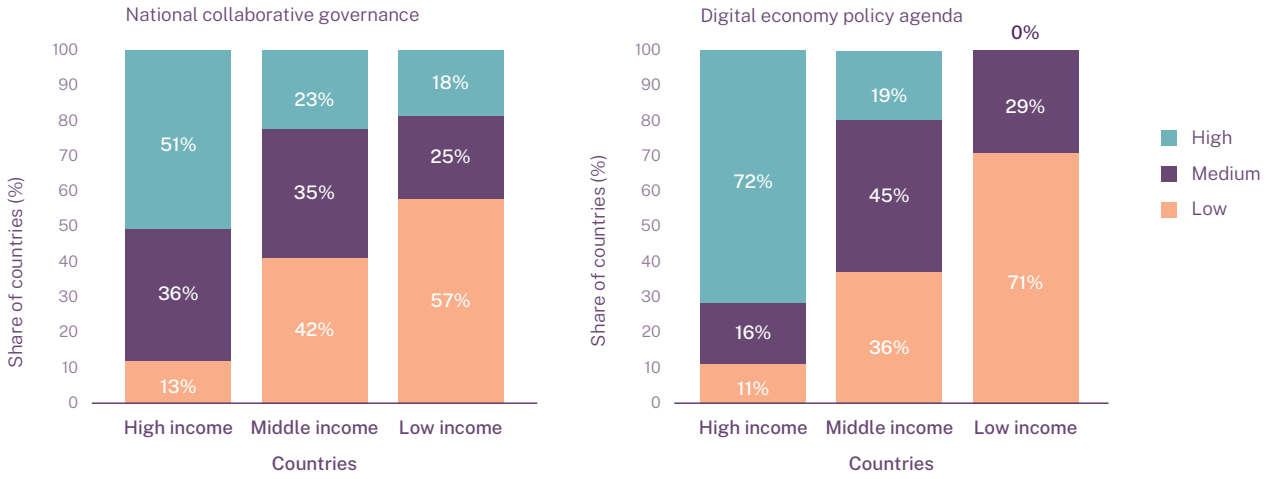
Low-income countries have fewer collaborative digital governance mechanisms. They often lack measures such as collaboration among institutions, industry stakeholders and cross-sector regulators. These measures are part of national or regional digital economy plans and strategies, either already in place or under development. According to the ITU, 51% of high-income countries exhibit high levels of national collaborative governance, compared to just 18% of low-income countries (Figure 20).

Figure 19: Expert users flourish under good regulation



Source: ITC, based on ITC Digital Transformation Survey and NRI from the Portulans Institute.

Figure 20: Collaborative governance lags in low-income countries



Source: ITC, based on ITU G5 Benchmark gen5.digital.

The gap is even more pronounced when assessing if countries have a digital economy policy agenda. This agenda measures governments' progress in updating their policy portfolios for the digital economy. Nearly three out of four high-income countries have a robust digital economic policy agenda, while none of the low-income countries do (Figure 20).

As digital technologies transcend national boundaries, international cooperation and collective action are essential for effective digital governance.[96] Governments must be flexible and harmonize regulations, standards and other measures when possible. Notably, this should take place through cooperative efforts aimed at the interoperability of digital regulations and technical standards, and mutual recognition of the solutions used.

Divergent national and regional approaches to digital governance weaken trust while erecting barriers to digital trade and innovation.[97] Moreover, they tip the balance in favour of those that can afford to navigate the complexity, negatively affecting the ability of small firms to leverage the opportunities of digital transformation.

Personal data protection rules, for instance, are now a prerequisite for a robust, safe digital economy.[98] However, small firms face a complex landscape of privacy regulations, making it difficult for them to adapt to and abide by varying requirements. They often struggle to determine which data are regulated, who owns or controls them, and which businesses must comply with these rules and how to prove it.[99]

This generates uncertainty and increases compliance costs for these firms, which may not be able or willing to bear the expenses involved, nor risk the delays, lost transactions and other consequences of failing to comply.[100] This wide range of rules can also complicate cross-border data flows and be used to justify data localization.

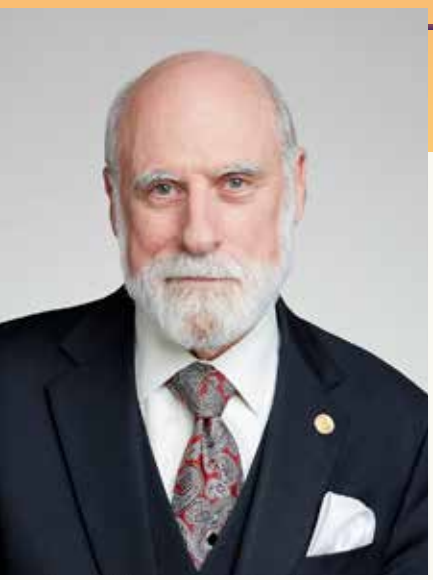
While some national interests may vary and governments may need to retain policy space in certain areas, they should achieve this goal in a targeted way through dedicated exceptions, exemptions and flexibilities. These steps should be subject to transparency requirements and be applied in a non-arbitrary and non-discriminatory way, while crafted with a risk-based approach in mind.

An example of what this can look like is the proposed WTO Agreement on Electronic Commerce, which more than 80 WTO Members have supported. It includes a dedicated section on exceptions – namely, outlining where parties can deviate from agreed rules for purposes such as safeguarding national security, protecting specific areas of public interest such as the availability of natural resources or maintaining the ability to take so-called prudential measures in the financial services sector.

These types of exceptions are common in international trade law. However, the proposed agreement notably outlines further exceptions for reasons of personal data protection and to affirm the flexibility for governments to accord more favourable treatment to their Indigenous Peoples. Parties can also deviate from certain substantive rules, such as by retaining their right to require specific methods of authentication or e-signing for designated transactions.[101]

THOUGHT LEADER

Free flow of information can spur small businesses growth



Vinton G. Cerf

Vice President
Chief Internet Evangelist
Google

The internet and digital ecosystem of the 21st century have become the fertile soil in which companies can grow. Key to this is the openness of the internet environment. Free flow of information is essential for domestic and international commerce.

Companies have quickly recognized the usefulness of digital infrastructure, leading to rapid growth in the market for online services and facilities. Consumers have similarly adopted online services to discover and obtain all manner of products and services with the click of a button.

The internet is a primary vehicle for gaining visibility and conducting trade in global marketplaces. Products and services can be discovered online, thanks to search engines and online advertising, and delivered through the same medium.

For those that create and sell software-based products and services, the internet is a global delivery platform reaching about two-thirds of the world's population. Just as important is its capacity to facilitate collaboration among partners, branches of companies and suppliers of goods and services needed by companies.

Key for SMEs

This digital environment is especially crucial for SMEs, which are the seeds from which great enterprises can spring. Their agility and freshness of thought drive the evolution of commerce and trade everywhere. Every great business started small and flourished.

The advent of cloud computing is particularly useful for SMEs. It provides scalable and efficient computing and digital storage capacity as well as ample backup capability for both processing and storage. This relieves SMEs of the burden of acquiring, managing, maintaining and upgrading their computational ecosystem. As a result, these companies can focus on producing and enhancing their products and services and coordinating supply-chain operations online.

Online commerce is, itself, an enabler. Information gathered by producers and distributors supports detailed analyses of production, transportation, storage and delivery, which in turn facilitate optimization. Businesses can tell where and when orders for goods and services are placed, how they were fulfilled, how and when they were delivered, what daily and seasonal demands look like, and how

tastes change with time. This information can help increase efficiency, maximize supply-chain use and build resilience.

Governments have also found that much of this information can help their efforts to spur creation and growth of domestic SMEs. Moreover, recognizing the potential of global markets, governments can act to encourage the use of online services and educate SME managers in how to engage in domestic and international trade.

Digital rules and agreements can be a powerful tool to drive a more consistent approach to governing cross-border technologies. By championing common principles such as non-discrimination, openness and interoperability in the digital economy, policymakers can empower more people worldwide to access digital services and enable SMEs to scale and launch transformative products. This harmonized approach benefits individual businesses and strengthens the global digital ecosystem.

Worrying trend

However, at Google we are concerned about the increase in restrictive digital rules in recent years. While these are often in response to real concerns about the misuse of technologies, restrictive rules risk untethering the internet from common global norms and leading to a fractured web where open, secure and democratic standards no longer prevail.

Digital fragmentation undermines the potential of the internet to lift new businesses and new voices and threatens the ability of countries to work together to address pressing social and economic challenges through common digital frameworks. It also hurts consumers and makes it more difficult for businesses of all sizes to provide cross-border services and technologies.

This is particularly true for SMEs that have fewer resources to comply with a patchwork of conflicting regulations across jurisdictions.

As we look ahead, our fundamental challenge is the preservation of the open internet and its free flow of information in the face of the unintended consequences of regulation. We need a balanced path forward to establish cooperative and collaborative international agreements that deliver openness, safety and security.

CHAPTER 3

Boosting competitiveness to transform

Adopting new technologies eventually leads to increased productivity, lower operating costs and higher revenues for business. These benefits apply generally to all digital technologies and all firms, albeit to different degrees.

The latest technologies bring with them additional benefits. Beyond efficiency gains, cloud computing allows small businesses to grow without heavy investments in IT infrastructure, whereas 3D printing lowers the benefits of scale, levelling the playing field between large and small.

The more firms adopt new technologies, the greater the reported benefits. Adoption, however, depends on firms' needs. These vary considerably across sectors and businesses lines. For example, the digital needs of an agricultural firm are quite different from those of a company operating in the digital services sector.

The degree to which firms digitally transform also depends on whether key enablers are present, namely digital infrastructure, skills and regulations, as shown in Chapter 2. In countries where enablers are insufficient, wide gaps exist among different types of firms in their adoption of new technologies. Where the environment is conducive, adoption gaps virtually disappear. Small firms in countries with sufficient enablers are almost as likely as their large counterparts to adopt new technologies. The same is true for women-led and youth-led companies, compared with those not led by women or young people.

Nonetheless, businesses can still achieve digital transformation through actions that help make up for what the environment lacks.

First, firms can improve their financial management, which is critical when the poor state of digital infrastructure makes accessing and using the internet more expensive. Second, they can boost their recruitment and internal training processes, increasing their chances of finding talent in a labour market where digital skills are in limited supply.

Finally, they can strengthen connections with the business ecosystem by engaging with strong business support organizations. These relationships can be particularly helpful in navigating a complex regulatory environment, and their advocacy efforts can also shape what this environment looks like.

Change at the cutting edge

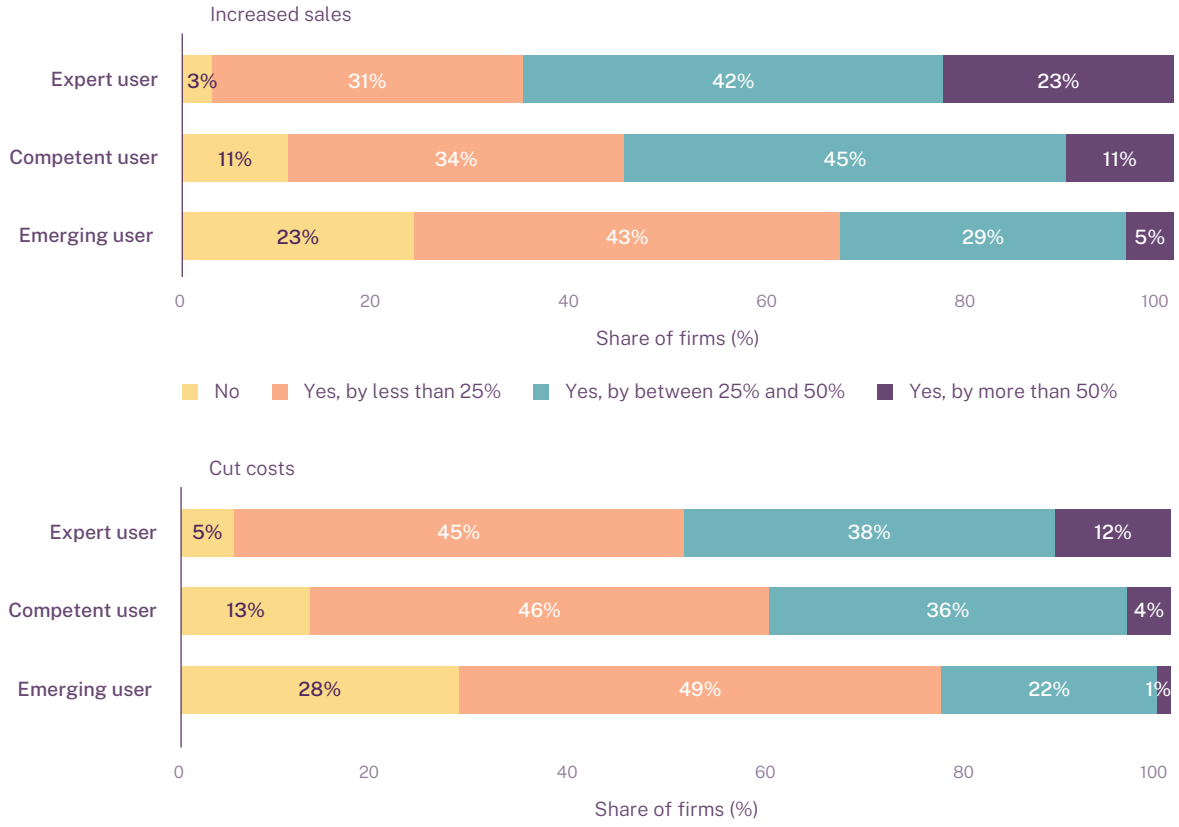
All companies benefit from using digital technologies. That is what an ITC survey with more than 7,000 companies in 78 countries clearly shows. Still, not all firms adopt the same technologies and to the same extent, which affects the types of benefits they accrue. Businesses that deploy more cutting-edge technologies enjoy benefits that go beyond productivity and efficiency gains, experiencing deeper transformation.

Beyond productivity gains

Firm investment in digital technologies improves productivity, many studies confirm.[102] Generally, firms that adopt digital technologies such as email, websites and electronic payments tend to have more workers, higher productivity and greater sales and exports.[103]

The firms that ITC surveyed for this report confirm that digital technologies enhance performance. On average, 84% and 87% reported that digital technologies helped them reduce cost and increase sales, respectively.[104] For instance, by using e-commerce platforms, companies cut search and information costs, making it easier, faster and cheaper to connect with buyers.[105]

Figure 21: Expert users, greater benefits



Source: ITC, based on ITC Digital Transformation Survey.

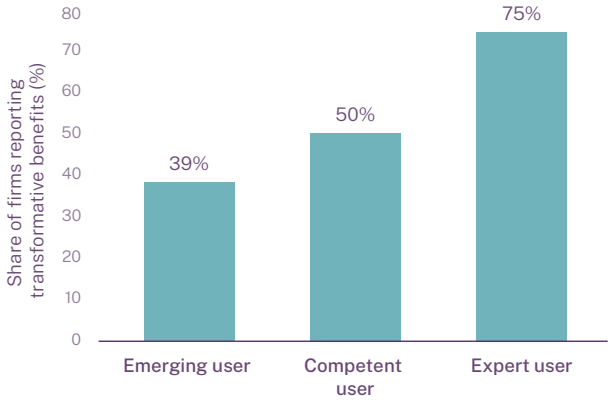
These platforms can also connect businesses to foreign customers, allowing them to sell beyond domestic markets.[106] In francophone Africa, companies using e-commerce were more than 30 percentage points more likely to report an increase in sales, according to ITC research.[107] Small businesses especially benefit from these improvements, as information-related costs are a bigger export barrier for them than for larger firms.[108]

How much firms adopt these technologies affects their productivity gains. Expert users were almost five times more likely than emerging users to report digital technologies boost sales by more than 50%. In a similar vein, 12% of expert users reported cost reductions of more than 50%, compared to only 1% of emerging users – or low digital adopters (Figure 21).

The advantages of digital technology adoption go beyond productivity gains, however. Three out of four expert users reported not only operational and communication-related benefits, but also transformative benefits. This means more opportunities for innovation and greater product and service quality, which often translate into higher prices.

By comparison, two out of five emerging users experienced transformative benefits (Figure 22). Most emerging users instead tend to report only operational benefits, such as improved efficiency and timeliness of production and delivery, as well as communication-related benefits, such as access to new customers.

Figure 22: Expert users, transformative benefits



Source: ITC, based on ITC Digital Transformation Survey.

Indeed, substantial gains come from integrating newer digital tools such as cloud storage or computerized inventory management, which can double the likelihood of improved efficiency compared to basic digital tools including e-mail or social media, previous ITC research showed.[109] Companies using more sophisticated digital tools were also almost 40 percentage points more likely to report lower operating costs.[110]

Leveraging digital technologies

Transformative benefits are often associated with the adoption of cutting-edge technologies. Small firms can strategically leverage artificial intelligence, blockchain, cloud computing and 3D printing to improve decision-making, scale their operations and innovate. However, adopting these technologies and tools can be challenging, particularly in the short term and for those small businesses lacking funds, skills and information.

Artificial intelligence: Boosting productivity

Artificial intelligence can help businesses become more efficient and productive, improve their risk management and enhance customer experience, among other benefits.

A study of Chinese manufacturing firms shows that a 1% increase in AI penetration can lead to a 14.2% increase in total factor productivity, as the technology helps firms optimize production processes, reducing or eliminating inefficiencies.[111] Another analysis comparing the performance of workers with and without access to AI-powered productivity tools showed that AI users completed their tasks in 26% to 73% less time.[112]

As they reduce inefficiencies, firms can focus their resources on the core business areas that add the most value, further boosting productivity. These effects are even stronger for firms in capital- and technology-intensive industries, as AI builds on and extends other digital technologies.[113] Firms benefit even more from AI when they are already using a higher share of capital and other technologies, and that normally occurs with larger enterprises.

Similarly, firms operating in more concentrated industries also tend to experience greater productivity gains from AI. In these industries, the few dominant companies can deploy AI at scale, and these are usually larger firms. Within less-concentrated industries, firms have limited possibilities to use AI at scale, meaning that its productivity-enhancing effects are less substantial.[114]

While small businesses in less capital- and technology-intensive sectors may see less significant efficiency gains from AI, there are still other benefits. AI-powered predictive analytics and data-driven insights enable firms to make quicker, more informed decisions. Enhanced prediction capability allows for improved demand forecasting, production planning, resource allocation and logistics.[115] Similarly, data-driven insights allow firms to better manage risks, including financial ones.

AI offers a host of benefits for the daily practice of trade, from helping firms and consumers interact despite speaking different languages to making trade logistics, customs clearance processes and border controls relatively seamless. It can make the intricate nature of supply chains easier to understand and track, while helping traders prepare for different eventualities across the process and saving them valuable time by automating some steps.

The resulting cost savings can help small businesses engage in trade more effectively and efficiently, even amid some trade barriers that would normally hold them back.[116]

AI also helps consumers, ensuring they can get customer support, personalized recommendations and other information through AI-powered chatbots and virtual assistants – all while working around the customer's schedule, rather than that of the service provider.[117] Generative AI further elevates these capabilities, making customer interactions more conversational, generating marketing content, targeting sales pitches, customizing after-sales services and fostering long-term relationships.[118]

All of these allow for greater market segmentation and price differentiation, opening new, higher value opportunities for small businesses.[119]

Despite the potential, SMEs face challenges in adopting AI-powered tools. Even if they have access to open-source software, integrating it into how they work requires investments in complementary technologies. They must also reengineer their business processes and train staff, which can be unfeasible for cash-strapped SMEs. This is illustrated by Coco Canela, the *Business Voice* featured in Chapter 2.

Firms with a more stable financial situation may still struggle to adopt AI tools due to a limited understanding of the potential benefits they can bring and an inability to calculate properly the expected return on investment.[120] They may also be wary of integrating AI into their business operations, given concerns about inaccuracies, cybersecurity threats and intellectual property rights infringements.[121]

Cloud computing: Scaling without mass

Cloud computing can be a transformative force for SMEs, providing access to more advanced systems typically reserved for larger enterprises.[122] Through the cloud, SMEs can access additional processing power, storage capacity and software based on their needs, with much lower upfront investments and regular maintenance expenses.[123] This flexibility allows businesses with limited resources to adapt quickly to market demands and compete more effectively in the digital economy.[124]

The adoption of cloud computing lowers barriers to entry, making it easier for small businesses to grow and innovate. Cloud-based manufacturing, for instance, helps streamline production and makes access to advanced manufacturing technologies more affordable. SMEs can then rapidly prototype and refine designs, accelerating the introduction of innovative products to the market.[125]

Small businesses must be able to access cloud computing to scale up their operations, without commensurate investment in physical infrastructure and related services. The disparity in high-speed broadband access, as analysed in the previous chapter, prevents small businesses in developing countries from using this technology to the fullest. The high costs of international bandwidth to access overseas servers and data centres further limits the uptake of cloud services.[126] Restrictions on cross-border data flows and data localization requirements pose additional hurdles.

Blockchain: Building trust

Blockchain (or distributed ledger technology) is transforming how companies manage their operations by reducing supply-chain risk, increasing visibility and enhancing trust across a complex business ecosystem.[127]

For SMEs integrated into supply chains, blockchain technology can increase operational efficiencies by eliminating errors, increasing transparency, reducing the number of physical documents and creating consistency across information sources. The use of smart contracts in blockchain-based supply chains, for instance, can help optimize order management, shipping, delivery times and administrative procedures.

Blockchain applications also provide for new methods to secure data authentication, storage and transfer, as the decentralized[128] sequentially arranged peer-to-peer structure makes them inherently resilient to malicious digital attacks.[129]

Beyond operational efficiency, SMEs can apply blockchain to their financial transactions, including through security token offerings, which can provide accessible and cost-effective alternatives to traditional financing.[130] This technology holds particular promise for responding to gender-based inequalities. For instance, blockchain-based digital identities can enable women-managed SMEs to establish their legitimacy and trustworthiness with financial institutions.

Quantitative evidence of this technology's positive impact is limited due to the scarcity of data. However, preliminary findings suggest that small businesses generally have a favourable view of blockchain technology, especially those with prior experience using it. Specifically, businesses recognize the technology's potential to attract new customers, reduce operating costs (excluding those related to its adoption), enhance value propositions and boost revenue, among other benefits.[131]

Access to reliable digital infrastructure, especially internet connectivity, is essential for SMEs to use blockchain technology to its fullest potential. Outdated IT infrastructure and a shortage of skilled professionals to implement and manage blockchain systems can get in the way of SMEs adopting these technologies. A few regulatory developments, including rules on cryptography, digital signatures, electronic transferrable records and digital assets, also appear to be essential. Another major hurdle for SMEs is limited interoperability between blockchain ecosystems.

3D printing: Unleashing innovation

Three-dimensional printing can help level the playing field between small and large companies. It offers cheaper, quicker and more accurate manufacturing solutions compared to traditional methods.[132] By allowing rapid prototyping and manufacturing of small-volume products and components, 3D printing minimizes setup costs and encourages innovation.

The adaptability of this technology extends beyond product customization to the creation of complex designs that would be impractical or too costly with conventional manufacturing methods. Alongside everyday items such as jewellery and furniture, manufacturers can produce more specialized objects including industrial components.[133]

3D printing also makes the manufacturing sector more environmentally friendly. It allows for more sustainable materials to be shaped in ways previously possible only with plastics, while reducing the use of chemical ingredients through adaptive printing techniques. By reducing the benefits inherent to scale, it also makes it easier to switch between materials. Finally, 3D printing helps minimize environmental impacts by making it possible to print replacement parts for legacy products that would otherwise be discarded.[134]

While 3D printing can democratize manufacturing processes, opening opportunities for distributed local production processes, it can also enable firms from high-income countries to shift production closer to their customers.[135] Evidence of the effect of 3D printing on competitive advantage and trade is nonetheless mixed, with some studies showing that trade is not reduced and that even new exporters manage to enter the market when the technology allows for lower costs.[136]

The initial cost of 3D printing equipment and materials can be a substantial barrier for SMEs with limited financial resources. They may also lack the technical expertise and skills required to implement and operate advanced 3D printing systems effectively.[137]

Finally, if customs duties are imposed on electronic transmissions (i.e. in this case, digital printing designs), this could affect the relationship between costs and benefits. These customs duties have been prohibited since 1998 under a time-bound, renewable WTO moratorium, which formalized an existent and longstanding practice, and similar prohibitions have also featured in various regional trade agreements.

An uneven playing field

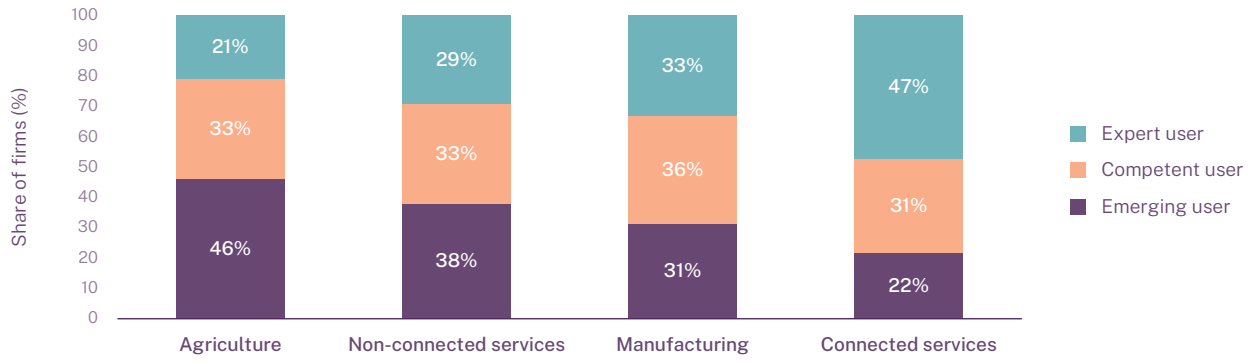
Despite the benefits of digital technologies, particularly cutting-edge ones, certain firms are less likely to use them. First, investment decisions are based on need, which varies across sectors and business models. Setting need aside, the lack of a conducive digital environment exacerbates the adoption gap between small, youth- and women-led business and their large, non-youth and men-led counterparts, highlighting the importance of enablers to level the playing field.

Matching adoption to business needs

All companies benefit from digital technologies, and the more they adopt, the greater the benefits. Yet not all companies aim to reach the same level of digital adoption, as they have different needs. For some types of firms, the use of less sophisticated technologies may deliver the same level of perceived gains as those reported by firms that deploy more sophisticated ones.

Variation across sectors partially explains these different degrees of adoption. Nearly all (98%) agricultural firms that use digital technologies reported benefits, underscoring the widespread utility of digital tools. However, about one in five agricultural firms did not use the internet for their business operations at all, compared with only 7% of those in the connected services sector.[138]

Figure 23: Connected services concentrate expert users



Source: ITC, based on ITC Digital Transformation Survey.

Furthermore, most agricultural companies are emerging users of digital technologies, while connected services companies are primarily expert users. Only 21% of agricultural businesses are expert users, compared to more than double this share among connected services companies (47%) (Figure 23).

Higher digital adoption among connected services firms, compared with agricultural companies, is largely because the former must be digital. Firms in connected services are early adopters of digital technologies and drivers of digital transformation. Businesses in the connected services sectors, including ICT, logistics, financial services and business and professional services, rely heavily on digital technologies.[139]

This bears out in how they allocate their resources: 41% of connected services firms spend more than 25% of their total operational expenditure on digital solutions, compared with only 22% of agricultural companies.[140] Firms in the connected services sector are also more likely to stay updated on new technological developments: 63% of firms in connected services do so, compared with 47% among agricultural firms.[141] As digital technologies continue to mature, however, their benefits spread rapidly across sectors, eventually extending to agriculture.

Another explanation for the higher levels of digital adoption among certain sectors is their differing sector-specific business functions.[142] For example, firms in agriculture tend to require technologies for functions such as land preparation and irrigation, while businesses in services sectors use digital technologies most frequently to perform tasks related to customer service, pricing, merchandising, inventory and marketing.[143] These latter functions are much more commonly digitized and digitalized than the former.

While manual tools and techniques are becoming obsolete at different speeds across different sectors, the process of obsolescence tends to be slower in agriculture than in services or manufacturing, implying that many agricultural processes are still manual or low tech.

Finally, business culture may also explain why certain sectors have lower adoption rates. Among agricultural firms, three-quarters (74%) reported resistance to change as a major obstacle to digital adoption, compared with 58% in connected services.[144] This resistance in the agricultural sector, particularly agrifood systems, is evident across the research in this area.[145]

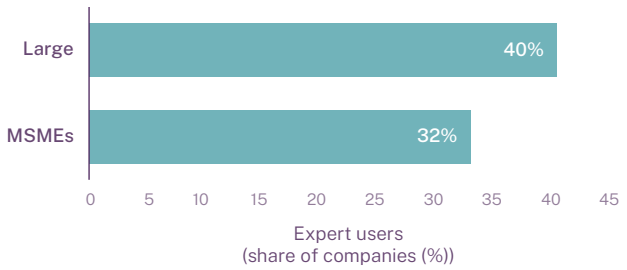
Agricultural firms wishing to shift to new technologies can struggle as a result, as they miss out on the possibilities of collaborating with their peers to test new tools, exchange experiences and potentially split costs. An Ethiopian company, Green Agro Solutions, is trying to break this reluctance to change among farmers. Through its digital platform, Lersha, and a network of local agents, Green Agro Solutions is giving smallholder farmers access to farming essentials and services.

This story, highlighted as a *Business Voice* in this chapter, shows that digital technologies can revolutionize even the most traditional sectors and communities.

Transforming in a challenging environment

Despite the benefits of incorporating digital technologies in business operations and taking different needs into account, important digital gaps remain across firms. Digital technology adoption tends to be lower among small businesses, ITC analysis indicates. Only a third of surveyed MSMEs are expert users of digital technologies, eight percentage points less than their larger counterparts (Figure 24). As a result, smaller companies derive fewer benefits from these digital tools and miss out on their more transformative potential.

Figure 24: Fewer expert users among small firms



Source: ITC, based on ITC Digital Transformation Survey.

The smaller the firm, the less likely it is to adopt digital tools and technologies – and when it does, uptake tends to be limited to basic uses.[146] Digital gaps between SMEs and large firms tend to be relatively narrow in basic technology use, such as for general administration or marketing functions. These gaps widen as uses become more sophisticated, such as data analytics, or when size matters for implementation, such as in enterprise resource planning for process integration.[147]

Adopting digital technologies, especially for sophisticated uses, entails costs. Large firms can spread these costs over many transactions, whereas small businesses have a much smaller number of transactions to spread costs over. They often have trouble accessing finance to cover upfront

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Founder and Managing Director
Green Agro Solutions (Lersha)
Ethiopia

BUSINESS VOICE

investments, even when there is a substantial payoff.

Farming goes digital

In 2018, Green Agro Solutions created Lersha, a digital platform for smallholder farmers to access farming essentials. Currently servicing 202,000 farmers through a network of almost 2,000 agents, the company aims to unlock the power of digital agriculture in Ethiopia and beyond.

'*Lersha* in Amharic means for agriculture. This is the purpose of our platform, to be a marketplace for smallholder farmers and bring digital solutions to the agricultural sector.

Through Lersha, we created a one-stop shop for potentially millions of smallholder farmers spread across rural Ethiopia. They can now purchase farming inputs, hire mechanization services, receive agro-climate advisory and fertilizer recommendations through SMS/Voice Blast, acquire financial services, access market linkages and request expert advice on a range of agricultural issues through our Lersha Agent Network, Call Center (7860) and Lersha Digital Platform.

Seamless access to inputs and mechanization services on the platform allows smallholder farmers to reduce costs and optimize their day-to-day activities. Through the platform, they also obtain information on good agricultural practices to boost their yields.

It is only through a phy-gital (a blend of physical and digital) system that our business can exist and reach so many and extend so far. Still, obstacles remain. Ethiopia has a nascent digital environment. Internet coverage and connectivity in remote rural areas tend to be poor, and this is exactly where most of our current and potential customers are. This pushed us to develop an offline version of our mobile application, though it does not solve the issue.

Farmers, we find, are often sceptical of change. They also tend to lack the digital skills to take advantage of a platform such as ours. To overcome these limitations, we set up a call centre to provide agro-climate advisory and fertilizer recommendations to smallholder farmers. Our digitally skilled Lersha agents create digital profiles for these farmers so they can access our services and start seeing the benefits.

Being agile and responsive has allowed us to expand. We recently ventured into the Kenyan market and plan to expand to other East African countries. Learning from and exchanging with other companies and partners around the world has been instrumental in growing our business. ITC has provided significant assistance by facilitating our participation in trade fairs and digital tools conferences. These have not only widened our network, but also allowed us to learn about new technologies, such as AI, that could help improve and grow our services further.'

The Ministry of Foreign Affairs of the Netherlands funds the Netherlands Trust Fund (NTF) V Ethiopia Tech project. It aims to contribute to the creation of sustainable jobs in the digital technologies sector and the modernization of agribusiness through digital technologies in Ethiopia.

Besides the difficulty in footing the upfront costs of technological upgrades, small business owners are often unaware or uncertain of the benefits new digital tools could offer.[148] Some also express concerns about cybersecurity and data privacy, as well as other emerging risks, though being concerned indicates that they are already more knowledgeable about such technologies.

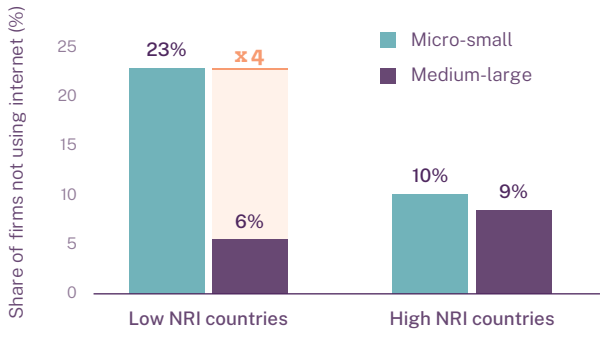
Partially as a result, micro and small firms are less likely to have or develop an ICT deployment strategy and more likely to view ICT training as a 'luxury item' beyond their budget, instead of as a cost-saving and productivity-enhancing investment.[149]

Limited budgets, lack of skills and expertise, and concerns about safety and compliance can hinder the ability of small firms to fully embrace digital transformation. Consequently, small businesses risk falling behind their larger counterparts, facing difficulties in competing effectively in an increasingly digital marketplace. This, in turn, can lead to market concentration, consolidating power among a few dominant firms and undermining competition, which further damages the smallest companies.

But not all is lost. Digital gaps across companies narrow considerably or are negligible when enablers – infrastructure, skills and regulation – are present. In countries with high digital readiness, 10% of micro and small companies do not use the internet, a share very similar to the 9% of medium-sized and large firms, which means size is probably not what is preventing adoption. Conversely, in countries with low digital readiness, only 6% of medium-sized and large companies do not use the internet, but the share rises to nearly one in four micro and small businesses (Figure 25).

For companies using the internet and adopting digital technologies, the gap remains connected to country readiness. In countries with high digital readiness, 64% of large companies and 58% of MSMEs are expert users of digital technologies, a narrow gap of only six percentage points (Figure 26 left panel).

Figure 25: Adoption gap emerges when the environment lacks the right enablers

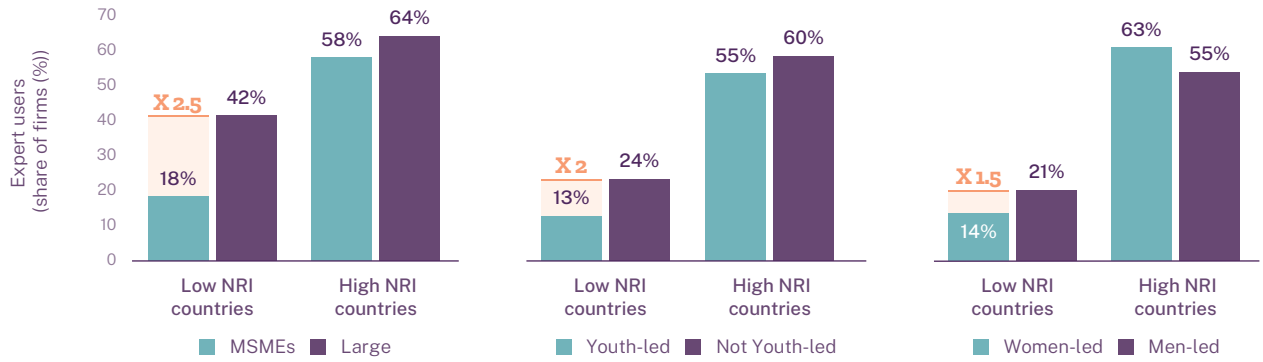


Source: ITC, based on ITC Digital Transformation Survey and NRI from the Portulans Institute.

In contrast, 41% of large companies in countries with low digital readiness are expert users, so they too are negatively affected. Strikingly though, only 18% of MSMEs achieve expert user status, a whopping 23 percentage-point gap. In other words, in unsupportive environments, large companies are two and a half times more likely to be expert users than small firms, whereas the gap is very small elsewhere.

The message is clear: size matters, but a supportive environment matters even more. Small businesses in countries with enablers in place are almost as well positioned as their large counterparts to adopt new technologies. This enables their participation in e-commerce, digital marketing, online communication and other digital activities.[150] Country readiness and firm digital transformation are clearly linked.[151]

Figure 26: Supportive environments level the playing field



Source: ITC, based on ITC Digital Transformation Survey and NRI from the Portulans Institute.

Women- and youth-led businesses tend to share similar characteristics as small firms, particularly in terms of resource constraints.[152] This makes it challenging to invest in digital tools and technologies.[153]

For women, especially in more patriarchal societies, these challenges are compounded by societal norms and systemic barriers that restrict their access to education and professional training, resulting in a skills gap that hinders their ability to fully leverage digital solutions.[154] Data from the ITC Digital Transformation Survey indicate that women- and youth-led businesses are less likely to be expert users in unsupportive environments.

But the place of operation matters. In countries with low digital readiness, non-youth-led firms are almost two times more likely than youth-led companies to be expert users. The gap is virtually non-existent in countries with high digital readiness (Figure 26 middle panel).

Even more striking is the impact on women-led businesses. In countries with low digital readiness, one and half times as many men-led companies are classified as expert users as women-led companies (Figure 26 right panel). This trend is reversed in digitally ready countries, in which the share of women-led firms at the expert user level surpasses the share of men-led ones.

Social and cultural responsibilities make balancing business and family duties challenging, often limiting women's participation in digital entrepreneurship.[155] At the same time, it is possible that these responsibilities drive women to adopt digital technologies more quickly to save time and more efficiently run their businesses – and even households – when the environment allows.

Making up for what the environment lacks

Digital gaps are larger in countries that do not provide the right enablers. This means that, to really move the needle on digital transformation, interventions at the macro level are needed. This is the first order of business.

Still, companies do not simply stand by hoping that the environment will improve. They can and must take action to make up – at least partially – for what the environment lacks. ITC analysis identifies three areas in which business action seems to have the greatest impact in fostering their own digital transformation: financial management, recruitment and training processes, and connections with BSOs.

Firm competitiveness to foster digital adoption

Firms have characteristics that make them more competitive, wherever they operate.[156] Firms need to better understand their strengths and weaknesses, as well as their position in the digital space, as being aware of their position will allow them to set in place a strategy to close the digital gaps.

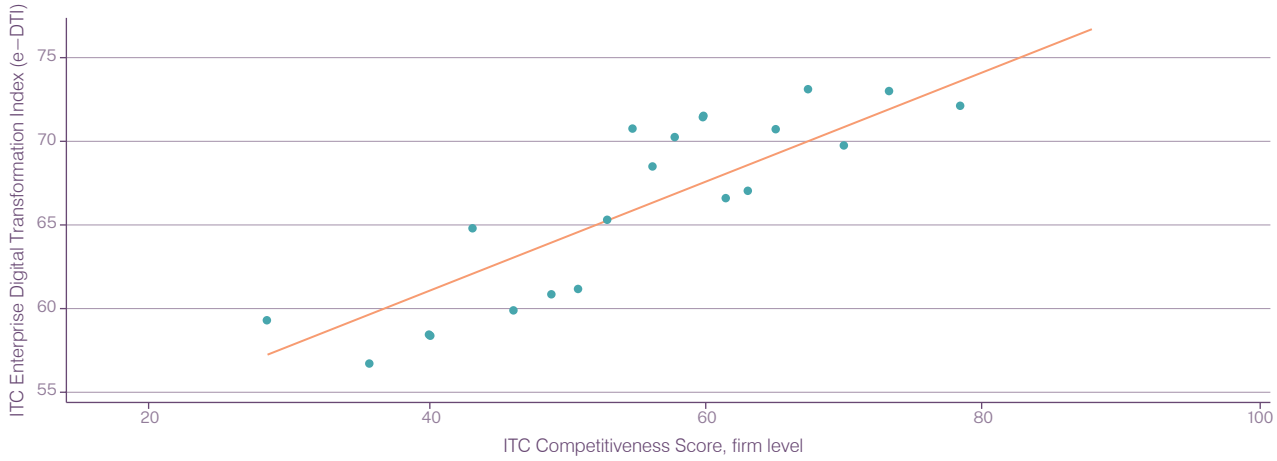
To understand which of these competitiveness features matter most for accelerating their digital transformation journey, ITC contacted a subset of firms whose competitiveness was assessed a few years prior using ITC SME Competitiveness Surveys and analysed their current level of digital transformation (Box 6).

Box 6: Linking competitiveness to digital transformation

ITC collects and analyses business information through its SME Competitiveness Surveys (SMECS) to explore the drivers of competitiveness. From mid-2022 to early 2024, the research team also conducted a survey on the digital transformation of firms, interviewing 7,402 companies across 78 countries (Box 5, Chapter 1).

In four of these countries – Cambodia, Colombia, Philippines and Togo – 1,210 firms had participated in SMECS in previous years. Merging firm-level data from the ITC SME Competitiveness and Digital Transformation Surveys allows ITC to investigate whether, and to what extent, pre-existing competitiveness factors influence the digital transformation of a business. The analysis in this section is based on the findings emerging from this merged dataset.

Figure 27: Competitiveness spurs digital transformation



Source: ITC calculations, based on ITC SME Competitiveness and Digital Transformation Surveys of 1,210 firms in Cambodia, Colombia, Philippines and Togo.

Generally, more competitive firms are also more prone to be digitally apt. In other words, firms that had scored higher in the ITC Competitiveness Surveys later displayed higher levels of digital technology adoption, as measured by their Enterprise Digital Transformation Index. This indicates that if a firm takes steps to increase its competitiveness and move from the bottom of the distribution (first tertile) to the top (third tertile), it becomes, on average, almost three times more likely to be an expert user of digital technologies (Figure 27 and Figure 28 middle panel).

Competitiveness is even more important in countries with low digital readiness, as it partially compensates for the lack of enablers. Just 5% of the least competitive companies, which also operate in low readiness countries, can be classified as expert users. However, if they push their competitiveness to higher levels, they increase their chances of becoming expert users fivefold.

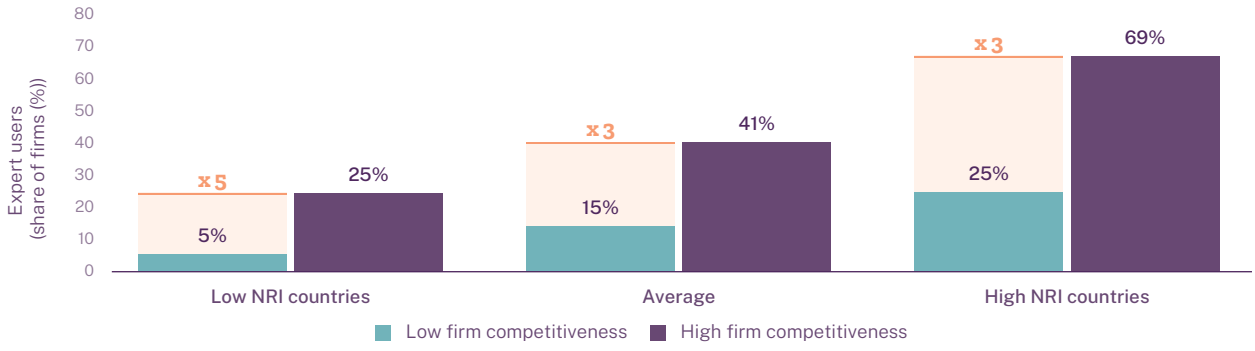
This means that, even in unconducive digital environments, one in four companies manages to be an expert user if it is highly competitive (Figure 28, left panel). For example, in sub-Saharan Africa, exporters, which tend to be the most competitive companies in a country, consistently outperform their non-exporting counterparts in digital transformation, as detailed in Box 7.

This begs the question: what actions make a winner in a challenging environment? To find the answer, ITC zoomed in on those firms that have managed to become expert users in countries with low digital readiness, and found three main approaches that stood out.

These firms were able to:

1. Improve financial management, helping them afford the higher cost of internet connectivity caused by limited or poor digital infrastructure locally;
2. Identify and train staff, making it easier to find and upgrade talent in labour markets with scarce supply;
3. Engage with strong business support organizations, helping firms foster connections and obtain knowledge and information to navigate complex regulatory ecosystems.

Figure 28: Competitive firms, expert users



Source: ITC calculations, based on ITC SME Competitiveness and Digital Transformation Surveys of 1,210 firms in Cambodia, Colombia, Philippines and Togo.

Box 7: Exporting firms, expert digital users

Exporting firms demonstrate higher digital adoption than non-exporters, even in environments where digital enablers are limited, ITC analysis shows.

Using data from sub-Saharan Africa, ITC analysis reveals that exporters – who are often the top performers in a country – are better able than their non-exporting counterparts to compensate for the lack of enablers in their surroundings, and consequently digitalize to a greater extent. A representative non-exporting firm in sub-Saharan Africa scores 62 in the e-DTI. If this firm were to export, its score would increase by 13 percentage points to 75.

Four key factors drive this enhanced digital transformation among exporting firms in sub-Saharan Africa.

- First, exporters deploy more advanced devices to connect to the internet. This is largely because they tend to have more resources to invest in digital technologies.
- Second, managers in exporting companies are more likely to be up to date with new developments in digital technologies. Exposure to globally competitive companies allows firms to benefit from knowledge and technology spillovers, which they can incorporate in their own value chains.
- Third, exporters are more likely to adopt a digital strategy than non-exporters in the region. Indeed, exporting firms tend to be more aware of the potential dividends from adopting digital technologies which, in turn, encourages a more proactive and structured approach to digital transformation.
- Finally, exporting firms tend to have a more digitally skilled workforce than non-exporting firms. While one explanation is that exporters have greater resources to pay for digital talent, the analysis also highlights that exporters have a higher propensity to assess digital skills during their recruitment processes and train their personnel to improve digital skills vis-à-vis their non-exporter counterparts.

The evidence from sub-Saharan Africa suggests that improving competitiveness and export capabilities of firms can have a substantial positive impact on firm digitalization, even when their environments do not have the adequate digital enablers in place.

Sources: (Borino et al., 2024; Albrieu et al., 2020; IFC, 2019; Luu, 2023; N'Dri & Su, 2024; OECD, 2022b; Trachuk et al., 2019).

Good financial management: Prepare to pay

Businesses need access to finance to digitally transform. For firms operating in countries with low digital readiness, this is an imperative, as they often face higher operating costs, including for energy, internet subscriptions and digitally enabled devices.[157]

Credit-constrained SMEs will be unable to make the necessary investments. Still, they can take steps to become better positioned to access finance from external providers and identify internal resources.

First, companies can develop and present comprehensive business plans to finance providers. Financial institutions perceive firms with well-structured business plans as less risky and offer funding under more favourable conditions. Many SMEs are refused finance because they make poor presentations or fail to adopt a business plan.[158]

In less digitally ready countries, the ability to present a business plan seems to give some companies an edge: 80% of firms with the status of expert user reported being able to present a properly structured business plan, which was double the share of those that only reached emerging user status (Figure 29).

Second, firms may be able to identify internal resources by diligently managing records and cash flow. Unfortunately, financial markets tend to be underdeveloped in lower-income countries.[159] This means that finding internal resources, even if amounts are not as substantial, can give firms some ability to pay for better digital services and devices.

Adequately managing finances, such as by keeping economic records or managing cash flow, enables firms to find some internal resources to invest in digital solutions. In countries with low digital readiness, most companies maintain financial records and many proficiently manage cash flow, but differences are still noticeable. While 83% of emerging users had the habit of keeping records, 93% of expert users did so. Similarly, 45% of emerging users had strong cash flow management, compared with 65% of expert users.[160]

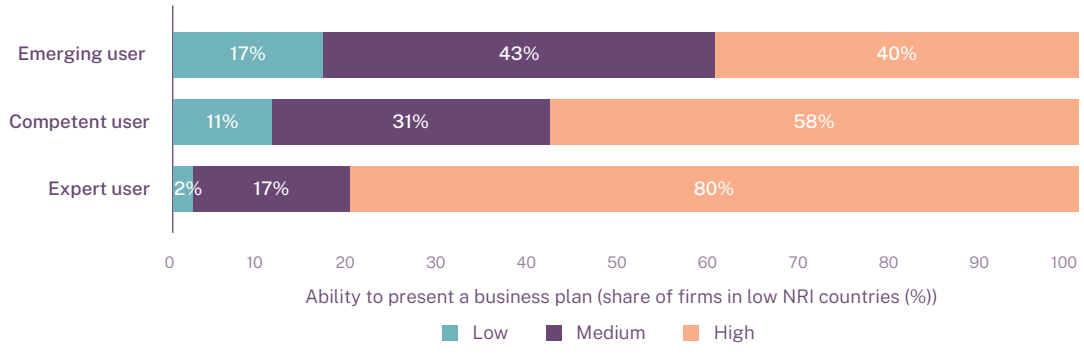
Barriers such as the high cost of qualified accountants and difficulty in understanding accounting records hinder the adoption of these practices.[161] These barriers can nonetheless be at least partially remedied by adopting digital technologies, as the *Business Voice* of Kanoo Pays in this chapter shows.

Some technologies can streamline financial management, ensure availability of electronic records of transactions and invoices, and even facilitate digital payments, making accounting tasks more intuitive and user-friendly. This creates a virtuous cycle: better financial management enables firms to invest in digital tools, which in turn further enhance financial management, improving overall efficiency and digital transformation.

Financial literacy and management play essential roles in driving business growth, studies show.[162] Strategic decision-making and cash flow management seem to be particularly important in spurring digital adoption and transformation in less supportive environments, according to ITC analysis.[163] Targeted financial education programmes can help SMEs adopt strategic financing methods and implement best practice.

Capacity-building initiatives should emphasize to SME owners the importance of accurate, up-to-date records to monitor their performance and evaluate their profitability effectively[164] and introduce digital tools that could be used to facilitate this task.

Figure 29: Today's expert users could present a business plan



Source: ITC calculations, based on ITC SME Competitiveness and Digital Transformation Surveys of 724 firms in Cambodia and Togo.

Nicholas
A. Rees

Chairman and
Co-founder
Kanoo Pays
The Bahamas

BUSINESS VOICE

Leveraging partnerships for digital inclusion

A fintech launched in 2019, Kanoo Pays leverages strategic partnerships and technology to bridge the connectivity and financial inclusion gaps in the Bahamas.

'Connectivity is a challenge in the Bahamas, at least in the physical sense. People and businesses are dispersed, some in hard-to-reach, sparsely populated areas, making it hard to provide services to everyone everywhere.

Take banking, for example. It is not possible to provide branches for every customer across an archipelago of over 700 islands and cays. We founded Kanoo Pays to bridge physical distances with digital technologies.

Our digital ecosystem enables merchants and institutions to establish connections with individuals to obtain financial services and engage in commerce. People who lack official identities can access financial services through Kanoo's wallet infrastructure. Kanoo's technology can effectively build a digital ID and a credit history for people previously excluded.

Our strategic approach to investing in innovative technologies allowed us to build a comprehensive ecosystem through our "Super App". The application offers an integrated digital marketplace and wallet experience, connecting the people and businesses of the Caribbean through technology.

Another important partnership was with our central bank, as Kanoo became the first authorized financial institution approved to provide central bank digital currency (CBDC) access to clients. In 2020, the Bahamas introduced the Sand Dollar, the world's first CBDC aimed at revolutionizing financial transactions in the region. By facilitating seamless conversion between digital and fiat Bahamian dollars, it enhances payment flexibility and access, reduces the operational costs of cash handling and supports economic inclusion through a secure payment system that is accessible to all.

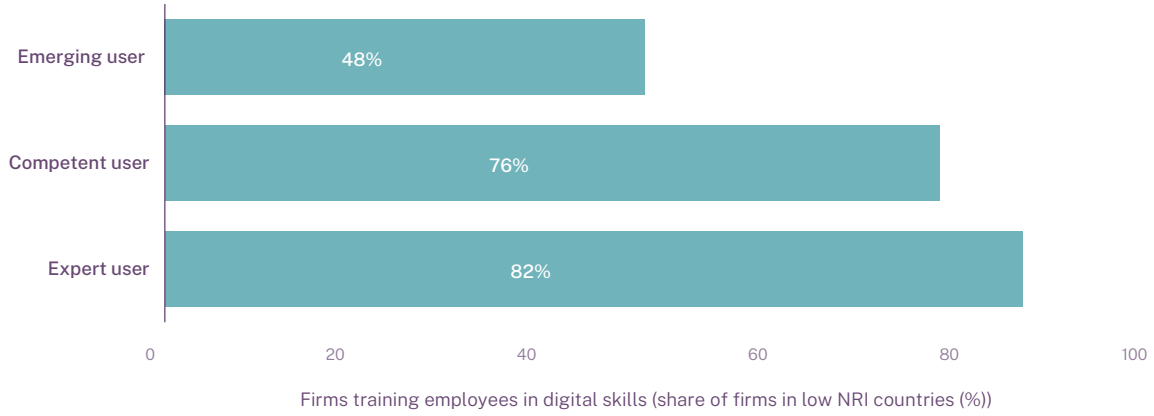
In 2021 Kanoo designed, built and launched our government payment system (Gov Pay) for use by the Government of the Bahamas. Gov Pay is a first-of-its-kind sovereign wallet CBDC management system for governments around the world. It provides complete transparency and accountability across departments, enabling multi-signatory capabilities, automatic sweeping and treasury functions.

As we innovate and venture into (literally) uncharted waters, it is normal to encounter regulatory hurdles. Collaborations and partnerships are crucial in this regard. By maintaining strong ties with organizations like the Bahamas Chamber of Commerce and the Caribbean Council, Kanoo gains much-needed assistance, effectively navigating the regulatory environment not just in the Bahamas, but regionally.

Support from ITC has given us industry insights and global best practices. This assistance has been pivotal in understanding market regulations, accessing new markets and establishing networks with investors and other stakeholders in the digital finance sector.'

The United Kingdom Trade Partnerships (UKTP) Programme aims to increase trade from countries benefiting from an economic partnership agreement with the United Kingdom or from the United Kingdom's Developing Countries Trading Scheme. Its tech start-up component supports the digital technologies sector in the Caribbean and aims to provide business with capacity, linkages to international business, investment opportunities and more.

Figure 30: Today's expert users frequently trained employees



Source: ITC calculations, based on ITC Digital Transformation Survey.

Solid recruitment process: A needle in a haystack

Digitally competent employees can offer key advantages to businesses adopting and using digital technologies. In countries with low digital readiness, however, this kind of talent may be harder to find – and afford.

Assessing digital skills during the recruitment process and training employees to improve their digital capabilities can help businesses build a more skilled workforce.[165] This, in turn, can boost digital adoption. In countries with low digital readiness, 90% of firms that are today classified as expert users assessed digital skills of potential employees during the recruitment process, compared with 59% of emerging users, a 31 percentage-point gap.

Beyond identifying potential talent during recruitment, firms that today exhibit higher levels of digital adoption also commonly trained their employees to improve their digital skills. Among today's expert users, 82% often trained employees on digital skills, almost double the share of emerging users (48%) (Figure 30).

Training plays a pivotal role in helping businesses develop a digitally skilled workforce, but where can firms get the most value for money? Educated business owners have an outsized effect on the digital transformation of their businesses, ITC analysis shows. When managers are more educated, they are better able to assess digital skills during the recruitment process, train employees to improve their digital skills, stay updated on digital technological developments and set clear investment priorities.

Among managers with post-secondary education, for instance, 71% developed clear priorities to invest in digital technologies and skills, compared with only 30% of managers with no formal education – a striking 40 percentage-point difference.[166] Similarly, only 27% of managers with no formal education assessed the digital skills of potential employees during the recruitment process, compared with 75% of those with at least a tertiary level of education.

Finally, 70% of managers with at least a tertiary level of education said they trained employees, almost double the share of managers with a primary level of education (34%) and even a secondary level of education (41%).

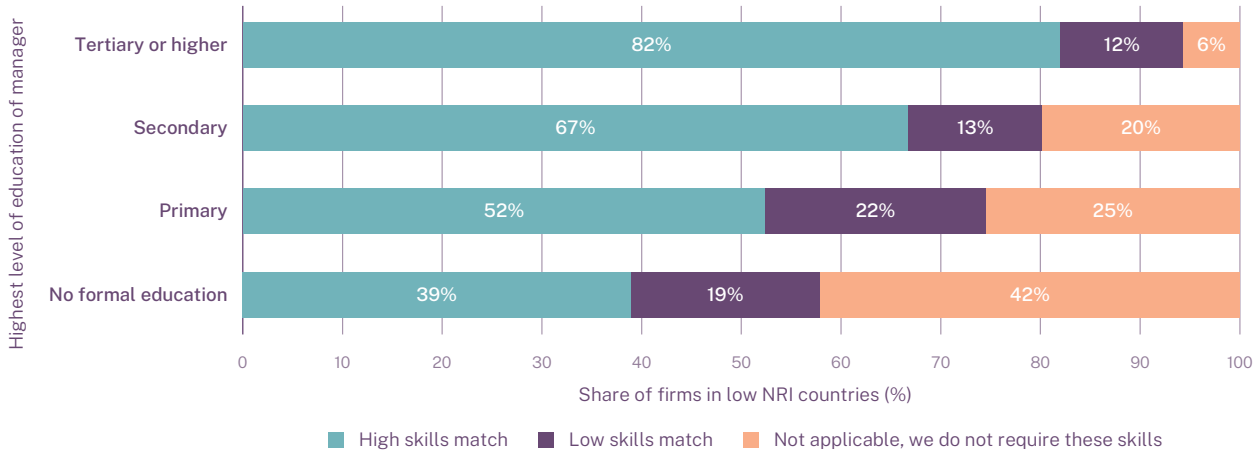
As a result, managers with higher levels of education were more likely to report having a digitally skilled workforce. Managers with a tertiary level of education or higher are more than twice as likely to say their employees are fully equipped to meet their business' digital technology needs (82%), compared with those with no education (39%) (Figure 31).

Targeting business managers also ensures talent stays within the company. Many of those interviewed for this report shared that their employees left after receiving training from official agencies and international development partners. This is not unusual, as qualified staff are bound to find more lucrative opportunities elsewhere, especially when skills are not widespread.

Business support organizations: Out of the regulatory maze

The presence of strong institutions is a crucial feature of a supportive regulatory ecosystem. Business support organizations[167] play a pivotal role in elevating the voice of the private sector, particularly of small firms, in policy and regulatory decisions, helping build more inclusive governance structures.

Figure 31: A manager's education spills over



Source: ITC calculations, based on ITC Digital Transformation Survey.

BSOs also facilitate the creation of networks that enable knowledge and technology sharing among firms.[168] Engaging with BSOs can expose smaller enterprises to a broader network of industry peers and potential partners, providing valuable insights and advice on digital transformation initiatives and emerging rules and regulations.

Finally, BSOs can help small businesses identify where and how the latest technologies could provide the most value and how to comply with national and foreign regulatory requirements. This tailored advice can help small firms effectively integrate technologies into key operational areas.[169]

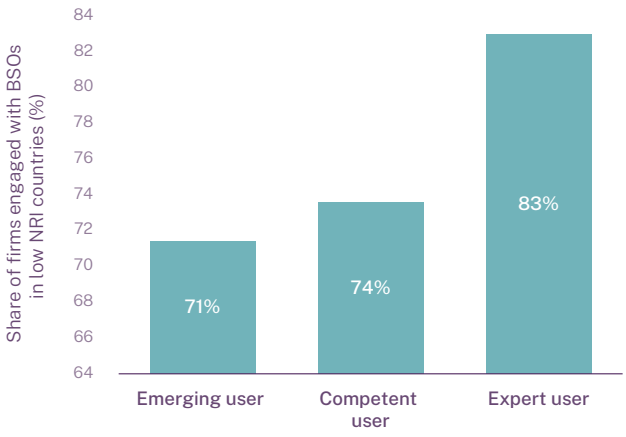
For all these reasons, engaging with BSOs can lay the foundations for higher digital adoption, particularly when the digital environment is lacking.

Most firms, including those operating in countries with low digital readiness, are connected to at least one business support organization, but the share is higher among expert users. In countries with low digital readiness, 83% of expert users are engaged with a BSO, compared with 71% of emerging users (Figure 32).

BSO engagement clearly matters for digital transformation, as these organizations are part and parcel of the business ecosystem. Good, supportive ecosystems tend to have good, supportive BSOs, better able to provide the type and quality of service that their clients need for digital transformation.

This chapter shows that firms can and must act when the business ecosystem is not supportive. When businesses take measures to become more competitive, including by improving financial strategy and management, putting in place robust recruitment and inclusive training programmes, and engaging with high-performing BSOs, they can partially make up for what the environment lacks. The odds may be stacked against firms – especially small ones – when operating in less-than-ideal conditions, but becoming more competitive may help them succeed nonetheless.

Figure 32: Today's expert users engaged with BSOs



Source: ITC calculations, based on ITC SME Competitiveness and Digital Transformation Surveys of 724 firms in Cambodia and Togo.

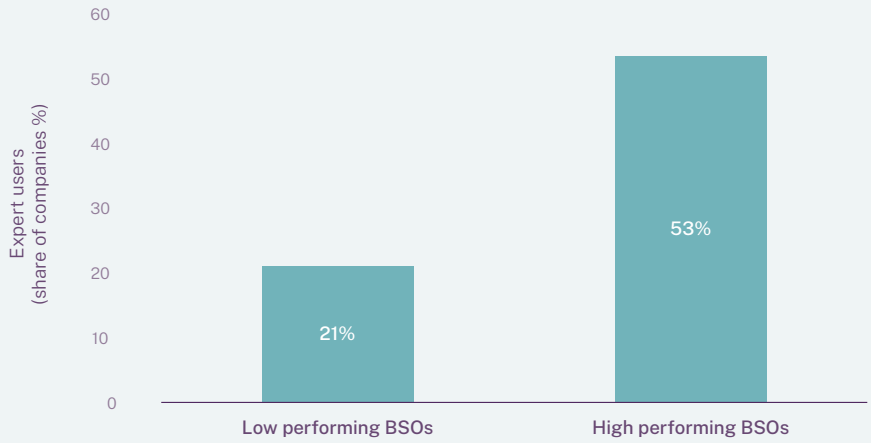
Still, investing in reliable, affordable and high-quality digital infrastructure, appropriate skills and an inclusive regulatory ecosystem remains the surest way to foster the digital transformation of businesses and economies. The next chapter highlights how governments, large firms and international organizations can support the digital transformation of small businesses by putting the right enablers in place, while ensuring that technologies are used responsibly and ethically.

Box 8: Ready countries, strong BSOs, expert firms

The ITC Institutional Strengthening Programme developed a benchmarking tool to assess the quality of business support organizations. Predictably, the strongest, highest performing BSOs tend to be in countries that are more digitally ready, further reinforcing the importance of an enabling ecosystem.

Similarly, firms connected to higher-performing BSOs are much more likely to digitally transform. In fact, 53% of firms in countries whose BSOs are high performing are expert digital users, compared with less than half this share (21%) in countries with low-performing BSOs.

BSO performance and firm transformation are connected



Note: Companies are defined as expert users of digital technologies if their digital transformation index is in the third tertile of the ITC Enterprise Digital Transformation Index distribution across countries. The horizontal axis measures the ITC's institutional benchmarking score. Countries are defined as having low- (high-) performing BSOs if their institutional benchmarking overall technical score is placed below (above) the median score. 'Performance' for BSOs is a multidimensional concept. It is not sufficient to have strong leadership, smooth operations and valuable services. High-performing organizations are also digitally equipped, sustainably focused and foster a positive, human-centric corporate culture.

Source: ITC, based on ITC Digital Transformation Survey and Institutional Strengthening Programme using ITC benchmarking methodology.

Economically, there are considerable benefits from operating in a place with high-performing BSOs. Firms that participated in the ITC Digital Transformation Survey and were in these countries tended to apply digital technologies in more sophisticated ways, such as engaging in e-commerce, using cloud storage, making digital payments and accessing government services electronically. As a result, they more often experienced transformative benefits, such as greater opportunities for innovation and enhanced quality of products and services.

There are clear channels for BSO engagement to support firm digital performance, such as information sharing and advice. Seventy percent of firms in countries with higher-performing BSOs report they are consistently informed about new digital developments, compared to just 43% in countries with lower-performing organizations, according to ITC analysis.

Similarly, 45% of companies in countries with higher-performing BSOs report that lack of awareness or understanding of the benefits of digital solutions can hinder the adoption of digital technologies. In countries where the performance of BSOs is lower, that figure shots up to 73%.

THOUGHT LEADER

Going digital with a soul

Décio Lima

President
Sebrae
Brazilian Service
for Enterprise Support

Integrating small businesses in the digital world requires digital inclusion, business digitalization and digital transformation.

Why would anyone ever need a clock in towns across Brazil? The time was once kept by people like Mr. Ferreirinha, a street vendor who roamed the city streets, announcing his presence from afar: 'I have tomatoes, onions, cucumbers! I have okra and fresh greens, everything super fresh!' He would then proclaim: 'Here comes the greengrocer!' Those at home waiting for ingredients to prepare lunch immediately knew that it was not yet 9 AM.

To tell the time of day, it was enough to look onto the street to see people waiting for Mr. Ferreirinha to pass door to door with his cart and products. He was just one of many street vendors typical of small communities, making an essential contribution to neighbourhood life.

The relationships built by these small businesses were rooted in tradition, customs and routine, far from digitization, process automation and connectivity.

Imperative to transform

Many fear that going digital means tarnishing the social fabric sustained by myriad small businesses. But in a world where globalization has reached the world's furthest flung corners, businesses can change and maintain their soul. Nowadays, Mr. Ferreirinha would arrive a little before 9 AM, choose a designated spot for his vegetable stall and send a WhatsApp message to his customers announcing the daily deals. By the end of the day, he would have a clear picture of sales and restocking needs.

For big and small firms alike, transforming digitally is an imperative. And given that small firms often struggle to compete, using digital tools is increasingly key to strengthening their operations and ensuring resilience.

Integrating small business into the digital world depends on following three paths: digital inclusion, so that businesses have access to all available digital tools; business digitalization, under which digital tools promote more efficient management; and digital transformation, which involves adapting business thinking to ensure that companies keep up with change.

Government targets small businesses

In this vein, Novo Brasil Mais Produtivo ('A new, more productive Brazil'), a programme launched by President Luiz Inácio Lula da Silva and Vice-President Geraldo Alckmin, seeks to reduce the bottlenecks that have prevented many small businesses from reaching their desired level of digital development.

The programme allocates 2.037 billion Brazilian reais ($357.4 million) to promote digital development in 200,000 small businesses, with the aim of offering in-person assistance to 93,000 companies by 2027. In partnership with SENAI (National Service for Industrial Apprenticeship), Sebrae also works to identify and minimize management and production challenges in the context of digital transformation.

Small businesses need to digitalize to succeed, according to studies by Sebrae. These also point to the benefits of trade, as trading businesses have the highest levels of digitalization, both in their use of digital tools and in the benefits derived from such tools. Such digital activities include access to the internet, online sales, use of digital platforms and communication channels (such as WhatsApp), and monitoring of clients. All these tools enable businesses to keep up with trends and expectations. Knowing how to use them allows companies to reduce costs and create more opportunities.

Of course, it is not enough to enter the digital world. It is essential to combine digitalization with elements such as entrepreneurial behaviour, the ability to identify market trends, sound management of staff and access to finance. Moreover, the spread of artificial intelligence will make it crucial to adapt to new business models.

To spur innovation, inclusion is key. Brazil is working to ensure that the gains brought by the digital economy are shared widely and equitably.

Focusing on one street vendor at a time, Sebrae has been working hard to ensure that small businesses transform digitally. As a result, the arrival of popcorn vendors is now announced not only by its alluring aroma, but also via WhatsApp. Customers can pay using a mobile money transfer app (PIX) and place orders in advance. The digital clock will chime right on time!

CHAPTER 4

A plan to leave no one behind

Becoming more competitive can help small businesses make up for what their environment lacks, to an extent, but full-fledged digital transformation requires closing infrastructure, skills and regulatory gaps. This demands a massive collective effort, one that brings together the public and private sectors as well as the international community.

This chapter identifies how these stakeholders can enhance the key enablers and redress imbalances while managing risks as they emerge. It outlines a digital transformation action plan that is designed to leave no one behind – especially small businesses led by women and youth in developing countries – and sets in its sights how these changes can help deliver the SDGs and a more inclusive, prosperous society.

The Digital Transformation Action Plan

The ITC Digital Transformation Action Plan (Table 2) is not a one-size-fits-all strategy. Rather, it recognizes that countries and firms may face radically different circumstances. For this reason, the plan provides examples of what has worked well under specific conditions, aiming to help inspire solutions for closing the digital gap.

Not all actions apply everywhere and priorities must align with a given economy's digital readiness. Countries with low levels of digital readiness may need to prioritize electricity access and basic skills such as digital literacy. Countries at higher levels of digital readiness may focus on greening energy sources, developing more advanced skills in the workforce and deepening their digital-trade related regulations. These measures must all be underpinned by sustainability, inclusivity and ethical considerations so the benefits outweigh the risks and no one is left behind.

Investing in digital infrastructure

Closing the digital infrastructure gap requires substantial investments. To achieve universal access to affordable, reliable and modern energy by 2030, investments must exceed $200 billion a year, more than twice their current levels.[170] Similarly, ensuring access to connectivity infrastructure requires an estimated $418 billion in investments, 73% of which is in emerging economies and 24% in low-income countries, according to the International Monetary Fund (IMF).[171]

No entity alone has the means to close this gap. Investments must come from a range of sources, both public and private. Domestically, these sources include national budgets, the private sector and public–private partnerships. Externally, support could entail greater foreign direct investment and concessional development financing.

Table 2: Digital Transformation Action Plan

	Public Sector	Private Sector	International Community	Small Business
Infrastructure	Increase availability and affordability through direct investment, partnerships and (fiscal and non-fiscal) incentives	Develop innovative market-based solutions and socially responsible initiatives	Offer concessional financing and support data collection efforts to pinpoint gaps and needs	Improve financial management and access to finance
Skills	Integrate digital skills in educational curricula, allow entry of foreign talent and strengthen social safety nets	Share information on demanded skills, provide training and transfer know-how	Support educational and training institutions to upgrade curricula	Professionalize recruitment and provide training to improve skills matching
Regulations	Update/build the regulatory toolbox for the digital age and ensure cross-border interoperability	Engage in digital strategy-, policy- and rule-making, as well as implementation	Champion and facilitate regulatory alignment and crossborder governance mechanisms	Engage with business support organizations to obtain information and advocate for SME-friendly rules

Source: ITC.

Electricity for all

Countries must ensure a consistent, high-quality and affordable supply of electricity, preferably from sustainable sources. If electricity is not supplied in sufficient quantity and quality, people and firms will resort to costly, inefficient and environmentally harmful solutions.

Some African countries have made notable progress in increasing energy access through **public investments in electrical grids**. Kenya has surplus energy from renewable sources, thanks to public- and private-sector investments in geothermal production. These joint investments have also supported small hydro, wind and solar projects.[172] Ethiopia is boosting its generation capacity to 17.1 gigawatts by 2030 to accommodate a projected 13.7% annual increase in electricity demand, with renewable sources meant to generate all future electricity.[173]

Innovative, off-grid solutions can be helpful in remote and rural areas, where low population densities make grid electrification less cost-effective.[174] These systems provide the same quality electricity as the grid and can be cheaper and more environmentally friendly than traditional diesel-powered systems. Burkina Faso has successfully integrated solar energy and battery storage across its national grid, mini-grids and individual household systems.[175]

The Global Energy Alliance for People and Planet deployed a rooftop solar system in Uttar Pradesh, India, which cut energy costs drastically from $0.17/kWh to $0.04/kWh and allowed a local grain mill to double its wheat production volume.[176]

De-risking instruments are essential for drawing private funds to the off-grid industry. These include establishing quantifiable and explicit goals, streamlining licensing processes and providing loan guarantees and risk insurance.[177] Bangladesh, for example, created a special status for independent power producers,[178] enabling **public–private partnerships** that have increased generation capacity.[179] The result was better access to electricity for remote areas, and the country achieved near-universal electricity access in 2022.[180]

Partnerships between private-sector companies, such as energy and telecom operators, can yield a double benefit in terms of digital infrastructure deployment. The Vodacom and Engie partnership in Mozambique and the Safaricom and M-Copa solutions in Kenya have provided affordable pay-as-you-go off-grid solar solutions,[181] allowing individuals and businesses to access cost-effective energy solutions for charging mobile phones and portable radios.[182]

Given the substantial electricity consumption and greenhouse gas emissions from data centres, the backbone of the digital world, implementing measures to enhance their energy and resource efficiency is essential.[183] This can be achieved by promoting the use of renewable energy sources and energy-efficient technologies.

For instance, the Climate Neutral Data Centre Pact sets two targets, spread out over the next five years, for changing the composition of the energy mix powering European data centres: three-quarters should come from renewable or hourly carbon-free energy sources by 2025, and all power should be derived from these same sources by decade's end.[184] Data governance policies allowing for joint usage of these types of facilities by the stakeholders, including those originating from different countries, also appear to be important.

Connectivity for all

Like electricity, access to affordable, high-quality connectivity infrastructure and services is a requirement for digital transformation.

Direct public-sector investment in infrastructure, for example in fibre optic cable networks, can expand broadband coverage and provide more affordable, reliable connectivity. In Mauritania, the deployment of 1,700km of fibre optic cable between 2021 and 2022 resulted in a 53% increase in broadband-connected localities and a 99% reduction in the average wholesale broadband price.[185]

Some governments have also boosted connectivity through **innovative solutions based on public–private partnerships.** The Botswana Fibre Networks, a publicly owned company, partnered with private internet service provider CENE Media to encourage internet use through free internet bonuses and expand its broadband network.[186] In Iquitos, which is in the Peruvian Amazon and is only accessible by air or water, the partnership between SES, a global satellite operator, and Axesat, a Latin American satellite connectivity provider, resulted in the upgrade of the city's network from 3G to 4G-LTE.[187]

Infrastructure sharing is another promising type of partnership. Wireless cellular networks tend to be better suited for sparsely populated remote areas, but the construction of cell towers and wireless masts for mobile or fixed wireless broadband can be very expensive. Different network access providers can share this infrastructure, while benefiting from the passive infrastructure of other utilities such as electricity grids and transport networks.

Incentives for operators to provide digital services in remote communities can improve digital connectivity in these areas.[188] The higher risks, lower profitability and longer time-frames for building infrastructure in rural areas tend to make these projects less attractive to the private sector.[189] Universal service funds from telecom revenues can also be used to finance digital connectivity in remote areas or for specific groups.

To attract **private investment**, an open and competitive telecommunications landscape is also critical. This can be spurred by aligning telecommunications regulations to the WTO General Agreement on Trade in Services (GATS), including its telecommunications annex and the Reference Paper on Basic Telecommunications.[190] These frameworks emphasize the importance of transparency in the regulatory process and the need to foster competition.

Key measures include requiring or encouraging network operators and service providers to share infrastructure, implement effective spectrum management[191] and promote competitive tendering.[192]

Concessional funding by donors, development banks and international organizations will be crucial in closing infrastructure gaps. The WTO-led Aid for Trade initiative, for example, supports developing countries, especially LDCs, in building infrastructure and productive capacity to become more integrated into global trade, with a growing focus on digitalization.[193]

To be effective, infrastructure projects must be informed by **data**. Funders, particularly development organizations, should underscore the importance of collecting data on network coverage, infrastructure assets, population density and income levels. This information is vital for identifying underserved areas and populations, enabling more targeted, cost-effective interventions.[194] **Information on access to and use of digital technologies** by small businesses can help measure progress and develop effective programmes to close the connectivity divide.[195]

Beyond its physical components, digital infrastructure includes access to internet-enabled devices. Reducing device costs can encourage businesses in developing countries to use digital technologies. Stakeholders can influence affordability through targeted **fiscal and non-fiscal incentives**. Governments, for instance, can facilitate access by lowering or eliminating duties on telecommunications and ICT equipment, as several WTO members have already done by signing onto the WTO Information Technology Agreement (ITA) and its expansion, the ITA-II.

Along with import duties, taxes can represent 30% to 40% of total device cost, according to the World Bank.[196] Several countries have implemented tax exemptions to make digital devices and services more affordable. In 2017, Colombia eliminated value-added tax on mobile devices under 654,000 Colombia pesos ($245 at the time of the law's enactment), leading to an increase in the number of smartphone and internet users, along with greater data consumption.[197] Other countries, such as Mongolia, apply duty or tax exemptions for ICT devices purchased by consumers.[198]

Allowing stakeholders flexibility in choosing their ICT equipment is important. The 'net neutrality' approach supports this by enabling users to connect to a network with their preferred devices. Aligning national standards for ICT equipment with international thresholds could also help to increase and diversify the domestic availability of ICT devices.

Access to digital products, such as interoperable computer software, even if developed abroad, should also be ensured. These products fall under the WTO moratorium on customs duties on electronic transmissions, meaning duties are not imposed on their imports, making them more affordable. However, the long-term future of the moratorium remains unclear.[199]

Skilling, up-skilling and re-skilling

Integrating basic, intermediate and advanced digital skills into formal education can prepare young people for a digital future. This can take different forms, such as offering devices to students, helping them access the internet or giving them specialized training. These interventions work better when they are combined, research shows.

Solely distributing laptops to schools fails to achieve meaningful digital inclusion. Many countries in Latin America made substantial investments in the One Laptop per Child programme, but the initiative did not improve mathematics and reading scores significantly because students mainly used these devices to search for information, while teachers were not properly trained to support them.[200]

Facilitating access to high-speed internet improves children's digital skills. In Peru, those with access to high-speed internet at home exhibited substantial improvements in digital skills within five months, outperforming peers without internet access, regardless of laptop ownership.[201] Similarly, free internet services provided by a private company across schools in Nairobi, Kenya, significantly boosted students' internet usage, access to educational content and participation in ICT education programmes.[202]

Rather than relegating digital learning to dedicated computer classes, integrating digital technologies across all subjects yields greater benefits. Experiential learning through apprenticeships, with immersive and hands-on techniques, can greatly enhance the effectiveness of this training.[203] Teachers must also be trained to use these technologies effectively and instil digital skills in their students.[204] Finally, AI could also be used to facilitate education and skills development processes.[205]

Partnering with private-sector entities, such as by setting up industry skills boards, can help educational entities **align curricula to local labour market needs**.[206] These partnerships should lead to the development of flexible courses, including for adults, that are tailored to industry demands.

Demand for expertise – and thus educational priorities – varies across countries. In OECD countries, advanced and specialized digital competences such as data analytics, cybersecurity, software development, automation and the Internet of Things have become more important over the last decade across all sectors.[207] In contrast, foundational abilities remain in highest demand in countries in Africa,[208] followed by non-ICT intermediate skills, with lower demand for advanced and highly specialized skills.[209]

Along with educating the future workforce, countries and companies must offer retraining at various points during a worker's career. The spread of digital technologies means that businesses, and their workforce, must adapt. Educational and training needs are thus not exclusive to children and young adults in schools and university. As companies integrate the latest technologies to streamline operations, drive innovation and meet changing customer expectations, demand for a digitally savvy workforce increases.[210]

Governments and companies must align skills objectives with the broader orientation of lifelong learning. The public and the private sectors must together seek ways to reskill workers constantly, such as by **updating the curricula of technical and vocational training** entities and **providing on-the-job skills training**, particularly for those who may otherwise be displaced by new technologies.[211]

Multinational and large corporations can play a key role in upgrading skills. Some firms train the host country's labour force in more advanced techniques and technologies than what is locally available. Others include the development of digital skills in their corporate social responsibility initiatives.

In 2023, MTN, Africa's largest mobile network operator, launched MTN's Skills Academy to provide access to digital and financial skills training across the continent in support of the African Union's Digital Transformation Strategy for Africa.[212] Similarly, in 2020, Orange launched a mobile digital skills campaign in Sierra Leone through its network of 'tech geeks', or community-based phone repair service providers.[213]

While building and upgrading skills are critical, the process is not immediate nor widespread. If the required skills are not available domestically, businesses must be able to **recruit qualified individuals regionally or globally**.[214] Reducing barriers to the temporary movement of people could open the door to importing digital talent.[215] Importing the services of specialized IT engineers was essential for Adili, a textile company showcased as a *Business Voice* in this chapter, to use and maintain the digital printing technologies that revolutionized its business.

Lack of transparency and availability of information on entry conditions, complex visa and work permit processes, diverging qualification requirements and the absence of mutual recognition or equivalence arrangements make it difficult to recruit foreign qualified individuals. Obtaining residency and work permits for foreign employees and going through registration processes are often time consuming and expensive.

As digital transformation may lead to job displacement and widening income inequality, governments must also **strengthen social protection systems and safety nets** to support those affected.[216] This may include measures such as targeted cash transfers, unemployment benefits and universal basic income schemes, adapted to the country's case and income level, to help prevent potential backlash against digital technologies.

Updating the regulatory toolbox

To drive digital transformation, countries need legislation that enhances the digital ecosystem and fosters digital skills – alongside a regulatory toolbox fit for the digital age. This toolbox should reinterpret existing rules, or craft new ones, across more than 80 areas. It should also remain technology-neutral and promote cross-border alignment to ensure interoperability, reducing compliance costs for small businesses.

This toolbox must **revisit old concepts and adapt them to new realities**, such as the challenges involved in protecting consumers and ensuring fair competition. This is increasingly urgent, as large players benefit most from greater access to data and the use of algorithms to interpret it.

With abundant information about consumer preferences and habits, digital platforms can precisely target customers, directing their purchase decisions. With data on millions of transactions, across multiple sellers, platforms can also identify and enter promising product lines, make pricing decisions and finetune their own business models, gaining a competitive edge. Policies that improve data governance and promote algorithmic transparency – so others can 'see' how data are being used and have control over such usage – can help prevent abuses and other problems.

Governments can also help level the playing field by sharing with businesses some of the data they collect, in what is referred to as open government data. In essence, firms can use publicly generated data, such as census information, traffic flow patterns, use of public infrastructure or university enrolment and performance, to tailor their offer and innovate in their respective sectors. For small businesses to benefit, these data should be selected in consultation with the private sector and be regularly updated, easily searchable and available at low to no cost.

Governments must also enact laws to **regulate entirely new areas** introduced by digitalization. These areas include the development and deployment of emerging technologies such as AI, blockchain and the Internet of Things, along with the use of electronic trust services and data governance. Some of these areas are particularly relevant for small businesses, given the potential for digital tools and technologies to lower their transaction costs and improve their efficiency.

Rules that recognize the legal equivalence of electronic and paper transactions expedite procedures and reduce the cost of doing business. For example, firms that submit customs declarations electronically rather than on paper can benefit from having their goods undergo customs processing before they even arrive at the border and ensure faster release of goods towards their destination.

BUSINESS VOICE

Weaving the future with technology

A trailblazer in digital printing on natural fabrics, Adili offers eco-friendly, Kazakhstan-made textiles that combine traditional designs with modern craftsmanship.

Assel Adil

Founder
Adili
Kazakhstan

'Fourteen years ago, my sister and I decided to pursue our dream of working in sustainable fashion and became entrepreneurs. Our goal with Adili was to bring our cultural heritage and sustainability to the textile industry.

Our first challenge was to overcome the constraints inherent to low-scale production and the use of traditional production methods. That is what led us to adopt digital printing technologies, a decision that revolutionized the Kazakh textile industry. Digital printing allowed us to manufacture highly tailored products with less waste, reducing our environmental impact, boosting efficiency and aligning with our sustainability goals.

Finding the digital skills we needed to make this move was nonetheless challenging, as they were not extensively integrated into the country's formal education system. To make up for it, we equipped our team with advanced software and tools for graphic design and trained our workers, encouraging them to use online learning and social media.

While mastering design skills was relatively straightforward, understanding the technical intricacies of digital fabric printing was harder. Luckily, we were able to count on foreign experts for these specialized tasks. IT engineers from China and the Netherlands helped use and maintain the digital printing technologies that have redefined our business.

For a business like ours to success, owners must act, as we did. But external support is also needed. We did access some subsidized loans, which helped us invest and grow. International agencies like ITC provided coaching and e-commerce training, enhancing our client outreach. These enabled us to build a robust supply chain, scale up production and expand to 90+ employees.'

The Ready4Trade Central Asia project, funded by the European Union and implemented by the International Trade Centre, aims to contribute to sustainable and inclusive economic development in Central Asia by boosting intraregional and international trade.

When authenticated with electronic signatures, digital documents help users to carry out business online more securely. The trick is for regulators to clarify the requirements for what counts as a valid signature and not make these too stringent for low-risk transactions. In other terms, while large transactions may require advanced cryptographic signatures, simpler tools – such as scanned ink signatures – should be considered sufficient for most transactions carried out by small firms.

These kinds of regulations support the digitalization and adoption of transferrable records that are commonly used in domestic and international trade, such as letters of credit or checks. These digital solutions can ensure greater authenticity and reliability throughout the transactions, compared to the use of physical documents, while cutting back on manual labour, errors and time.

Digital identities are another promising tool for increasing efficiency and security. Individual digital identities and wallets, along with electronic verifiable representations of a person's identity and credentials, are increasingly used to access online services and platforms. Corporate digital identities, which are relatively rare, could play a similar role for businesses. These can help firms interact seamlessly with customers, partners and governments, sharing the relevant corporate information and allowing for the use of electronic payments and authorized economic operator schemes.

They could also simplify reporting and help demonstrate creditworthiness. One example of a reliable international corporate identity is being developed by the Global Legal Entity Identifier Foundation.[217]

In an environment in which traceability is increasingly relevant for market entry, digital product identifiers can similarly ensure authenticity and facilitate verification. These tools can simplify origin determination, expediting customs clearance. They can also provide accurate, accessible product information such as ingredients and environmental footprint, building consumer trust and helping firms demonstrate compliance with regulations at home and abroad. To enable their widespread use, governments must define what information is required and how it will be collected, transferred and authenticated.

A major hurdle to implementing digital solutions is the blending of commercial and personal data. Aligning personal data protection policies across jurisdictions helps build trust, allowing for unilateral or mutual recognition of data protection regimes, reducing data localization requirements and facilitating cross-border data flows.

Interim solutions can help manage cross-border data transfers where broader arrangements are absent. For example, standard contractual clauses for data transfers can establish legal and technical data protection regimes between parties located in countries that lack mutual recognition arrangements for their privacy regimes. Private parties can incorporate such clauses in their contracts, as was done in both the European Union[218] and the Association of Southeast Asian Nations (ASEAN)[219] while interoperability between the two is being explored.[220]

In addition, a **risk-based approach** to small business data transfers, with exemptions or lighter scrutiny, could further ease cross-border operations.

Privacy trust marks can also signal compliance with specific privacy standards or regulations and can be based either on a self-assessment or issued by an independent or government organization. Singapore's Data Protection Trustmark Certification Scheme,[221] for instance, is a voluntary certification programme that allows companies to demonstrate compliance with the country's Personal Data Protection Act.

In all the above, **technological neutrality is a must**. It ensures that regulations do not favour specific technologies, allowing businesses to choose the right solutions for their needs and adapt accordingly. This flexibility is critical in the fast-changing digital landscape. Similarly, rules promoting **open-source software solutions** enhance flexibility, prevent technological lock-ins, foster interoperability[222] and enable small businesses engaged in ICT development to join the relevant value chains.

While domestic regulations are essential, businesses cannot fully transform digitally without cross-border alignment. **Interoperable or mutually recognized rules and standards for digital tools** lower costs and simplify information exchange. In cases where different governments establish diverse criteria for valid electronic signatures or corporate digital identities, the adoption of these tools remains limited, given the increased compliance costs for businesses operating internationally.

Several cross-border initiatives aim to align digital regulations. For example, the United Nations Commission on International Trade Law facilitates regulatory harmonization with its model laws and treaties on e-commerce, supporting reliability and promoting cross-border use of electronic solutions.[223]

Other efforts include the proposed WTO Agreement on E-commerce,[224] the ASEAN E-commerce Agreement,[225] the African Continental Free Trade Area Digital Trade Protocol,[226] the Comprehensive and Progressive Agreement for Trans-Pacific Partnership,[227] the U.S.-Mexico-Canada Agreement[228] and the Regional Comprehensive Economic Partnership.[229] Dedicated databases catalogue existing and pending digital trade rules, offering a repository for reference and alignment.[230]

Although mature digital economies tend to lead these initiatives, emerging digital players, including developing countries and LDCs, are increasingly expressing their interests and needs. Participation in these international discussions offers countries with low digital readiness a unique learning opportunity.

Digital technologies bring challenges related to development, ethics, equity, environment, safety and security. **Promoting multidisciplinary and multistakeholder approaches to regulation** increases the chances that domestic rulebooks duly cover the areas affected by digitalization, facilitating adoption and use of digital technologies while addressing emerging risks and imbalances. This requires **strategic and structured engagement across government agencies and with enterprises**, within and across borders, to obtain information, understand challenges and devise holistic solutions.

Small businesses need a voice in regulatory discussions, too. Organizations such as ITC play a crucial role in advocating for SME-friendly policies. Regulations can support business growth but must not impose excessive costs or complexity, which SMEs are less equipped to handle than larger firms. Different approaches and ad hoc responses jeopardize the interconnected nature of the digital economy.

Strengthening cross-border interoperability and related governance structures prevents the kind of fragmentation, with conflicting standards and methods, that is so damaging to small businesses.

Conclusions

Technological change poses no existential threat to small businesses – quite the opposite. The benefits of using digital tools go beyond productivity enhancements and can truly transform how businesses produce, interact and trade.

But digital transformation does not happen by chance – and there are serious risks if the future of the digital economy and governance continues to unfold in a patchwork, reactive way. These risks run the gamut: they could lead to environmental harm, greater inequalities in and across countries and segments of society, and economic growth that only benefits those that are already prosperous. Nor can the pace of regulatory change continue to play catch-up to the far quicker developments in digital technology's evolution.

A digital transformation that leaves no one behind instead requires deliberate action from myriad stakeholders, from governments to large firms, international organizations and small businesses themselves. These actions must have, at their core, the environmental, social and economic implications of the different pathways involved – and must include the voices of everyone these decisions affect.

They must also account for the fact that different firms have different needs: for instance, small, youth-led and women-led business face numerous barriers beyond mere access to devices and internet connectivity, particularly in countries that lag behind in the provision of digital enablers.

Fostering the digital transformation of firms and economies requires investing in infrastructure, developing skills and updating the regulatory playbook for the digital age, with tailored actions based on a country's level of digital readiness, along with its respective policy priorities.

At the same time, all stakeholders – governments, firms and the international community – must collectively establish and enforce principles and frameworks and be prepared to update them continuously over time. This is key to ensure that digital technologies do not exacerbate inequalities and vulnerabilities, are developed and deployed ethically and sustainably, and are interoperable across sectors and borders.

That is what it looks like to have a digital transformation where everyone benefits: one that can help bring the 2030 Agenda for Sustainable Development closer within reach, rather than standing in its way. It is a collective process and an iterative one – and one that, as the Pact for the Future and Global Digital Compact have both recognized, must not just keep pace with technological change, but be ahead of it.

THOUGHT LEADER

Governance needed to address AI concerns

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Use of artificial intelligence holds great promise for companies to improve efficiency and reduce costs, especially small and medium-sized enterprises.

Early estimates of AI's benefits point to some eye-watering gains. Generative AI could add up to $4.4 trillion annually across 63 different applications in functions ranging from customer operations in marketing and sales to software engineering and R&D.[231] In healthcare alone, AI could help cut spending in the United States by 5% to 10% annually.[232] In Africa, smallholder farmers in seven agriculturally dependent economies could experience a surge in revenues of $6.1 billion through simple applications of AI to improve their crop yields.[233]

Such outcomes, however, depend on overcoming the AI trust gap. Using a machine to do jobs that otherwise would have been carried out by qualified humans entails a deep level of trust in technology. Trust issues are especially salient for SMEs, because they have fewer alternatives on which to fall back if the technology fails to deliver.

Although there are few standards to define, measure and evaluate trust levels, there is growing evidence of distrust in institutions and technology, particularly AI. Consumers are voicing concerns over many AI-related risks, while businesses are concerned about near- to long-term issues despite AI's obvious benefits, according to the US Federal Trade Commission.[234]

Drivers of the AI trust gap

For most new products, distrust often stems from concerns about performance. There are also worries about negative side effects or unintended consequences.

In the case of AI, there is apprehension about a persistent gap in performance. AI systems make mistakes and can dispense wrong and, at times, harmful recommendations. For example, the hallucination rate – the frequency with which AI models produce outcomes that do not match reality – of the major AI models ranged from 1.3% to 29.9% in September 2024, according to a regularly updated 'hallucination leaderboard' on the Vectara platform.[235] It is expected that hallucinations can never be eliminated.[236]

In addition, there are AI blind spots when algorithms confront situations on which they haven't been trained, leading to the wrong outcomes.[237] Moreover, AI could contribute to an information quality problem, where users may not be able to distinguish between authentic and false information. AI-aided information can

present severe risks, such as dispensing inaccurate medical advice, recommending unsafe products or even using consumers as 'guinea pigs'.[238]

Of course, AI models will continue to improve and performance gaps will narrow. However, performance is not the only factor affecting trust in AI. There are also concerns about ethics and protection of human rights, data privacy worries and the potential for bias from faulty historical data being used for future decisions by algorithms trained on this data.

Although the pace of investment in advancing AI should help allay some of these concerns, the way in which AI is growing can undermine trust-building. One barrier has to do with the 'black box' nature of AI; the other with the fact that AI models are being developed largely by a small number of industry players.

Macro risks

There are also broader issues raised by AI at a macro or societal level. Safety and security worries associated with AI are plentiful.[239] These include concerns about data breaches, cyberattacks, internal or external weaponization of AI, lethal autonomous destructive systems and autonomously triggered catastrophic accidents.

Secondly, many fear AI's impact on jobs and the wider implications for income inequalities. There are already indications that certain types of jobs are vulnerable to being displaced by AI. Thirdly, AI's environmental footprint is bound to become a growing concern. Training AI models alone emits the equivalent of nearly five times the lifetime emissions of the average car.[240] Moreover, there are worries that the technology can be co-opted by the state to conduct surveillance on citizens. At least 75 out of 176 countries already use AI for surveillance of their citizens.[241]

Investing in AI governance

As a result, closing the AI trust gap involves more than merely tackling performance. Industry players and regulators must acknowledge that lack of trust in AI poses a threat to its productive use and formulate policies to address issues identified here.

AI products must be accompanied by appropriate digital governance mechanisms that incorporate six key elements:

- Improve oversight, accountability and controls by independent bodies
- Ensure that there are appropriately trained human 'pilots' accompanying and deploying AI
- Invest to reskill and re-educate the workforce affected by AI
- Establish formal regulatory frameworks to provide public policy guidance and guardrails
- Create mechanisms to facilitate the wider sharing of AI's economic benefits and costs

The current limitations of artificial intelligence – such as bias or the lack of open-source AI models – also create an opportunity to improve them, and in turn open up new markets for these technologies. As we invest in making AI models bigger and more powerful, we must in parallel invest in their governance. If we do not, small and medium-sized businesses are likely to be among the biggest losers. We will end up in a situation where AI performance improves, but adoption trails, undermining the returns on the enormous investments being made on performance.

Endnotes, References and Annexes

Endnotes

1 Connected services comprise transport and logistics, financial services, information and communication technologies (ICT) and business and professional services. See (ITC, 2022b) for more information.

2 (Schwab, 2016).

3 (ITU, 2017).

4 (Tsidulko, 2024).

5 (Lean, 2016).

6 (ITU, 2017).

7 (ECLAC, 2021; ILO, 2017).

8 (Melián-González et al., 2021).

9 (Stanford University, 2024).

10 (Ferrero Guillén, 2023).

11 Analysis and definitions from Accenture (2024). See (IMF, OECD, World Bank et al., 2023).

12 (Shpachuk, 2023).

13 (Charles et al., 2022; Mandl, 2021).

14 (United Nations, 2015).

15 (Afzal et al., 2022).

16 (United Nations, 2015).

17 (Czernich et al., 2011; Koutroumpis, 2009; Qiang et al., 2009).

18 (Zhang et al., 2023).

19 (Dzator et al., 2023).

20 (Jean et al., 2016).

21 (Okolo, 2023).

22 (Okolo, 2023).

23 (WEF, 2023).

24 (Mohamadi et al., 2016).

25 (ECLAC, 2021).

26 (Talwar et al., 2022).

27 While electricity is an older technology and closer to saturation, which partially explains its slower growth compared to internet access, this alone does not account for the trend. Indeed, some modern technologies, despite starting much later, have even surpassed electrification rates. For instance, more households in developing countries own a mobile phone than have access to electricity (World Bank, 2016), underscoring the distinct pace of digital transformation.

28 (ITU, 2024).

29 (Qureshi, 2022).

30 (UNCTAD, 2024a).

31 (The Economist, 2024).

32 (The Economist, 2024).

33 (WHO, 2023).

34 (ECLAC, 2021).

35 (OHCHR, 2023).

36 (OHCHR, 2023).

37 Even in countries on the cutting edge of digital technology development and adoption, challenges remain in ensuring that gaps do not widen internal divides and that potentially negative outcomes do not outweigh benefits.

38 Available at https://networkreadinessindex.org/

39 The technical details of how the NRI is calculated and of how the elements of the index are selected are available at https://networkreadinessindex.org/. We acknowledge the existence of other indexes that can help measure digital transformation or specific enablers contributing to digital transformation. For instance, ITC's Digital Trade Regulatory Readiness Assessment Methodology can be used for a diagnostics of the national regulatory ecosystem.

40 (UNCTAD, 2024b).

41 (Bonaglia & Wunsch-Vincent, 2023).

42 (WIPO, 2024).

43 (IMF, OECD, World Bank et al., 2023).

44 (ITU, 2024).

45 (Freund et al., 2022).

46 (Freund et al., 2022).

47 (Foster et al., 2023).

48 (Luo et al., 2019).

49 (ILO, 2021).

50 This is in line with the key message from the (World Bank, 2016).

51 Fibre-to-the-home/building internet subscriptions refer to the number of internet subscriptions using fibre-to-the-home or fibre-to-the-building at downstream speeds equal to, or greater than, 256 kbit/s.

52 (OECD, 2019c).

53 (EIB Economics Department, 2023).

54 (OECD, 2021b).

55 (IEA et al., 2023).

56 (The Economist, 2024).

57 (ITU, 2023b).

58 (Broadband Commission, 2024).

59 (Broadband Commission, 2024).

60 (OECD, 2019a).

61 (ITU, 2023b).

62 (ITU, 2024).

63 (Diop, 2022).

64 (ITU, 2023b).

65 (Zeufack et al., 2019).

66 (Alliance for Affordable Internet, 2020b).

67 (Broadband Commission, 2023).

68 (van Dijk, 2005).

69 (Mithas & Krishnan, 2008; Rehman, 2015).

70 (Bartel & Lichtenberg, 1987).

71 (Glaeser & Saiz, 2003; Skinner & Staiger, 2005).

72 (ILO, 2021).

73 (WTO, 2024b).

74 (Farrell et al., 2020; Nikou et al., 2022).

75 (Baca-Feldman et al., 2021). This grouping is based on the EU's DigComp 2.1 Digital Skills Framework and its adaptation by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in the Digital Literacy Global Framework.

76 (Autor et al., 2003).

77 (ITU & ILO, 2017).

78 (Fietz & Lay, 2023).

79 (Szczepański, 2019).

80 (Berg et al., 2023).

81 Ibid.

82 (Szczepański, 2019).

83 (IMF, OECD, World Bank, et al., 2023; ITC, 2022b).

84 (Eang et al., 2023; Prasanna et al., 2019).

85 (ITC, 2022b).

86 (Willems & Kamau, 2019).

87 (ITU, 2021a; 2023a).

88 (United Nations Commission on International Trade Law (UNCITRAL), n.d.).

89 ITC calculation based on ITC Digital Transformation Survey and NRI 2023. Respondents were asked 'Please rate the cost of the following: a. Internet access (e.g. cost of monthly/annual subscription).' Firms were classified as reporting high cost if they chose options five or six on a Likert scale ranging from one (Low cost) to six (High cost). The maturity of the telecommunications market is determined using the NRI's *regulation* sub-pillar indicator on *ICT Regulatory environment*. Countries are classified as having 'High' maturity of telecommunications market if the indicator value is in the third tertile of the indicator distribution, 'Medium' if the indicator value is in the second tertile and 'Low' if the indicator value is in the first tertile.

90 ITC calculation based on ITC Digital Transformation Survey and NRI 2023. Respondents were asked 'To what extent are you satisfied with the following digital services in your country: d. E-commerce platforms.' Firms are classified as 'Very satisfied' if they choose options five or six on a Likert scale ranging from one (Very dissatisfied) to six (Very satisfied). A country is classified as having e-commerce legislation adopted/pending within three or fewer areas if it has adopted legislation or has a draft law pending adoption within three or fewer of the four following areas related to e-commerce: electronic transactions, consumer protection, privacy and data protection, and cybercrime.

91 (ITU, 2023a).

92 Ibid.

93 (ITC, 2022b).

94 (ITU, 2023a).

95 Ibid.

96 (UNEP, 2023).

97 (Ferracane & van der Marel, 2024).

98 (OECD, 2021c).

99 (Casalini et al., 2021).

100 (Ferracane et al., 2024; ITC, 2022b; UNCTAD, 2021).

101 (WTO, 2024a).

102 In economics, increased productivity means that, for the same level of expenditure on inputs, firms can achieve higher revenue. (Borowiecki et al., 2021; DeStefano et al., 2019; Duso & Schiersch, 2022; Gal et al., 2019).

103 (Paunov & Rollo, 2015; 2016).

104 ITC, based on ITC Digital Transformation Survey 2023. Respondents were asked 'Have digital technologies helped you cut the costs of your business?' and 'Have digital technologies helped you increase the sales of your business?'. The benefits are substantial regardless of the company size, whether it is led by women or men, youth or non-youth, or across various sectors.

105 (Lendle et al., 2016).

106 Large digital platforms can exert significant market power, which could offset some of these cost reductions, particularly for small businesses. This falls outside the scope of this section, but a deeper discussion on anti-competitive behaviour in the context of digital platforms is available in (ITC, 2022b).

107 (ITC, 2022a).

108 (Fontagne et al., 2020).

109 (ITC, 2022a).

110 Ibid.

111 (Gao & Feng, 2023).

112 (Stanford University, 2024).

113 (Gao & Feng, 2023).

114 Ibid.

115 (Perifanis & Kitsios, 2023).

116 (WTO, 2024c).

117 (Dwivedi et al., 2023).

118 Ibid.

119 (OECD, 2021d).

120 Ibid.

121 (Stanford University, 2024).

122 (Grigoriou & Fink, 2023).

123 (SEGWITZ, 2023).

124 (DeStefano et al., 2019).

125 (Gharibvand et al., 2024).

126 (UNCTAD, 2019).

127 (Henry et al., 2023).

128 (Nugraha, 2023).

129 (OECD, 2021d).

130 (Mazzorana, 2019).

131 (Treiblmaier & Špan, 2022).

132 (Makenica, 2023).

133 (BBC, 2014).

134 (OECD, 2017a).

135 (UNCTAD, 2023).

136 (Freund et al., 2022).

137 (Conner et al., 2015; Shahrubudin et al., 2020).

138 The analysis in this chapter uses the standard three-sector classification – agriculture, manufacturing and services – to categorize firms according to their economic activity. The services sector, however, is further divided into two categories: connected services and non-connected services. This is because not all services are the same. A set of four activities, which ITC dubbed connected services, adds higher value to exports and are more digitally intensive. Connected services comprise transport and logistics, financial services, ICT and business and professional services. See (ITC, 2022b) for more information.

139 (ITC, 2022b).

140 ITC calculation based on ITC Digital Transformation Survey 2023. Respondents were asked 'Of the total operational expenditure of your business, what percentage is spent on digital solutions?'.

141 ITC calculation based on ITC Digital Transformation Survey 2023. Respondents were asked 'Does the manager of the company stay up to date on new developments in digital technology that could be relevant for the business?'. Options include 'Yes, always', 'Sometimes' and 'Never'. The share represents the company that responded 'Yes, always'.

142 (Cirera et al., 2022).

143 Ibid.

144 ITC calculation based on ITC Digital Transformation Survey 2023. Respondents were asked 'Please rate the severity of the following obstacles to using the internet and adopting digital solutions for your business: resistance to change in my company'.

145 (Conti et al., 2021).

146 (OECD, 2021d).

147 (OECD, 2021a).

148 (Kergroach, 2021).

149 (Giotopoulos et al., 2017).

150 (Bradač Hojnik & Huđek, 2023).

151 (Zamani, 2022).

152 (ITC, 2021).

153 (Senou & Soro, 2022; Gray, 2024).

154 (ITC, 2024b; Peláez-Sánchez et al., 2023).

155 (Sabri et al., 2021).

156 (ITC, 2015).

157 (ITU, 2023b).

158 (Chowdhury & Alam, 2017).

159 (Kaboski, 2023).

160 ITC calculation based on ITC SME Competitiveness and Digital Transformation Survey in low NRI countries. Respondents were asked 'Please rate this company's ability to manage its cash flow to reliably execute payments' and 'Does your company keep the following types of records?'.

161 (Agyei-Mensah, 2010).

162 (Adda, 2020; Dongming et al., 2023; Yakob et al., 2021).

163 (Wolmarans & Meintjes, 2015).

164 (Adda, 2020).

165 (ITC, 2022a; ITC 2024c).

166 ITC calculations, based on ITC SME Competitiveness and Digital Transformation Surveys. These statistics focus solely on firms operating in countries with low digital readiness, as measured by the NRI, specifically those placed in the first tertile of the index distribution.

167 ITC defines a BSO as any organization or institution that provides support or capacity-building services to businesses and entrepreneurs. These BSOs can include trade promotion organizations, chambers of commerce, sector associations, businesswomen's organizations and incubators. For definitions, see https://www.itcbenchmarking.org/resources-and-help/client-definitions

168 (ITC, 2018; 2022c).

169 (ITC, 2024a).

170 (IEA, 2023).

171 (IMF, OECD, World Bank, et al., 2023).

172 (World Bank, 2018).

173 (African Development Bank, 2022).

174 (World Bank & ESMAP, 2022).

175 (Puliti, 2022).

176 (Chen & Ng'ang'a, 2024).

177 (United Nations, 2018).

178 A scheme whereby a producer of electrical energy, which is a private entity, owns and/or operates facilities to generate electricity and then sells it to a utility, central government buyer or end users. The independent power producer invests in generation technologies and recovers its cost from the sale of the electricity. Definition based on (Asian Development Bank, 2022).

179 (Asian Development Bank, 2022).

180 (The Daily Star, 2022).

181 (World Bank, 2023).

182 (World Bank, 2023).

183 (UNCTAD, 2024a).

184 (Climate Neutral Data Centre, 2023).

185 (World Bank, 2024).

186 (Dikuelo, 2017).

187 (ITU, 2021b).

188 (Begazo et al., 2023).

189 (Philip et al., 2017).

190 (WTO, 1996). The expansion of the scope of the Reference Paper and further reinforcement of some of its disciplines is part of the proposed WTO Agreement on E-commerce. Relevant provisions are incorporated in the stabilized text of this agreement under Article 21, Telecommunications. (WTO, 2024a).

191 Spectrum management – as defined by the (U.S. Department of Transportation, 2019) – is the art and science of managing the use of the radio spectrum in order to minimize interference and ensure that the radio spectrum is used to its most efficient extent and for the benefit of the public.

192 (ESCAP et al., 2023).

193 (OECD & WTO, 2022).

194 (OECD, 2021b).

195 (Broadband Commission, 2023).

196 (Amin & Gallegos, 2023).

197 (Alliance for Affordable Internet, 2020a).

198 (Ministry of Finance Mongolia, 2014).

199 (WTO, 2024a).

200 (de Melo et al., 2017).

201 (Malamud et al., 2019).

202 (Okyere, 2020).

203 (Accenture & G20 Young Entrepreneurs Alliance, 2018).

204 (UNESCO, 2023).

205 (United Nations Economist Network, 2024).

206 (WEF, 2019).

207 (OECD, 2022a).

208 (World Bank, 2021). Based on UNESCO's Digital Literacy Global Framework, 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 technical and vocational education and training 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.

209 (World Bank, 2021).

210 (ITC, 2022a).

211 (ILO & UNESCO, 2020; World Bank, 2019).

212 (MTN, 2023).

213 (Sterngold, 2023).

214 (Elizur, 2021).

215 (Hooper & Benton, 2022; Kategekwa, 2014).

216 (OECD, 2017b).

217 (GLEIF, 2025).

218 (European Commission, 2021).

219 (ASEAN, 2021)

220 (European Commission, 2024).

221 (Infocomm Media Development Authority, n.d.).

222 (United Nations, 2020).

223 (UNCITRAL 2023).

224 (WTO, 2024a).

225 (ASEAN, 2019).

226 (AfCFTA, 2024).

227 (Ministry of Foreign Affairs and Trade New Zealand, 2018).

228 (Office of the United States Trade Representative, 2020).

229 (Office of the United States Trade Representative, 2020).

230 (Burri et al., 2022; WEF, 2024).

231 (McKinsey, 2023).

232 (Sahni et al., 2023)

233 (Adisa et al., 2024).

234 (Fondrie-Teitler & Jayanti, 2023; Hammond, 2023).

235 (Hughes et al., 2023).

236 (Leffer, 2024).

237 (Goodfellow et al., 2015).

238 (Ashraf et al., 2024; De Freitas & Cohen, 2024; Nyce, 2024).

239 (Hendrycks et al., 2023).

240 (Hao, 2019).

241 (Feldstein, 2019).

242 For more information on the SME Competitiveness Survey, see: https://intracen.org/resources/data-and-analysis/research-and-data/

243 (Falciola et al., 2020).

244 The data collection occurred in two rounds. The first round took place in francophone Africa from May to August 2022. The second round was conducted globally from July 2023 to March 2024.

245 Observations by firm size and sector do not exactly sum up to 7402 as some firms did not reply to the question 'What is the main sector of activity of the business?' or 'How many full-time employees does the business have?'

246 The following countries had fewer than 10 firms interviewed: Afghanistan, Algeria, Anguilla, Barbados, Brazil, Burundi, Canada, Central African Republic, China, Comoros, Democratic Republic of the Congo, Djibouti, Dominican Republic, Ecuador, Eswatini, France, Guatemala, Guinea, Haiti, India, Iraq, Jamaica, Jordan, Kyrgyzstan, Madagascar, Maldives, Mauritania, Moldova, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Peru, Rwanda, Saint Lucia, Saint Vincent and the Grenadines, Sierra Leone, Spain, Sri Lanka, Switzerland, Tajikistan, The Gambia, Turkey, United Kingdom, United Republic of Tanzania, Uruguay, Uzbekistan, Venezuela, Zambia and Zimbabwe.

247 In francophone Africa, distinguishing between rural and urban areas is challenging due to a slightly different questionnaire. The distinction can only be made between the capital and areas outside the capital.

248 Observations by sector do not exactly sum up to 1210 as one firm did not reply to the question 'What is the main sector of activity of the business?'

249 The results from ITC Digital Transformation Survey presented in the report (Figures 6, 9,12, 13, 15,16, 19, 21,22, 23, 24, 25 and 26) are unweighted. However, the results (except Figure 12) are robust to alternative weighting methods. To control for differences in the number of observations in each country, we apply several weighting methods. These methods are designed to reduce the statistical influence of smaller countries with a disproportionately large number of responses. First, we weight observations by the country's share of the global population divided by the number of firms observed from each country. Second, we weight observations based on the country's share of global GDP divided by the number of firms observed in the country. Results are robust to the inclusion of the different weights.

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Annex: Methodology note and data sources

This annex provides details for all figures and calculations in the report. It includes definitions, sampling, econometric and statistical methods and data sources. Additional detail can be requested by email to the ITC research team at SMEcompetitiveness@intracen.org.

Definitions

Micro, small and medium-sized enterprises

There is no internationally harmonized definition of micro, small and medium-sized enterprises. For feasibility and comparability reasons, this report classifies companies based on the number of full-time employees:

- Micro: 0 to 4 employees
- Small: 5 to 19 employees
- Medium: 20 to 99 employees
- Large: 100 or more employees.

SMEs are therefore companies with fewer than 100 employees. Micro firms are implicitly included in the definition.

Women-led enterprises

Women-led firms are defined as those managed by a woman. Otherwise, firms are defined as men-led.

Youth-led enterprises

Youth-led firms are defined as being run by a top manager under the age of 35. Otherwise, firms are defined as non-youth-led.

ITC SME Competitiveness Surveys

Content and sample

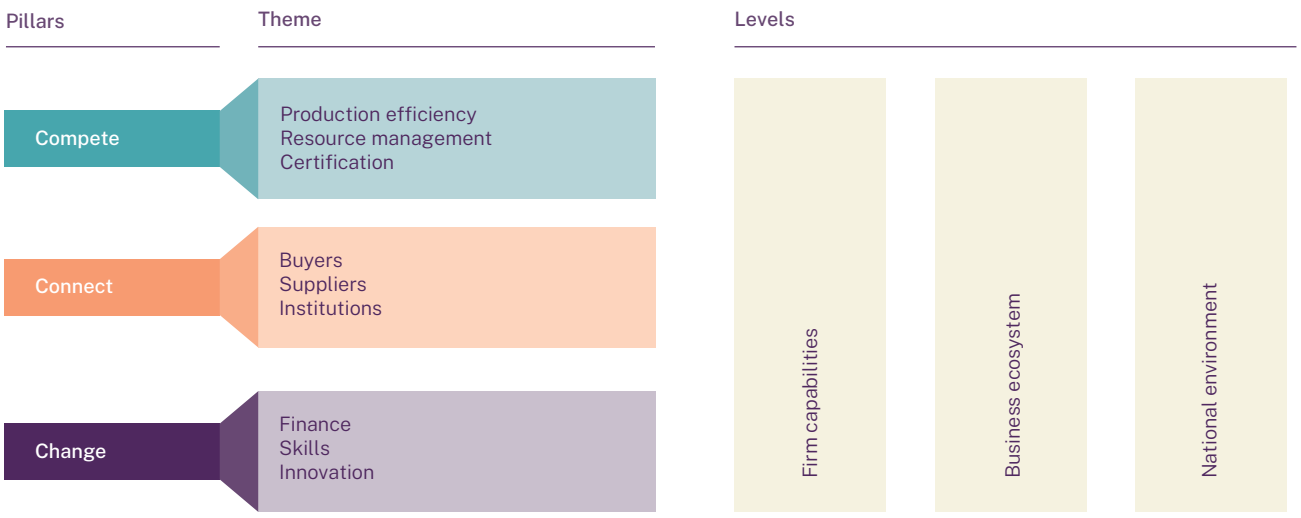
The SME Competitiveness Survey (SMECS) is a national firm-level survey of a representative sample of an economy's private sector. Data are gathered, to the extent possible, from firms across all regions of the country, of all sectors (primary, manufacturing and services), of differing sizes (micro, small, medium and large) and export status (exporting and non-exporting firms).[242]

Typically carried out in partnership with business support organizations, the SMECS is designed to combine information at the micro (firm capabilities) and meso (business ecosystem) levels to provide a holistic picture of the capacity of a country's private sector to compete in international markets. As of May 2024, more than 48,000 companies had been surveyed in 58 countries.

The baseline questionnaire of SMECS is based on ITC's competitiveness framework,[243] which is composed of three pillars – compete, connect and change. It also operates on three levels – firm capabilities, business ecosystem and national environment. Each pillar is further disaggregated into three themes (Figure A1).

Based on ITC SME Competitiveness Survey responses, classified by pillar, theme and level according to the ITC competitiveness framework (Figure A1), ITC computes a 'capacity to compete', 'capacity to connect' and 'capacity to change' score for each firm, as well as an overall competitiveness score. Each score has a value between 0 and 100, with 100 representing the best score.

Figure A1: SME competitiveness framework



Source: ITC SME competitiveness scores

Questions in the SMECS questionnaire have different structures (from dichotomous to Likert scale). Each response option is transformed on a 0–100 scale, with 100 representing the best possible outcome. As such, for each surveyed firm it is possible to calculate a score for each theme and level as a simple average of the transformed answers from relevant questions (see the list of questions included in each theme-level in Table A1, Table A2 and Table A3 for the compete, connect and change pillars, respectively). Pillar scores (compete, connect and change) are computed at a firm level as the average of the scores of each of their three component themes and two levels (firm capabilities and business ecosystem). Finally, for each interviewed firm, the competitiveness score is the simple average of the scores of the three pillars.

Capacity to compete

The capacity to compete score is calculated as the average of firm capabilities and business ecosystem competitiveness scores in meeting production efficiency, resource management and certification requirements (Table A1).

Table A1 Questions by theme and level in the compete pillar

		Levels	
	Themes	**Firm capabilities**	**Business ecosystem**
Compete	Production efficiency	• Capacity utilization • Quantity delivered on time	• Access to electricity • Access to water
	Resource management	• Inventory management system efficiency • Keep records • Bank account • Ability to manage cash flow	• Quality of the logistics services • Cost of the logistics services
	Certification	• International certificates: Safety certificates • International certificates: Quality or performance certificates • International certificates: Sustainability certificates • International certificates: Other	• Availability of domestic information on international certificates • Quality of domestic information on international certificates • Cost of domestic information on international certificates

Capacity to connect

The capacity to connect is calculated as the average of firm capabilities and business ecosystem competitiveness scores in connecting with buyers, suppliers and institutions (Table A2).

Table A2 Questions by theme and level in the connect pillar

		Levels	
	Themes	**Firm capabilities**	**Business ecosystem**
Connect	Buyers	• Business website • Forms of advertising: leaflet, poster, etc. • Forms of advertising: radio or tv • Forms of advertising: internet-based	• Completeness of information on buyers • Availability of market information on potential buyers • Quality of market information on potential buyers • Cost of market information on potential buyers
	Suppliers	• Reliance on biggest supplier • Assess the performance of suppliers	• Availability of market information on potential suppliers • Quality of market information on potential suppliers • Cost of market information on potential suppliers • Exchange of market information with other companies in sector • Cooperation with firms in sector
	Institutions	• Engagement with institutions: TPO • Engagement with institutions: IPO • Engagement with institutions: Chambers of Commerce • Engagement with institutions: sector association	• Quality of services provided by TPO • Quality of services provided by IPO • Quality of services provided by Chambers of Commerce • Quality of services provided by relevant sector association

Capacity to change

The capacity to change is calculated as the average of firm capabilities and business ecosystem competitiveness scores in finance, skills and innovation requirements (Table A3).

Table A3 Questions by theme and level in the change pillar

		Levels	
	Themes	**Firm capabilities**	**Business ecosystem**
Change	Finance	• Business plan • Need for financing	• Quality of the banks • Quality of the insurance companies • Access to financial institutions is an obstacle to operations
	Skills	• Skill set of employees matches the needs of the company • Established hiring process	• Availability of skilled workers • Quality of bodies teaching relevant skills for the sector • Cost of bodies teaching relevant skills for the sector
	Innovation	• Protect sensitive business information • Registered patents • Resources to R&D • New or improved processes or products	• Quality of the services offered by patent registration institutions • Cost of the services offered by patent registration institutions • Quality of innovation supporting institutions • Cost of innovation supporting institutions

ITC Digital Transformation Survey

Content and sample

The ITC Digital Transformation Survey is a global survey aimed at assessing how SMEs access and use digital technologies. The survey contains data from 7,402 companies across 78 countries, collected between May 2022 and March 2024.[244]

The sample encompasses a diverse range of regions, sectors (agriculture, manufacturing and services) and firm sizes (micro, small, medium and large). The sample is not representative in all countries/territories and response rates vary across countries. Table A4 shows how many interviews were collected by country, sector and size.

Table A4 Sample size of Digital Transformation Survey

Sector	Number of surveyed firms
Primary	795
Manufacturing	1389
Services	5152
Size[245]	
Micro	3050
Small	2396
Medium	1165
Large	725
Country[246]	
Bangladesh	17
Benin	445
Botswana	29
Burkina Faso	503
Cambodia	402
Cameroon	238
Chad	416
Colombia	568
Côte d'Ivoire	552
Curaçao	10
Ethiopia	18
Gabon	100
Ghana	19
Kenya	24
Malaysia	76
Mali	1062
Morocco	96
Nigeria	12
Pakistan	31
Philippines	399
Republic of the Congo	250
Senegal	11
Togo	1963
Tunisia	11
Uganda	28
Country	**Number of surveyed firms**

The sample includes both internationally trading and domestic firms. Women led 34% of the companies interviewed, while youth led 24%. Since fewer than 8% of the enterprises surveyed are informal, the analysis focuses on the formal sector. Most surveyed companies (three out of four) are in the capital.[247]

Additionally, the questionnaire explores whether the business has a digital strategy, and if its management is aware of digital advancements, the level of expenditure on digital tools and how these tools are used. It also includes questions on the benefits gained from using digital technologies and the obstacles to digital adoption, such as digital skills, internet access and regulation.

Merging ITC SME Competitiveness and Digital Transformation Surveys

In four of these 78 countries (Cambodia, Colombia, Philippines and Togo) where the ITC Digital Transformation Survey was conducted, businesses had already been interviewed through the SMECS. To examine how firm-level competitiveness factors (determined through SMECS) relate to a business' digital transformation (determined through the Digital Transformation Survey), some of the firms that responded to the SMECS were contacted again to participate in the ITC Digital Transformation Survey.

Overall, 1,210 of the business interviews collected through the ITC Digital Transformation Survey could be merged with their SMECS responses. Table A5 shows how many interviews were collected by country, sector and size.

Table A5 Interviews from Digital Transformation Survey merged with SMECS

Country	Number of interviews merged with SMECS	Share
Cambodia	144	12%
Colombia	246	20%
Philippines	257	21%
Togo	563	47%
Sector[248]		
Primary	197	16%
Manufacturing	312	26%
Services	700	58%
Size		
Micro	134	11%
Small	432	36%
Medium	317	26%
Large	327	27%
Total	**1210**	**100%**

ITC Enterprise Digital Transformation Index (e-DTI)

To construct the ITC Enterprise Digital Transformation Index, questions on digitalisation use and access from the ITC Digital Transformation Survey were used.

The ITC Enterprise Digital Transformation Index is constructed for a subset of firms that use digital technologies for business operations and for which full and comparable data are available: 4,651 firms from 67 countries. The sample includes firms of different regions of the world, sizes and sectors.

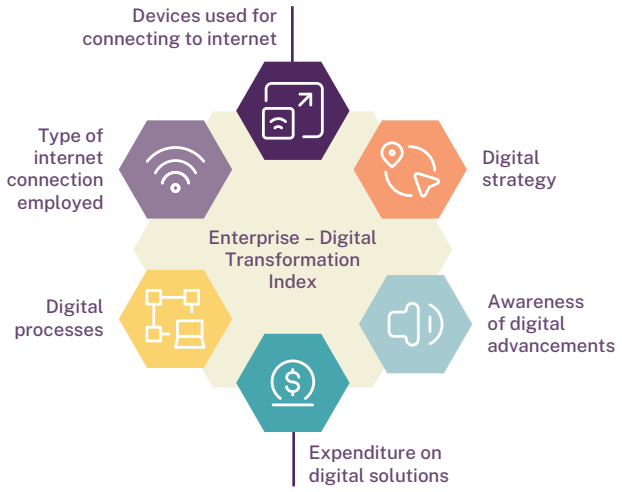
Although there are many methodologies available to build indices, factor analysis is particularly well suited for constructing the Enterprise Digital Transformation Index. First, since no single indicator is sufficient on its own to predict digitalization, it can be considered a latent concept. Second, factor analysis allows estimating weights (also known as factor loadings) associated to each observed indicator in the measurement of the latent factor. These estimated factor loadings relieve the researcher from subjectively designing the weighting scheme in the aggregation step.

Third, it combines theoretical considerations of digitalization with a statistical technique to compress a larger set of variables into a latent factor while minimizing information loss.

The variables included in the index are produced through a confirmatory factor analysis. The e-DTI consists of six variables from the ITC Digital Transformation Survey: the types of devices and internet connection employed, how digital tools are used, the level of expenditure on digital tools and whether the management is aware of digital advancements and has a digital strategy (Figure A2).

1. **Devices used for connecting to internet**. Businesses were asked 'What device does your company use to connect to the internet?' Options include (from higher to lower score): laptop/computer, tablet and smartphone.
2. **Type of internet connection employed**. Businesses were asked 'What is the main type of internet connection your company uses?' Options include (from higher to lower score): fixed broadband, mobile broadband and public Wi-Fi.
3. **Digital processes**. Businesses were asked 'Do you use digital technologies for any of the following purposes: (multi-select)'. Options include (from higher to lower score) using digital technologies for advanced digital processes (such as selling on e-commerce platforms, storing data on the cloud, making digital payments and accessing government services provided electronically), intermediate processes (tracking and analysing customer information, creating and maintaining a website, doing accounting, keeping financial records, managing inventory and researching new ideas for products and services) and basic digital processes (such as communicating with customers, teleworking and advertising on social media).
4. **Expenditure on digital solutions**. Businesses were asked 'Of the total operational expenditure of your business, what percentage is spent on digital solutions?'. Options include (from higher to lower score) spending more than 50% of total operational expenditure, between 25 and 50%, less than 25% and zero.
5. **Awareness of digital advancements**. Businesses were asked 'Does the manager of the company stay up to date on new developments in digital technology that could be relevant for the business?'. Options include (from higher to lower score): always, sometimes and never up to date on new developments in digital technologies.
6. **Digital strategy**. Businesses were asked 'Has the manager of the company developed a clear set of priorities to invest in digital technologies and skills?'.

Figure A2: ITC Enterprise Digital Transformation Index



Source: ITC

After running the appropriate structural equation model, the Enterprise Digital Transformation Index can be predicted by combining the resulting coefficients with the values for each observation. The index is then standardized between 0 and 100 through a max-min procedure, whereby higher values are firms with better digital transformation. The associated equation is defined below:

$$\bar{x}_i = \frac{\hat{x}_i - \max(x)}{\min(x) - \max(x)} \times 100$$

where $\hat{x}_i$ is the prediction and $\bar{x}_i$ is the standardized value for business i.

This results in a vector containing the e-DTI for each individual business. Robustness checks confirm that the model is stable and robust to a variety of alternative approaches.

Notes on figures

The results shown in all figures are statistically significant and reveal correlation, but they do not imply causality. The controls used in regressions vary across figures. Additional information on these results is available upon request.[249]

Chapter 1

The analysis in Chapter 1 was conducted using multiple sources. In addition to data collected from 7,402 firms in 78 countries through the ITC Digital Transformation Survey, additional sources include the ITC Trade Map (2024), World Development Indicators from the World Bank, DataHub from the International Telecommunication Union, and the Network Readiness Index 2023 from the Portulans Institute. Countries are categorized as more or less digitally ready based on their NRI compared to the distribution of the sample. If a country's NRI falls within the first tertile of the NRI distribution, it is classified as 'Low digital ready,' while those in the third tertile are classified as 'High digital ready.' Detailed information about the countries included in each sample for the various figures is available upon request.

Figure 1. The figure is a scatterplot. The horizontal axis represents ICT goods imports as a share of total goods import for year t. It covers a range of items including computers and peripheral equipment, communications equipment, consumer electronics, electronic components and miscellaneous information and technology goods. The vertical axis measures the annual percentage growth rate of gross domestic product (GDP) per capita based on constant local currency for year t+5. Extreme cases (the top and bottom 5 percentile of the distribution) have been excluded. Data are from the most recent year available for ICT goods imports, with a five-year lag for GDP.

Source: ITC, based on World Bank World Development Indicators.

Figure 2. This figure focuses only on low- and middle-income countries. Internet users are those who have used the internet within the preceding three months, irrespective of device or location, including but not limited to computers, mobile phones, personal digital assistants, games machines, digital TVs and similar compatible technologies.

Source: ITC, based on the World Bank World Development Indicators and ITU data.

Figure 3. Countries are defined as having low (medium/high) digital readiness if their Network Readiness Index is in the first (second/third) tertile of the index distribution. Analysis is based on 133 economies in the year 2023.

Source: ITC, based on World Bank World Development Indicators and NRI for Portulans Institute.

Figure 4. Information and communication technology services exports include computer and communications services (telecommunications and postal and courier services) and information services (computer data and news-related service transactions). ICT goods exports include computers and peripheral equipment, communication equipment, consumer electronic equipment, electronic components and other information and technology goods (miscellaneous). When including ICT goods exported from China to Hong Kong, China, and then re-exported back to China, the ICT goods exports of middle-income countries are higher than those from high-income countries. However, in both middle- and high-income countries, ICT goods exports are much higher than those from low-income countries. The latest year with complete export data is 2021. Income groups based on the World Bank classification.

Source: ITC, based on World Bank World Development Indicators.

Figure 5. The vertical axis measures the Network Readiness Index at the country level. The horizontal axis measures the ITC Enterprise Digital Transformation Index at the firm level. Values range from 0-100, with higher scores denoting better performance in the respective indices. The results are confirmed in a regression in which firm level e-DTI is regressed on NRI, controlling for firm size and sector and for GDP per capita (constant 2015 USD). This figure includes only countries with more than 20 firms with e-DTI. Uganda is excluded from the figure because the surveyed firms are predominantly in the ICT sector, leading to a high digital transformation score that does not accurately reflect the broader national context. Notably, even when Uganda is included, the correlation between e-DTI and NRI remains consistent.

Source: ITC, based on ITC Digital Transformation Survey and NRI from Portulans Institute.

Figure 6. Companies are defined as expert, competent or emerging users of digital technologies if their digital transformation index is in the third, second or first tertile of the ITC Enterprise Digital Transformation Index distribution, respectively. Countries are defined as having low (medium/high) digital readiness if their NRI is placed in the first (second/third) tertile of the NRI distribution.

Source: ITC, based on ITC Digital Transformation Survey and NRI from Portulans Institute.

Chapter 2

The analysis in Chapter 2 was conducted using multiple sources. In addition to data collected from 7,402 firms in 78 countries through the ITC Digital Transformation Survey, additional sources include World Development Indicators from the World Bank, DataHub from the International Telecommunication Union, and the Network Readiness Index 2023 from the Portulans Institute. Countries are categorized as more or less digitally ready based on their NRI sub-pillar, compared to the distribution of the sample. If a country's NRI sub-pillar falls within the first tertile of the index distribution, it is classified as 'Low digital ready' in that sub-pillar, while those in the third tertile are classified as 'High digital ready.' Detailed information about the countries included in each sample for the various figures is available upon request.

Figure 7. Fixed broadband subscriptions refer to fixed subscriptions to high-speed access to the public internet (a TCP/IP connection), at downstream speeds equal to, or greater than, 256 kbit/s divided by population and multiplied by 100. Fixed broadband basket is defined as the cheapest plan providing at least 5GB of monthly high-speed data (256Kbit/s or higher) from the operator with the largest market share in each economy. Active mobile broadband subscriptions refer to the sum of active handset-based and computer-based (USB/dongles) mobile broadband subscriptions that allow access to the internet. Data-only mobile broadband basket refers to the cheapest mobile broadband plan providing at least 2GB of monthly data using at least 3G technology. The most recent year is between 2021 and 2022.

Source: ITC, based on ITU.

Figure 8. The vertical axis measures the country score in the access sub-pillar of the NRI, at country level. The horizontal axis measures the ITC e-DTI at firm level. The results are confirmed in a regression in which firm-level e-DTI is regressed on the NRI access sub-pillar, controlling for firm size and sector and for GDP per capita (constant 2015 USD). This figure includes only countries with more than 20 firms with e-DTI. Uganda is excluded from the figure because the surveyed firms are predominantly in the ICT sector, leading to a high digital transformation score that does not accurately reflect the broader national context. Notably, even when Uganda is included, the correlation between e-DTI and the NRI access sub-pillar remains consistent.

Source: ITC, based on ITC Digital Transformation Survey and NRI from the Portulans Institute.

Figure 9. Companies are defined as expert, competent or emerging users of digital technologies if their e-DTI is in the third, second or first tertile, respectively, of the index distribution. Countries are defined as having low (high) digital readiness in the access sub-pillar if their NRI-Access index is placed in the first (third) tertile of the index distribution.

Source: ITC, based on ITC Digital Transformation Survey and NRI from Portulans Institute.

Figure 10. Income groups based on the World Bank classification.

Source: ITC, based on World Bank World Development Indicators 2021.

Figure 11. Fixed broadband subscriptions refer to fixed subscriptions to high-speed access to the public internet (a TCP/IP connection), at downstream speeds equal to, or greater than, 256 kbit/s divided by population and multiplied by 100. Active mobile broadband subscriptions refer to the sum of active handset-based and computer-based (USB/dongles) mobile broadband subscriptions that allow access to the internet. Penetration rates for fixed subscriptions are much lower than for mobile subscriptions, partly because fixed connections tend to be shared by several people in a household. Fixed broadband basket is defined as the cheapest plan providing at least 5GB of monthly high-speed data (256Kbit/s or higher) from the operator with the largest market share in each economy. Data-only mobile broadband basket refers to the cheapest mobile broadband plan providing at least 2 GB of monthly data using at least 3G technology. Most recent year per country is between 2021 and 2022. Income groups based on the World Bank classification.

Source: ITC, based on ITU.

Figure 12. Respondents were asked, 'What device does your company use to connect to the internet? (multi-select)'. Options include smartphone (internet-enabled), desktop/laptop computer, tablet, other (e.g., friends' devices). Income groups are based on the World Bank classification.

Source: ITC, based on ITC Digital Transformation Survey and World Bank World Development Indicators.

Figure 13. Respondents were asked, 'Please rate the quality of the following: devices used to access the internet'. Companies are classified as using high-quality devices if they choose options five and six on a Likert scale ranging from one (low quality) to six (high quality). Companies are defined as expert, competent or emerging users of digital technologies if their digital transformation index is in the third, second or first tertile of the ITC Enterprise Digital Transformation Index distribution across countries, respectively.

Source: ITC, based on ITC Digital Transformation Survey and World Bank World Development Indicators.

Figure 14. The vertical axis measures the country score in the individuals sub-pillar of the Network Readiness Index. The horizontal axis measures the ITC Enterprise Digital Transformation Index. The results are confirmed in a regression in which firm level e-DTI is regressed on NRI individuals sub-pillar, controlling for firm sector and for GDP per capita (constant 2015 USD). This figure includes only countries with more than 20 firms with e-DTI. Uganda is excluded from the figure because the surveyed firms are predominantly in the ICT sector, leading to a high digital transformation score that does not accurately reflect the broader national context. Notably, even when Uganda is included, the correlation between e-DTI and NRI individuals sub-pillar remains consistent.

Source: ITC, based on ITC Digital Transformation Survey and NRI from the Portulans Institute.

Figure 15. Companies are defined as expert, competent or emerging users of digital technologies if their digital transformation index is in the third, second or first tertile of the ITC e-DTI distribution across countries, respectively. Countries are defined as having low (high) digital readiness in the individuals sub-pillar if their NRI individuals index is placed in the first (third) tertile of the index distribution.

Source: ITC, based on ITC Digital Transformation Survey and NRI from the Portulans Institute.

Figure 16. Respondents were asked: 'Do your employees have the skills needed to meet the business' digital technology needs? Responses include: a. Yes, b. Yes, but with some skills gaps, c. No, we have considerable skills gaps, d. Not applicable, we do not require these skills.' Companies that chose options 'a. Yes' and 'b. Yes, but with some skills gaps' were classified as 'fully digitally skilled'. Companies are defined as expert, competent or emerging users of digital technologies if their digital transformation index is in the third, second or first tertile of the ITC e-DTI distribution across countries, respectively.

Source: ITC, based on ITC Digital Transformation Survey.

Figure 17. The ITU groups ICT skills into five categories. Information/data literacy refers to the ability to verify the reliability of information found online. Communication/collaboration includes the ability to send e-mails with attached files. Digital content creation comprises the capacity to create electronic presentations with presentation software, use basic arithmetic formulas in a spreadsheet, use copy and paste tools within a document and write a computer programme. Safety refers to the ability to change privacy settings on a device, account or application and set up effective security measures to protect devices and accounts. Problem-solving includes connecting and installing new devices, finding, downloading, installing and configuring software, and transferring files between a computer and other devices. Countries are classified as low (medium/high) NRI if their score is in the first (second/third) tertile of the index distribution.

Source: ITC, based on NRI 2023 from the Portulans Institute and ITU ICT Skills indicators for the latest year available.

Figure 18. The vertical axis measures the country score in the regulations sub-pillar of the NRI. The horizontal axis measures the ITC Enterprise Digital Transformation Index. The results are confirmed in a regression in which firm level e-DTI is regressed on NRI regulation sub-pillar, controlling for firm size and sector and for GDP per capita (constant 2015 USD). This figure includes only countries with more than 20 firms with e-DTI. Uganda is excluded from the figure because the surveyed firms are predominantly in the ICT sector, leading to a high digital transformation score that does not accurately reflect the broader national context. Notably, even when Uganda is included, the correlation between e-DTI and NRI regulation sub-pillar remains consistent.

Source: ITC, based on ITC Digital Transformation Survey and NRI 2023 from the Portulans Institute.

Figure 19. Companies are defined as expert, competent or emerging users of digital technologies if their digital transformation index is in the third, second or first tertile of the ITC Enterprise Digital Transformation Index distribution across countries, respectively. Countries are defined as having low (high) digital readiness in the regulation sub-pillar if their NRI-Regulation index is placed in the first (third) tertile of the index distribution.

Source: ITC, based on ITC Digital Transformation Survey and NRI from the Portulans Institute.

Figure 20. The figure shows the share of countries classified as having low, medium and high levels of national collaborative governance (left) and highly developed digital economy policy agenda (right), stratified by income group. A country is classified as having high (medium/low) levels of national collaborative governance if its national collaborative governance score is in the top (middle/bottom) tertile of the distribution. Similarly, a country is classified as having highly developed (medium/low) digital economy policy agenda if its digital economy policy agenda score is in the top (middle/bottom) tertile of the distribution. National collaborative governance measures the breadth and depth of cross-sector collaboration between the ICT regulator, peer regulators and policymakers. It factors in the institutional set-up (agencies and their mandates) as well as practices around regulatory collaboration, formal and informal, across 16 areas, including consumer protection, spectrum management, education and e-waste. The digital economic policy agenda features country policies and interventions for promoting the digital economy, entrepreneurship and investment. The areas covered range from an innovation framework to digital transformation to sector taxation and adherence to international and regional integration initiatives. Income groups are based on the World Bank classification.

Source: ITC, based on ITU G5 Benchmark gen5.digital and World Bank World Development Indicators.

Chapter 3

The analysis included in Chapter 3 is based on data collected through the ITC Digital Transformation Survey. The first two sections of the chapter are based on responses from 4,651 firms in 67 countries that use digital technologies for business operations and for which full and comparable data are available. Countries are categorized as more or less digitally ready based on their overall NRI, compared to the distribution of the sample. If a country's NRI falls within the first tertile of the index distribution, it is classified as 'Low digital ready,' while those in the third tertile are classified as 'High digital ready.' Detailed information about the countries

included in each sample for the various figures is available upon request.

The last section of Chapter 3 is based on a dataset of 1210 companies in four countries (Cambodia, Colombia, Philippines and Togo) that replied to both the ITC Digital Transformation and SME Competitiveness Surveys. Less digitally ready countries are those with an NRI equal or below the median NRI in our sample.

Figure 21. Companies are defined as expert, competent or emerging users of digital technologies if their digital transformation index is in the third, second or first tertile, respectively, of the ITC Enterprise Digital Transformation Index distribution. Respondents were asked, 'Have digital technologies helped you cut the costs of your business?' (right panel) and 'Have digital technologies helped you increase the sales of your business?' (left panel).

Source: ITC, based on ITC Digital Transformation Survey.

Figure 22. Companies are defined as expert, competent or emerging users of digital technologies if their digital transformation index is in the third, second or first tertile, respectively, of the ITC Enterprise Digital Transformation Index distribution. Respondents were asked 'What benefits do you gain from using digital technologies?'. Options include: (1) reduce operating costs, (2) improve efficiency and timeliness of production, (3) improve efficiency and timeliness of delivery, (4) improve quality of products or services, (5) more opportunities for innovation, (6) more access to information, business intelligence and networks, (7) access to new customers, (8) increased sales, (9) enhance customer experience, (10) access to easier/more convenient payment methods, (11) enhance security (CCTV, access control systems and alarms) and (12) others. Operational benefits include options 1, 2, 3, 8, 10 and 11. Communication benefits include options 6, 7 and 9, in addition to operational-related benefits. Finally, transformative benefits include options 4 and 5, as well as operational and communication-related benefits of digital technologies.

Source: ITC, based on ITC Digital Transformation Survey.

Figure 23. Companies are defined as expert, competent or emerging users of digital technologies if their digital transformation index is in the third, second or first tertile, respectively, of the ITC Enterprise Digital Transformation Index distribution. Connected services are transport and logistics, financial services, ICT and business and professional services.

Source: ITC, based on ITC Digital Transformation Survey.

Figure 24. Companies are defined as expert users of digital technologies if their ITC Enterprise Digital Transformation Index is in the third tertile of the index distribution across countries.

Source: ITC, based on ITC Digital Transformation Survey.

Figure 25. Companies were asked 'Is your company using internet for business operations and interactions with clients and suppliers?' Countries are defined as low (high) NRI if their Network Readiness Index is placed in the first (third) tertile of the index distribution.

Source: ITC, based on ITC Digital Transformation Survey and NRI from the Portulans Institute.

Figure 26. Companies are defined as expert user of digital technologies if their digital transformation index is in the third tertile of the index distribution across countries. Countries are defined as low (high) NRI if their Network Readiness Index is placed in the first (third) tertile of the index distribution.

Source: ITC, based on ITC Digital Transformation Survey and NRI from the Portulans Institute.

Figure 27. This figure is a binned scatterplot, controlling for firm size, sector and GDP per capita. Binned scatterplots are a non-parametric method of plotting the conditional expectation function, which describes the average y-value for each x-value. To generate a binned scatterplot, the binscatter command groups the x-axis variable into 20 equal-sized bins, computes the mean of the x-axis and y-axis variables within each bin and creates a scatterplot of these data points. By default, binscatter also plots a linear fit line using OLS, which represents the best linear approximation to the conditional expectation function. The horizontal axis measures the average competitiveness score of firms, based on responses to the SMECS. It is obtained by taking the simple average of the capacity to compete, capacity to connect and capacity to change indices, at firm level. The vertical axis measures the average digital transformation of firms based on the ITC e-DTI.

Source: ITC calculations, based on ITC SME Competitiveness and Digital Transformation Surveys of 1,210 firms in Cambodia, Colombia, Philippines and Togo.

Figure 28. Companies are defined as expert users of digital technologies if their e-DTI is in the third tertile of the index distribution across countries. Companies are defined as having low (high) competitiveness if their firm-level competitiveness score is in the first (third) tertile of the index distribution across countries. Countries are defined as low digitally ready if their NRI is equal to or below the median of the index distribution across countries, and as high digitally ready if it is above the median.

Source: ITC calculations, based on ITC SME Competitiveness and Digital Transformation Surveys of 1,210 firms in Cambodia, Colombia, Philippines and Togo.

Figure 29. Respondents were asked 'Please rate the extent to which this company has the capability to present a fully costed business plan to a bank for the purpose of getting a loan.' Firms are classified as high (medium/ low) ability if the respondent chose options five or six (three or four / one or two) on a Likert scale ranging from one (low) to six (high). This figure focuses solely on firms operating in countries with low Network Readiness Index, specifically those below the median of the index distribution. Companies are categorized as expert, competent or emerging users of digital technologies based on their position within the distribution of the ITC e-DTI: third tertile for expert, second for competent and first for emerging users, respectively.

Source: ITC calculations, based on ITC SME Competitiveness and Digital Transformation Surveys of 724 firms in Cambodia and Togo.

Figure 30. Companies were asked, 'Do you train your employees to improve their digital skills?'. This figure focuses solely on firms operating in countries with low digital readiness under the NRI, specifically those placed in the first tertile of the index distribution. Companies are categorized as expert, competent or emerging users of digital technologies based on their position within the distribution of the ITC e-DTI: third tertile for expert, second for competent and first for emerging users, respectively.

Source: ITC calculations, based on ITC Digital Transformation Survey.

Figure 31. Companies were asked 'Do your employees have the skills needed to meet the business' digital technology needs? a. Yes, b. Yes, but with some skills gaps, c. No, we have considerable skills gaps, d. Not applicable, we do not require these skills'. Companies that choose options 'a. Yes' and 'b. Yes, but with some skills gaps' were classified as 'high skill match'. This figure focuses solely on firms operating in countries with low NRI, specifically those placed in the first tertile of the index distribution.

Source: ITC calculations, based on ITC Digital Transformation Survey.

Figure 32. Companies were asked 'Are you actively engaged with any of the following types of institutions? Options include: Trade promotion organizations, Investment promotion organizations (e.g. Ministry of Investment), Chambers of commerce, Sector associations'. This figure focuses solely on firms operating in countries with low digital readiness under the Network Readiness Index, specifically those placed below the median of the index distribution. Companies are categorized as expert, competent or emerging users of digital technologies based on their position within the distribution of the ITC Enterprise Digital Transformation Index: third tertile for expert, second for competent and first for emerging users, respectively.

Source: ITC calculations, based on ITC SME Competitiveness and Digital Transformation Surveys of 724 firms in Cambodia and Togo.

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