

SKILLS RATHER THAN JUST DEGREES

**Isa Ali Ibrahim
(Pantami)**

Foreword by
Brad Smith
President, Microsoft Corporation

Skills Rather Than Just Degrees

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(Pantami)

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Acknowledgments

I wish to strongly and passionately acknowledge my late parents whom I cherish so much and who have laboured to give me a solid foundational upbringing that was enhanced and further sharpened by my teachers to make my humble self. I also acknowledge the efforts of my colleagues in academia, public offices and other spheres of life, with whom we toddled together to make us the personalities we are today. In addition, all those who taught me various skills at formal and informal institutions and places, including my late father.

Furthermore, special mention and appreciation go to my principal, President Muhammadu Buhari, GCFR, President and Commander-in-Chief of the Armed Forces of the Federal Republic of Nigeria, for the opportunity given to me to serve the country, and the support and confidence he reposed in me throughout my period of service. I am glad of Mr President's commendation, at different times, of our modest achievements in the offices entrusted to me. One last public commendation of the President to me was on Thursday, February 27, 2022 during the public launching of the National Policy on 5th Generation Networks for Nigeria's Digital Economy at the Presidential Villa. The President stated: "I use the opportunity to applaud the commitment and consistency of the Honourable Minister of Communications and Digital Economy, Professor Isa Ali Ibrahim towards the delivery of the mandate of delivering Nigeria's Digital Economy. The progress has been unprecedented and highly commendable."

I acknowledge and thank the Governing Council, management, Senate, staff and students of the Federal University of Technology, Owerri, for giving me the opportunity to share my knowledge and experience with them.

In addition, I appreciate Brad Smith, the US Attorney and President of Microsoft Corporation, for taking his time to review and write the foreword for the book. He is a co-author of *Tools and Weapons: The Promise and Peril of the Digital Age*, a New York Times bestseller; Brad is a lawyer and joined Microsoft's legal team in 1993. He helped usher in a big cultural and strategic shift at the company. Acknowledged as a sophisticated thinker having a great command of technology by Bill Gates, former President of Microsoft, Brad

saw things differently from the perspective of software developers and guided the company to put more time and energy into connecting with different constituencies, including the government, company's partners, and sometimes even competitors of the company. Moreover, Brad's thinking was not limited to Microsoft's self-interest but included technology and the policies that affect it generally, emphasizing partnership with other players in the technology space – for example, when artificial intelligence, cybersecurity, etc., are involved.

Brad believes in the irony of a business leader asking for more government rules, arguing that there are times when it is in everyone's interest for the government to step in with more regulation. Instead, the tech industry needs to come together, working with customers and governments worldwide. He is further known to argue that if we let things fragment so that the rules vary hugely from country to country, it would not be good for customers, the tech industry, or society. Similarly, skills development can best be achieved through partnerships among stakeholders in the technology ecosystem. These are the words of Bill Gates (the founder of Microsoft) in describing Brad Smith.

I also particularly appreciate Brad for this visit to Nigeria, President Muhammadu Buhari and my office. I recall with nostalgia the fruitful discussions we had on the imperative of skills development in the world, especially in Africa, which is home to a sea of young people of productive age.

Special appreciation goes to all our global tech companies and members of REAP for their partnership toward developing skills in Nigeria. Without your support and partnership, the modest achievements recorded would not have been possible.

I also appreciate the heads of parastatals I supervise and direct, as Minister, to implement my initiatives and national policies on the digital services development in Nigeria: Director-General of National Information Technology Development Agency (NITDA), Kashifu Inuwa Abdullahi, CCIE; Executive Vice-Chairman (EVC) Nigerian Communications Commission (NCC), Professor Umar Garba Danbatta; MD Galaxy Backbone, Professor Muhammad Bello Abubakar; DG National Identity Management Commission (NIMC), Engineer Aliyu Abdulazeez; MD Nigerian Communications Satellite (NIGCOMSAT), Dr Abimbola Alale; PMG of the Federation, Dr Isma'il Adewusi; Secretary, Universal Service Provision Fund (USPF), Mr Ayuba

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Finally, I am genuinely grateful to all my family members for all their support always while I was busy researching, reading, writing or holding meetings towards the preparation of this book. Therefore, I dedicate this book to them. I am also grateful for the support received from my colleagues and other aides.

Foreword

This book addresses one of the critical issues and opportunities of our time. Around the world, employers across the economy are growing their firms and looking to hire more people. This is good news – for businesses, the economy, and most importantly, for people. We’re entering a new age of opportunity with huge potential to create a brighter future for more people than ever before.

But for many employers and people alike, this potential doesn’t always translate into reality. Too many employers complain that they have open jobs they cannot fill. And too many people find that even after years of study, they cannot find the type of job they seek. In short, there’s too often a mismatch between what employers are looking for and what potential employees have to offer.

Why does this mismatch exist, and what can we do to fix it? This book shines an important light on the answers.

As Professor Isa Ali Ibrahim makes clear, part of the problem is that the world hasn’t yet made the paradigm shift from degrees to skills. As I see every day, not just at Microsoft but across the global business community, even if a degree may help someone obtain a job, it won’t necessarily help someone do a job. Success at work requires a variety of soft and hard skills, as Chapter 2 describes so well. And with ongoing technological change impacting every part of society, including the nature of work, the skills needed for success are changing rapidly.

Increasingly employers have figured this out. As we see through the LinkedIn service owned by Microsoft, employers are increasingly turning to what they call ‘skills-based hiring’. In other words, look more for evidence of specific skills and not just at specific degrees held by job applicants. This is a key to building a more effective workforce.

Professor Ibrahim has captured well how this change is starting to ripple across society. We’re seeing it in new initiatives being taken by companies, industries, cities, and countries. By sharing concrete case studies and cutting-edge innovations, this book provides a roadmap and something like a user’s

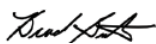
manual to help us all learn and think about global best practices worth emulating.

These issues are important everywhere in the world. And they are even more important across Africa. In part, this is because Africa has the world's youngest workforce. With a population of 1.3 billion people and a median age under 20, Africa has more opportunities than any other continent to put a skills-based approach to work. If countries across Africa can make the shift from degrees to skills, it will create a new foundation for the success of individuals and faster growth of entire economies.

Interestingly, Africa has not only an ample skilling opportunity but also a significant skilling challenge. As Professor Ibrahim writes, "one of the biggest problems facing African companies today is lack of a skilled workforce." At Microsoft, we see first-hand the enormous talent of the software developers we are hiring in our Africa Development Centers in Lagos and Nairobi. On a trip in April that included meetings and events in Nigeria and Kenya, I found myself wishing that we could find even more of them.

Across Africa, talent is already present. But now, more work is needed to give people the skills they need. In many ways, smart skilling investments by governments and companies across Africa can be the game changer the continent needs to grow economies more quickly and consistently. Not just for the next decade but on an ongoing basis throughout the 21st century.

That's why this book is so important. In part, it addresses critical opportunities for individuals. But it also points the way towards steps that can unlock the potential for the African continent and the world.



Brad Smith

President, Microsoft Corporation

May 2022

Preface

Governments and businesses require a skilled workforce to expand their activities, boost their prosperity and for the prosperity of citizens. However, there are concerns across the world that the workforce being produced through conventional education typically lacks the skills required to meet the changing needs of the modern economy. This skills gap or skills mismatch is more pronounced in Africa, where up to 20 million young people are estimated to join the labour force every year for the coming three decades. It is also estimated that about 25% of the world's population under age 25 will be in or from Africa by 2030. This means that the world's economic prospects will heavily depend on the skills, capabilities and productivity of African youth.

One of the biggest problems facing many African companies today is the lack of a skilled workforce. This problem affects an organizations' growth and profitability, as reported by 97% of African chief executives in a 2019 survey by Pricewater houseCoopers (PwC). Similarly, an article in *Scientific American* (SciAm) identifies a challenge of the skills gap in the tech industry that is expected to reach one million engineers by 2024. This challenge is attributable to the mismatch between the dynamic nature of modern work requirements – the collaborative nature of today's work environment, the increasing demand for specialized skill sets, etc. – and the relatively static nature of degree curricula. Thus, degree holders, who may be versed in fundamentals and theory, are increasingly misaligned with the industry's fastest-growing specialities.

This book, *Skills Rather Than Just Degrees*, is written to emphasize and exemplify the potential impacts of skills in addressing the problems of unemployability, unemployment and underemployment. It is also to highlight the potential of requisite skills in facilitating the growth and profitability of companies, the establishment of new enterprises, in attracting foreign direct investment and improving peoples' quality of life. Finally, it is also meant to stimulate discussion on possible public-policy responses necessary for further promoting the development and utilization of relevant skills to boost the economy.

To overcome the problems associated with the lack of skills, skills

development must go beyond technical skills to include socio-emotional skills, cognitive skills and cross-cutting digital skills, as discussed in the book. In exemplifying international best practices in skills development for accelerating growth, the book considered case studies of leading countries, key cities and notable tech companies. The book also discussed partnerships and corporate social responsibility (CSR), highlighting the win-win impacts of CSR and the specific memoranda of understanding brokered between Nigeria and tech companies, noting their benefits on skills development and application. Finally, the book concluded with recommendations on strategies that can be employed to enhance skills development. I hope that these recommendations and other lessons that may be learnt from these studies will help advance the cause of skills development and application towards a more prosperous world.

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List of Abbreviations

3D Three Dimensional
4IR Fourth Industrial Revolution
5G Fifth Generation Technology
AAA African Angel Academy
ADC Africa Development Center
AEA Abuja Enterprise Agency
AGI Artificial General Intelligence
AI Artificial Intelligence
API Academia-Public-Sector-Industry
CEOs Chief Executive Officers
CIOs Chief Information Officers
CDR Corporate Digital Responsibility
CES Consumer Electronics Show
CSP Cloud Service Provider
CSR Corporate Social Responsibility
CTOs Chief Technology Officers
ccHub co-creation Hub
DGI Defence Geospatial Intelligence
DJI Da-Jiang Innovations
EBC Executive Briefing Centre
E-CAP Entrepreneurial Capacity
EI Emotional Intelligence
EQ Emotional Quotient
EMI Entrepreneurship Monitoring Initiative
EU European Union
FDI Foreign Direct Investment
FEC Federal Executive Council
GDP Gross Domestic Product
GIGO Garbage-In-Garbage-Out
GITEX Gulf Information Technology Exhibition
GMC General Motors Company
HTML Hyper Text Markup Language
I-CAP Innovation Capacity
IaaS Infrastructure as a Service

IBM International Business Machines
IDEs Innovation-Driven Enterprises
IIT Indian Institute of Technology
IHHP Institute for Health and Human Potential
IITA International Institute of Tropical Agriculture
ILO International Labour Organization
IMF International Monetary Fund
IP Intellectual Property
IoT Internet of Things
MDAs Ministries, Departments and Agencies
MIT Massachusetts Institute of Technology
MSMEs Micro, Small and Medium Enterprises
MBW Must-Win Battle
MoU Memorandum of Understanding
NADDC Nigerian Automotive Design and Development Council
NAVSA National Adopted Village for Smart Agriculture
NEETs Not in Education, Employment, or Training
NERC Nigerian Electricity Regulatory Commission
NDEPS National Digital Economy Policy and Strategy
NDIEP Nigerian Digital Innovation and Entrepreneurship Policy
NITDA National Information Technology Development Agency
NSB Nigeria Startup Bill
OECD Organisation for Economic Cooperation and Development
REAP Regional Entrepreneurship Acceleration Program
SDGs Sustainable Development Goals
SEO Search Engine Optimization
SMEs Small and Medium Enterprises
SQL Structured Query Language
STEAM Science, Technology, Engineering, Arts and Mathematics
UNESCO United Nations Educational, Scientific and Cultural Organization
UX User Experience
VET Vocational Education and Training
WEF World Economic Forum
WIPO World Intellectual Property Organization
ZTE [Zhongxing Telecom Equipment](#) (Company)

Profile of the Author



Isa Ali Ibrahim, PhD (born in Pantami, Gombe State, Nigeria), is the Minister of Communications and Digital Economy of the Federal Republic of Nigeria. Professor Isa Ali Ibrahim obtained a Bachelor of Technology in Computer Science (B.Tech) from the Federal University of Technology, known as the Abubakar Tafawa Balewa University (ATBU), Bauchi, and proceeded to acquire two master's degrees from the same institution in quick succession. One in Computer Science (MSc) and the other, an MBA in Technology Management. His scholarly pursuits led him to the Robert Gordon University, Aberdeen, Scotland, United Kingdom, where he obtained a doctorate in Computer Information Systems. He is also a Professor of Cybersecurity with the Federal University of Technology, Owerri, Imo State, Nigeria, where he teaches cybersecurity courses, supervises postgraduate students, and partakes in community services among others.

Prior to his appointment as the Minister of the Federal Republic of Nigeria, he was the Director General (DG)/Chief Executive Officer (CEO) of the National Information Technology Development Agency (NITDA), which has a strong mandate for research, regulation, and development of information technology. Prof. Ibrahim is currently the Chief Digital Officer of the Federation, based on the National Policy for Virtual Engagements in federal public institutions. He has also been chairman and member of several presidential and inter-ministerial committees, including Chairman, Committee on Citizen Data Management and Harmonization Sub-Committee, National Committee on Export Promotion, Digital Identity Ecosystem Steering

Committee, National Action Committee on African Continental Free Trade Area Agreement (AfCFTA). He was also appointed as the AfCFTA Champion for Communications and Digital Economy, as well as Chairman, Presidential Steering Committee for National Identity and also the Chairman of the National Council on Digital Economy and e-Government.

At the international level, he was appointed by the International Telecommunication Union (ITU) as the Chairman of the World Summit on the Information Society (WSIS) Forum, 2022.

Under the leadership of Prof. Ibrahim, as the first-ever Minister of Digital Economy in Nigeria, a National Digital Economy Policy and Strategy (2020-2030) and National Broadband Plan (2020-2025) were developed, among others, and many unprecedented successes recorded. In fact, within less than 3 years in office, 17 national policies have been developed and implemented. Also, in less than a year, as the Minister of Communications and Digital Economy of the Federal Republic of Nigeria, the lingering issue of excessive right of way charges and vandalism of telecommunication infrastructure has been effectively addressed. Under his stewardship, broadband penetration increased by more than 10% in a year, rather than the average annual increase of about 1.7%, and the Information and Communications Technology (ICT) sector contributed an unprecedented 17.83% to the GDP based on the Q2 2020 GDP Report by National Bureau of Statistics (NBS). The ICT sector was also the fastest-growing sector of the Nigerian economy in the 4th quarter of 2020, growing at a rate of 14.70%. He initiated the first weekly virtual Federal Executive Council and first virtual National Security Council meeting on May 13, 2020, and has been coordinating and supervising the technical aspects of the meetings since then. This saved government money running into billions of naira monthly.

Recently, his achievements have led to him being recognized and awarded the *2020 Minister of the Year Award by the Blueprint Newspaper*; *Most Outstanding Minister of the Year 2021 by Elite Exclusive Magazine*; and *Digital Economy Driver Award* by the national body of the Nigeria Information Technology Reporters Association (NITRA), amongst others. He received a 2020 Person of the Year Award from *Thinkers' Magazine* in September 2021. He has received over 180 awards, international and local, from 2017 to March 2022.

Prof. Ibrahim also holds certificates in Digital Transformation from

Harvard University, Digital Strategy from Massachusetts Institute of Technology (MIT) and the Institute of Management Development (IMD), Lausanne, Switzerland; Strategic Leadership from Oxford University, and a University of Cambridge Certification in Management. The dynamic, inspirational agent of transformation is also a conflict resolution expert with national and international experiences in that regard. Prof. Ibrahim taught ICT courses at various universities and other higher institutions for almost two decades. During his early days, Prof. Ibrahim was a lecturer at the Federal University of Technology, Bauchi, for over a decade, before joining other universities in Asia, among others.

Prof. Ibrahim is a recipient of several global awards and is a well sought-after speaker, delivering convocation lectures in a several public and private universities, including the Federal University of Technology Minna, the Nile University, the Federal University Kashere and the National Defence College, among others. He has also served as Speaker at leading global events like Mobile World Congress (MWC) Barcelona, Gulf Information Technology Exhibition (GITEX) in Dubai, the GSMA Africa Policy Leaders Forum, the Consumer Electronics Show (CES), Las Vegas and International Telecommunication Union (ITU) events, amongst others.

Furthermore, as an expert in core fields like the digital economy and cybersecurity, he also teaches and serves as a resource person to several institutions, including the National Defence College, Nigerian Army Resource Centre, and the National Institute for Policy and Strategic Studies, among others.

In addition, he was the Champion of the Massachusetts Institute of Technology (MIT) Regional Entrepreneurship Acceleration Program (REAP), Abuja, from November 2019 to November 2021. The MIT REAP is a global initiative that helps regions accelerate economic growth and promote social progress through innovation-driven entrepreneurship (IDE). He has published several academic articles in professional journals, presented papers at more than 200 conferences and published several books. These include “Datafication of Society to Foster an Internet Economy”, “Building a Digital Economy for a Digital Africa”, “Selected Speeches on Developing the Nigerian ICT Sector” (Volumes I-III), *Cybersecurity Initiatives for Securing a Country*, “Counter-Terrorism through Cybersecurity and Emerging

Technologies”, among others. He has also visited over 40 countries for academic activities and to foster collaboration toward developing digital economy, cybersecurity, among others.

Prof. Isa Ali Ibrahim, popularly known as the Digital Minister, is a global IT citizen, a revered and highly respected Fellow of the Nigerian and British Computer Societies, a stakeholder in the Chartered Institute of Information Security, as well as a Fellow of the Cybersecurity and Cybercrime Forensics Specialist Group of the British Computer Society. Prof. Ibrahim is happily married with children.

1



Introduction

This chapter begins with a brief motivation for the book before proceeding to present the importance and essentiality of skills as opposed to mere degrees in Section 1.2. Section 1.3 outlines the growing problem posed by unemployment and employability, which can be mitigated by developing and acquiring relevant skills.

1.1 Motivation

I have been motivated to write this book due to my passion for promoting skills development and application in this information age. The book is to serve as a catalyst for a paradigm shift to a focus on skills rather than just certificates and degrees. No knowledge-based economy can thrive except there is an abundant supply of highly skilled citizens.

In the same vein, unemployment and unemployability will remain problems in society unless there is a paradigm shift from mere degrees to skills. I am not opposed to people obtaining certificates and degrees, as I obtained many, including Bachelor of Technology (BTech), Master of Science (MSc), Master of Business Administration (MBA), Postgraduate Certificate in Research (PgCert), PhD and also attended and obtained certificates from some of the best institutions in the world, such as Oxford University, Universities of Cambridge, Harvard, International Institute for Management Development (IMD), Switzerland, and Massachusetts Institute of Technology (MIT), among others. However, these certificates must be backed up by possessing of the requisite skills, otherwise, they are of little value and misleading.

1.2 Why Skills and Not Empty Certificates and Degrees

In his book, *7 Habits of Highly Effective People*, best-selling author Stephen R. Covey identified “Starting with the end in mind” as Habit #2 (Covey, 2004).

Put another way, the habit states that an effective person, or system, always seeks to determine the destination and conditions the journey in a way that can lead to such a destination.

In the same vein, an effective educational system needs to understand the future of work to ensure that the students are prepared for their future work environment, whether as employees or entrepreneurs. Unfortunately, the traditional approach has been that of enrolling in an educational institution and obtaining a certificate in the hope that such certificates will prepare them for the workplace.

Furthermore, research has shown that work requirements are evolving, and the current requirements are much different from what they were only a few years ago (Sondergaard, Murthi, Abu-Ghaida, Bodewig & Rutkowski, 2012; ILO, 2021a). In fact, a 2016 report by the World Economic Forum (WEF) on the future of jobs stated that “in many industries and countries, the most in-demand occupations or specialities did not exist 10 or even 5 years ago, and the pace of change is set to accelerate.”

In addition, it is also noteworthy that freelancing, or offering services at a fee to multiple customers, is becoming popular worldwide and is highly dependent on the availability of the right skill sets. In the United States of America, 35.81% of the total workforce freelanced in 2017 and this proportion is expected to grow to 50.88% of the workforce by 2027 (Upwork, 2017). According to Bloomberg, Google had a workforce of 222,000 in March 2019, made up of 54% freelancers as shown in Figure 1.1 (Bergen & Eidelson, 2018).

Google's workforce of 220,000 workers (2019)

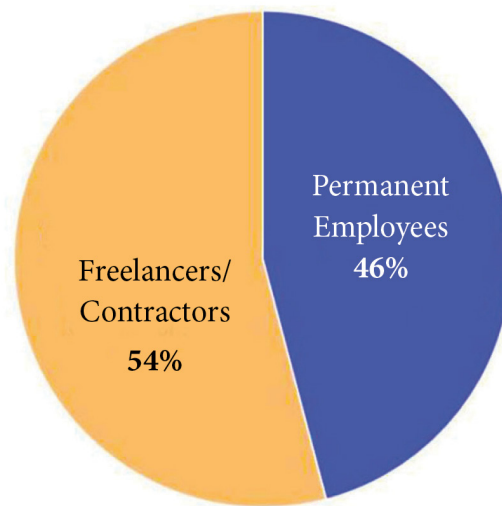


Fig. 1.1: Comparing Google's freelancing to permanent staff

In 2019 alone, 57 million freelancers in America contributed \$1 trillion dollars to the economy (Upwork & Freelancers Union, 2019). A 2018 survey of freelancing in America showed that 93% of the respondents indicated that they considered skills training to be important, even though they all had university degrees (Upwork & Freelancers Union, 2019).

According to the [Future Workforce Report](#) (Ozimek, 2021), 47% of hiring managers at enterprise organizations utilized freelancers rather than temporary workers through a staffing firm. To help enterprises digitally transform or complement their conventional contingent staff solutions, Microsoft launched the [Microsoft 365 freelance toolkit](#), a curated set of tools, templates, and best practices to help customers launch, execute, and manage freelance programmes at scale. The Microsoft 365 freelance toolkit offers solutions for the main friction points enterprises encounter when deploying a freelance programme, including internal communications and awareness, team-wide collaboration, data analytics, and workflow automation (The Microsoft 365 Marketing Team, 2018).

Like the customers Microsoft serves, Microsoft has also responsibly weaved freelance engagements into their enterprise environment. For example, over the past year, they have completed 2,000 freelance projects across writing, research, video editing, translation, design, and data science – spanning 25

internal teams and hundreds of employees – recording measure cost and time saving (The Microsoft 365 Marketing Team, 2018). This motivated and led to the development of the Microsoft 365 freelance toolkit.

Overall, businesses are increasingly reaching outside the firm to get work done. In addition to the benefits that freelancing brings, like the ability to hire faster and anywhere in the world, businesses can concentrate on their core competencies.

For every industry, there are basic sets of skills that the practitioners of that industry need to possess (Gavin, 2019). In a number of instances, a common set of skills is required irrespective of the role or profession. For example, most careers require practitioners who can think critically and show courtesy in how they relate with clients and co-workers. In other instances, the skill set may vary from role to role within a given industry, and from industry to industry. For example, this is evident by taking a cursory look at roles in the **STEAM** (Science, Technology, Engineering, Arts and Mathematics) industries.

A laboratory scientist needs to be adept at using a microscope to analyze samples to screen for diseases and an automobile technician should have the dexterity to carry out engine repairs. A computer engineer should typically have some coding skills that support in converting a set of real-life challenges into a set of codes that a computer can execute to solve problems. A mathematical physicist should be comfortable with using mathematical models and algorithms to describe natural phenomena. Members of an orchestra need to readily understand music and express it through their vocal cords or instruments.

It is important to note that skills are key requirements for career progression regardless of the role or the industry. Degrees could give you a job in some institutions; however, only skills can make you progress smoothly and ceremoniously.

1.3 The Growing Impact of Unemployment and Unemployability

According to the United Nations' International Labour Organization, "persons in unemployment are defined as all those of working age who were not in employment, carried out activities to seek employment during a specified recent period and were currently available to take up employment

given a job opportunity” (Sakamoto & Sung, 2018).

Unemployment is considered a global problem that the COVID-19 pandemic has worsened. According to a report by the International Labour Organization (ILO), global unemployment is expected to stand at 205 million people in 2022 (ILO, 2021b). Furthermore, the United Nations identified unemployment as a global challenge and listed it as one of the Sustainable Development Goals (SDG) 8: “promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all” (United Nations, 2015).

There is a nexus between unemployment and a lack of skills. This was discussed at the WorldSkills Conference in Abu Dhabi in 2017. The deliberations were captured in a national daily as follows: “too much education, not enough skills causing youth unemployment” (Burgess, 2017). According to an article by the International Monetary Fund (IMF), “Unemployment: The Curse of Joblessness”, increased levels of unemployment impose very high costs on citizens, communities and countries (Table 1.1), and these costs are not only economical (Oner, 2010).

Unemployability refers to a situation where there are available jobs but those positions cannot be filled because there are graduates and candidates without the requisite skills to take up such positions. This is undoubtedly one of the major challenges in Nigeria. Many engineers and technical graduates, when employed cannot do the technical work expected of them but rather become administrative staff only. This is a growing concern and has been the complaint of many employers. Focusing on skills development is the most direct route for addressing this growing challenge. This book aims to address this lingering issue by providing a guide to developing and applying the skills needed to tackle unemployment and, indeed, unemployability.

Table 1.1: Impact of unemployment on citizens, the community and the country

S/N	Category	Impact of Unemployment/ Unemployability
1.	Citizens	Economic hardship, reduced income, mental stress, and erosion of skills
2.	Community	Need for safety nets and higher crime rates
3.	Country	Reduced revenue, increased borrowing, loss of human capital and increased poverty levels

As a result of unemployment or unemployability, *citizens* can experience economic hardship and an inability to meet their obligations. The reduced income of the citizen also leads to reduced economic activity and can reduce the country's Gross Domestic Product (GDP). In addition to reduced income, unemployment can lead to an erosion of skills, and health issues, including mental health challenges (Robalino, Margolis, Rother, Newhouse & Lundberg, 2013; and Nichols, Mitchell & Linder, 2013). Regarding the erosion of skills, without constant utilization of skills (Nichols, Mitchell & Linder, 2013) and keeping pace with change, a person considered to be skilful can soon become known as a person who lacks skills.

Communities also feel the impact of unemployment. When a society's employment level becomes high, there are increased calls for the government to commit a significant amount of funds to create a safety net (World Bank, 2018). These safety nets create a temporary buffer against the effects of economic hardship. For example, in December 2021, the World Bank indicated that they would provide \$800 Million to scale up the delivery of social assistance to an additional 8.2 million Nigerians (World Bank, 2021). However, where the requisite skills are not developed, unemployment can persist and the use of safety nets can be unsustainable. Elevated community employment levels can also lead to higher crime rates.

Pervasive unemployment and unemployability in a country can result in reduced revenue, increased borrowing, loss of human capital and increased poverty levels, among others.



Skills and the Future of Work

This chapter presents skills more closely, especially with the increasingly changing nature of jobs. Section 2.1 begins by explaining formal definitions of skills before delving into the various kinds of skills required in the Fourth Industrial Revolution era in Section 2.2. Thereafter, Section 2.3 then explains soft and hard skills in detail.

2.1 Definition of Skills

Skills are defined as “the ability to use one’s knowledge effectively and readily in execution or performance” and “a learned power of doing something competently: a developed aptitude or ability” (*Merriam Webster Dictionary*, 2016).

Furthermore, skills require sustained effort and can be developed or acquired through training or direct experience. Over the years, the skills required by workers and institutions have depended on the evolution of such jobs. The rapid pace at which technology is evolving has also accelerated the pace at which workers have to embrace skills to thrive in the Fourth Industrial Revolution (4IR).

In addition, Sakamoto and Sung (2018) define skill as “the ability to carry out tasks and duties of a given job.” They also included two additional dimensions for describing skills. The first is the *level of the skill*, and the second is the *specialization for such skills*. The skill level is a reflection of the level of complexity and the range of tasks that someone with the skill can handle. For example, a person with an elementary level of skill in developing websites may be able to use basic Hyper Text Markup Language (HTML) to build an informative page about an event. However, to develop an interactive website with multiple forms, e-commerce, integrated social media and Search Engine Optimization (SEO) functionality, the developer will need to be at an intermediate or advanced skill level.

The skill specialization describes the field of knowledge, the tools and machinery, and as the kinds of goods and services. With respect to digital skills, it will be dependent on the domain where the skill is being deployed and the types of tools being used. For example, the skills and tools required by a video editor are much different from those required by a cybersecurity expert.

2.2 Skills in the Fourth Industrial Revolution

The Fourth Industrial Revolution, also known as 4IR or Industry 4.0, refers to the fusion of the physical, digital and biological worlds (Ndung'u & Signé, 2020). The 4IR introduced the virtual world. Professor Klaus Schwab, founder and Executive Chairman of the World Economic Forum (WEF), coined the term *Fourth Industrial Revolution*. He described it as “a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres” (Schwab, 2016).

According to Deloitte, 4IR “refers to the marriage of physical assets and advanced digital technologies – the internet of things (IoT), artificial intelligence (AI), robots, drones, autonomous vehicles, 3D printing, cloud computing, nanotechnology, and more – that communicate, analyze, and act upon information, enabling organizations, consumers, and society to be more flexible and responsive and make more intelligent, data-driven decisions” (Deloitte, 2020). The 4IR commenced toward the end of the first decade of the 21st century (Kimberley, 2019). Figure 2.1 and Figure 2.2, respectively, show the areas of focus and the skills needed for the different industrial revolutions (Getsmarter, 2021; Jarcho, 2018).

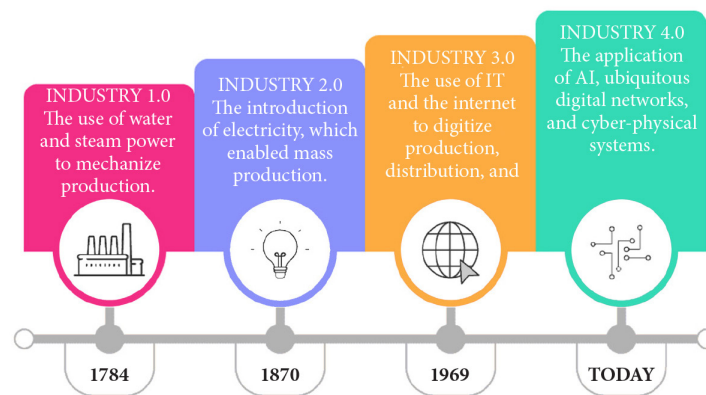


Fig. 2.1: Focus of the 1st to 4th industrial revolutions (Getsmarter, 2021)

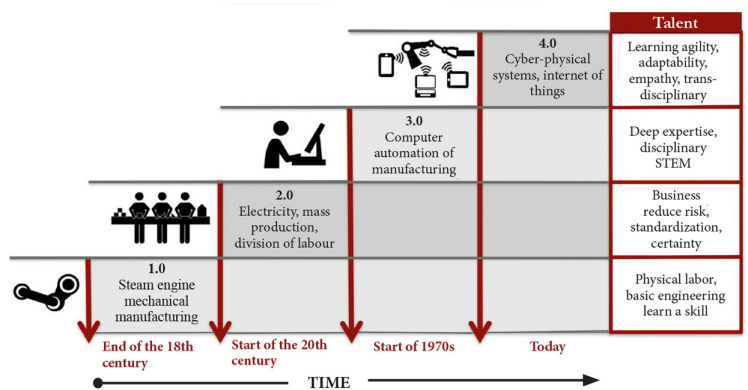


Fig. 2.2: Some skills needed for the industrial revolutions (Jarche, 2018)

The influence of Industry 4.0 on every aspect of our lives is growing and the skills needed to experience its benefits are also changing. According to the 2020 Future of Jobs Report by the World Economic Forum, the following represents the top 10 skills required to thrive in the 4IR for 2015 and 2020 (WEF, 2020). For the year 2015, the following skills were needed:

1. Complex problem-solving;*
2. Coordinating with others;*
3. Project management;*
4. Critical thinking;*
5. Negotiation;*
6. Quality control;
7. Service orientation;*
8. Judgement and decision-making;*
9. Active listening; and
10. Creativity.*

The skills required for the year 2020 are as follows:

1. Complex problem-solving;*
2. Critical thinking;*
3. Creativity;*
4. People management;*
5. Coordinating with others;*
6. Emotional intelligence;
7. Judgement and decision-making;*

8. Service orientation;*
9. Negotiation;* and
10. Cognitive flexibility.

It is interesting to note that eight skills appeared on both lists (those with asterisks). This is because both lists reflect skills that are required across industries, albeit at different skill levels. However, in addition to these general skills, each industry and profession has its skill requirements. These general skills and the specialised ones will be discussed in the following sections.

2.3 Categorizing Skills

Skills can be broadly categorized as hard and soft skills. The former refers to skills that are job and industry-specific. The latter are skills that speak about a person's social ability and how well they relate with other people. Soft skills are also known as non-technical, personal, transferable, interpersonal, and essential. Similarly, hard skills are known as technical skills or job-specific skills.

Hard and soft skills are discussed in the sections that follow. However, in order to thrive in the Fourth Industrial Revolution, a worker needs the right mix of both skills. Johners captured the importance of both skills well in his book, *Hard Skills Get You Hired, but Soft Skills Get You Promoted: Learn How These 11 Must-Have Soft Skills Can Accelerate Your Career Growth* (2021).

The global job listing website, Indeed, contrasted hard and soft skills as follows (Indeed Editorial Team, 2020a):

- (i) **Hard skills** are the technical knowledge or training that you gained through any life experience, including in your career or education; and
- (ii) **Soft skills** are personal habits that shape how you work on your own or with others.

LinkedIn's global professional networking portal analysis also shows an increased demand for employees that combine hard and soft skills (Anderson, 2020).

ZipJob, a leading global resume writing company based in New York, also contrasted hard and soft skills, as shown in Figure 2.3 (ZipJob Team, 2020).

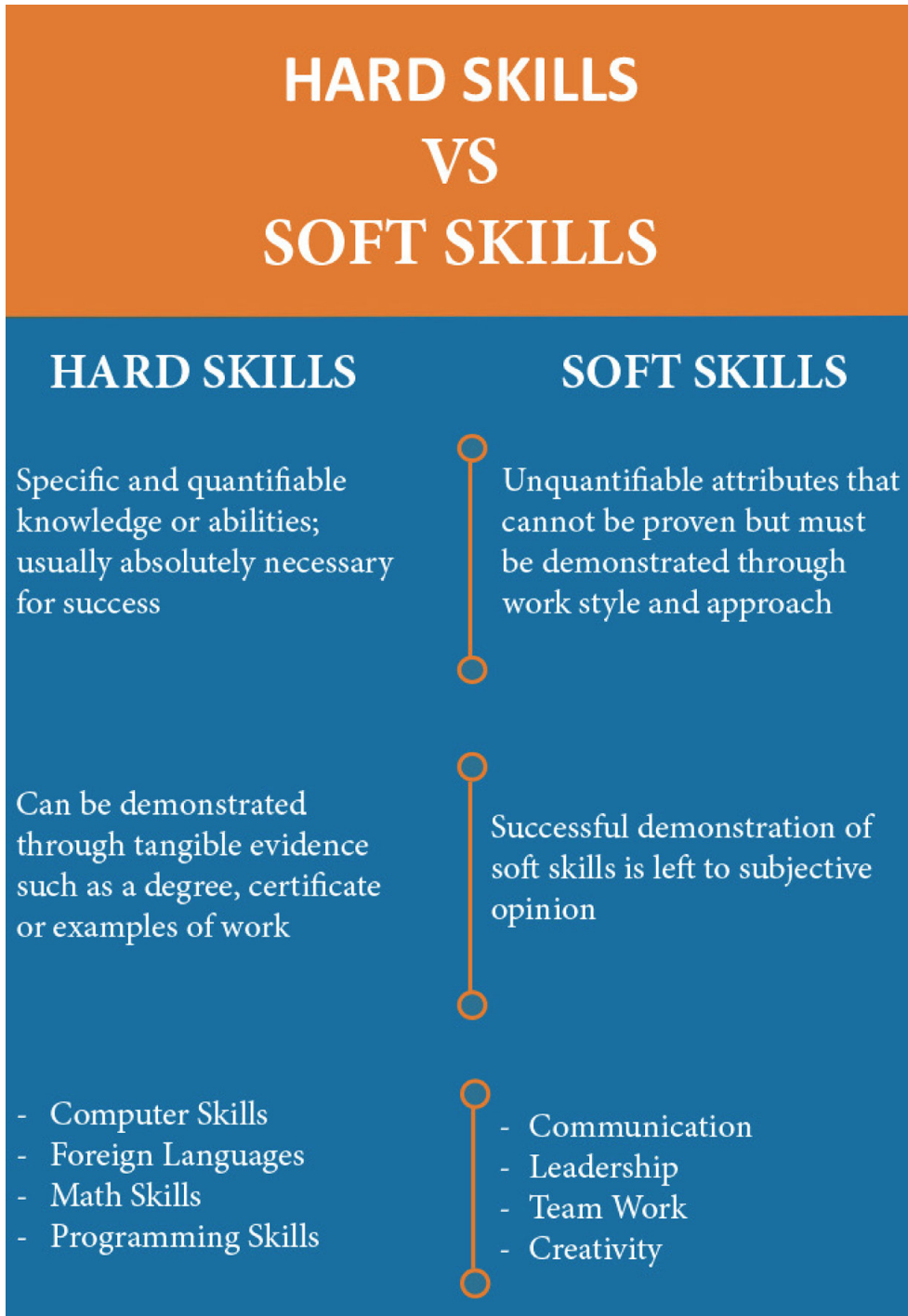


Fig. 2.3: Hard skills vs soft skills (ZipJob, 2020)

2.3.1 Soft Skills

The following are some examples of soft skills:

- i. Complex problem-solving;
- ii. Critical thinking;

- iii. Analytical thinking;
- iv. Creativity;
- v. Emotional intelligence;
- vi. Active listening; and
- vii. General social skills.

2.3.1.1 Complex problem-solving

Life is not devoid of challenges, and an important soft skill is the ability to solve problems that may come up in the workplace. Complex problem-solving involves considering as much information when finding a solution to a problem. It refers to the aptitude to address increasingly challenging problems through research methods, analysis, prototyping and feedback.

Furthermore, it also involves analyzing possible future changes to circumstances and any other thing that may affect the implementation of solution. Complex problem-solving also considers the solution's impact on other individuals, the environment and society.

According to the global job site, Indeed, complex problem-solving includes the following considerations (Indeed Editorial Team, 2021):

- i. Scope of the problem;
- ii. Impact of the problem;
- iii. Resources available to solve the problem;
- iv. Potential changes to the situation;
- v. Potential solutions;
- vi. Optimal solutions;
- vii. Impact of optimal solutions;
- viii. Options for implementing solutions; and
- ix. Method of measuring the success of the solutions.

The World Economic Forum predicts that a minimum of a third of jobs across all industries will require complex problem solving as an essential skill (WEF, 2016).

2.3.1.2 Critical thinking

Critical thinking is analyzing an issue or situation and the facts, data or evidence related to it. A critical thinker analyzes a situation and the evidence or data related to it. According to Indeed, critical thinking skills involve

observation, analysis, inference and communication.

It should be noted that while critical thinking and complex problem-solving involve a similar process, they are different as complex problem-solving also identifies obstacles and comes up with a set of solutions to address those problems. In other words, you need to think critically before you can embark on complex problem-solving. The combination of the aspects of critical thinking and how they lead to problem-solving is shown in Figure 2.4.



Fig. 2.4: Aspects of critical thinking skills and problem-solving (Indeed Editorial Team, 2020b)

Jeff Bezos of Amazon is a good example of a person with critical thinking skills. He spent around 10 years working on his start-up and targeting the future. His efforts have paid off, and today, he is the second richest person in the world, with the 2022 Forbes List of Wealthiest People valuing his wealth at \$171 billion (Dolan & Peterson-Withorn, 2022).

2.3.1.3 Creativity

The word creativity comes from the root Latin word *create*, which means to create or make (Czernik, 2015). Synonyms for creativity include imagination and innovation. Creativity, as a skill, refers to the ability to perceive a task or challenge differently, and generate new ideas. It enables one to solve complex challenges or innovative ways to carry out existing tasks.

Creativity is the ability to think about a task or problem in a new or different

way, or use imagination to generate new ideas. Creativity enables one to solve complex problems or find interesting ways to approach tasks (Indeed Editorial Team, 2020c). To a large extent, cognitive skills cannot be automated and this is why creativity will remain a top skills needed in the fourth industrial revolution. According to a survey conducted by the World Economic Forum, creativity was identified as the most desirable quality for future leaders. It was further discussed in an article titled, “Ever Wonder what the most Desirable Quality is in Future Leaders?” According to this survey conducted by the World Economic Forum, the answer was creativity, which was described as “the ability to come up with unusual or clever ideas about a given topic or situation, or to develop creative ways to solve a problem” (WEF, 2016).

2.3.1.4 Analytical thinking

Analytical thinking refers to the mental process of breaking down available complex data into fundamental parts for further analysis (Ibrahim, 2021). It is a subset of critical thinking, as shown in Figure 2.5.

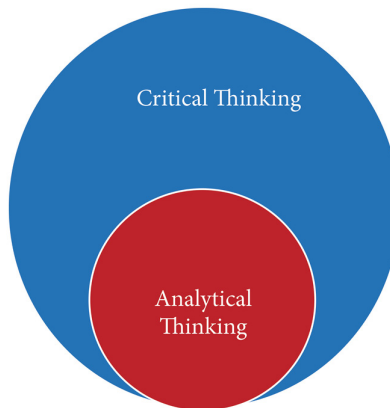


Fig. 2.5: Analytical thinking as a subset of critical thinking

2.3.1.5 Emotional intelligence

Emotion and intelligence do not seem like two words that should be paired. Intelligence is usually associated with rational, rather than emotional, thinking. Nonetheless, emotional intelligence is one of the in-demand soft skills in the 4IR.

Furthermore, emotional intelligence, also known EQ or EI, refers to the ability to understand one’s emotions within the context of the emotions of

others to channel thoughts and activities in a way that effectively addresses the demands and pressures that are presented by the environment (emage-me, 2020).

According to the Institute for Health and Human Potential (IHHP) research, EQ is the “ability to recognize, understand and manage our own emotions and recognize, understand and influence the emotions of others” (IHHP, 2019). As a result, it fosters a culture of greater human connection and is widely regarded as a competitive advantage for organisations that desire to build a purpose-driven workforce (Harvard Business Review, 2019).

As a result of the growing importance of EQ, McKinsey & Company predicts that the need for EQ skills will be greater than the need for cognitive skills by 2030 (Benjamin, 2019).

2.3.1.6 Active listening

George Fuechsel, an IBM programmer and instructor, is widely believed to have coined the term ‘garbage-in-garbage-out’ (GIGO) in the early years of computing (Ford, 2021). While originally used in the computing field, it applies to other fields and essentially means that wrong or poor-quality inputs will lead to flawed outputs.

In the business world, productivity can be highly dependent on the quality of the instructions received; this is why listening actively is considered an important skill. Active listening is important in the business place, and a lack of it can lead to grave consequences. One of such cases is the Tenerife air disaster of 1977, considered the greatest air disaster in history, where 583 people died and an additional 61 injured. Lack of active listening of the captain to his crew was one of the factors that contributed to this tragedy (Chan, 2019).

According to the Centre for Creative Leadership (2021), active listening skills are as shown in Figure 2.6.



Fig. 2.6: Six key aspects of active listening skills (Centre for Creative Leadership, 2021)

2.3.1.7 General social skills

Social skills are the skills that are used for communication and interactions. Unfortunately, these skills are missing in many developing countries, and in some cases, people are treated like animals. In my recent trip to the Kingdom of Saudi Arabia in 2022, I discovered that there had been a significant improvement in social skills, where visitors were treated with dignity. Many Arab countries are improving in this regard.

These general social skills are reflected in verbal and non-verbal ways, through gestures, body language and personal appearance. Examples of actions that constitute good social skills:

- i. Learning people's names;
- ii. Holding doors for others;
- iii. Saying 'thank you', 'please', 'Sir', etc;
- iv. Talking less and listening more;
- v. Giving more and taking less;
- vi. Listening with intention to learn;
- vii. Refraining from interrupting, except when necessary; and
- viii. Smiling more.

2.3.2 Hard Skills

As mentioned earlier, hard skills are job and industry-specific. In other words, there would be a very long list of hard skills if we consider the different industries and job roles. We will still have a long list even if we narrow our

focus to just digital skills.

LinkedIn, Indeed and Glassdoor are global job portals and recruitment sites. Also, *Forbes* is a well-respected media magazine in the area of business, and they have a technology council that focuses on tech-related businesses. I will use the research of these organizations on top hard digital skills as a guide to select the skills to focus on.

According to Anderson (2020), the following are the top hard skills that companies needed in 2020:

- i. **Blockchain;**
- ii. **Cloud computing;**
- iii. Analytical reasoning;
- iv. **Artificial intelligence;**
- v. **UX design;**
- vi. Business analysis;
- vii. Affiliate marketing;
- viii. Sales;
- ix. Scientific computing; and
- x. Video production.

Similarly, the Indeed Editorial Team (2020d) identified the following as the top in-demand hard skills for today's technology-driven workforce:

- i. **Cloud computing;**
- ii. **Artificial intelligence;**
- iii. Analysis;
- iv. Translation;
- v. Mobile app development;
- vi. Video production;
- vii. Audio production;
- viii. **UX design;**
- ix. **SEO/SEM** marketing;
- x. **Blockchain;**
- xi. Industrial design;
- xii. Digital journalism; and
- xiii. Animation.

The Forbes Technology Council an invitation-only body, comprises top Chief Executive Officers (CEOs), Chief Information Officers (CIOs), Chief Technology Officers (CTOs) and other senior-level technology executives appointed based on their “deep knowledge and diverse experience in the industry” (Forbes, n.d.). The Council members identified the following as 15 In-demand hard skills that tech professionals should focus on (Expert Panel, Forbes Technology Council, 2020):

- i. **A grounding in emerging technologies;**
- ii. **Machine learning and artificial intelligence;**
- iii. **Internet of things;**
- iv. **Cybersecurity;**
- v. **Cloud security;**
- vi. **Cloud technology and data engineering;**
- vii. Back-end, full-stack and front-end engineering (especially Python, React/React Native and SQL);
- viii. Website reliability engineering;
- ix. Quality assurance for machine learning algorithms;
- x. Technical product management;
- xi. Adtech and MarTech (advertising and marketing technology);
- xii. Retail customer insight;
- xiii. **Business intelligence analysis (similar to data analytics);**
- xiv. **Real-world machine learning experience; and**
- xv. Business risk management.

Hard tech skills selected by Indeed, LinkedIn and the Forbes Technology Council show that 30.77%, 40% and 53.33%, are skills related to emerging technologies. As shown in Figure 2.7, this gives an average of 41.37% of hard tech skills that are directly related to emerging technologies only. It goes to show the important role that emerging technologies play ahead of many others in the fourth industrial revolution.

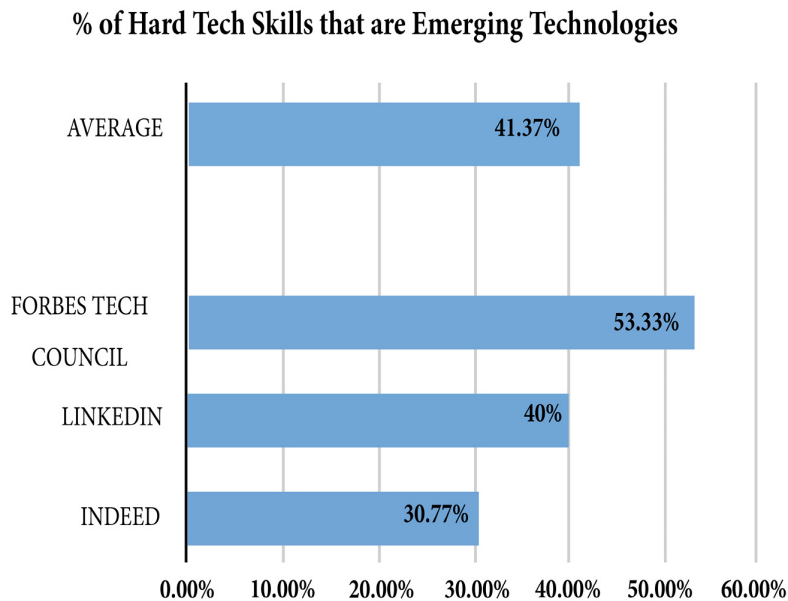


Fig. 2.7: How hard tech skills relate to emerging technologies

The following emerging technologies are described in the sections that follow:

- i. Artificial intelligence;
- ii. Blockchain;
- iii. Internet of things (IoT);
- iv. 5th generation technology (5G); and
- v. Cloud computing.

2.3.2.1 Artificial intelligence

Artificial Intelligence (AI) is the ability of machines to perform tasks normally requiring human intelligence. More specifically, with AI, machines attempt to replicate the cognitive ability of humans. However, the human has to start by programming the machine, so it solves future problems by learning from past patterns.

Furthermore, it would be useful to discuss another concept known as Artificial General Intelligence (AGI). With AGI, the machine is expected to be as smart as humans – or even smarter – without pre-programming. While AGI is more futuristic, AI is being applied in many industries today and acquiring

skills in this area creates many career opportunities.

AI is also transforming labour markets, as shown in the 2021 report published by UNESCO entitled “Understanding the impact of artificial intelligence on skills development” (Shiohira, 2021). Furthermore, according to McKinsey, about half of the work tasks currently being performed by humans will be automated through AI techniques by 2055 (Manyika, *et al.*, 2017).

Furthermore, the number of AI jobs advertised on Indeed grew by 29% between May 2018 and May 2019 (Columbus, 2019).

Also, Gartner forecasts that the global business value from AI systems is expected to reach \$3.9 trillion in 2022 (Gartner, 2018). Furthermore, machine-learning engineers were said to be the highest-earning AI jobs with an average of \$142,858 in 2019 (Indeed Editorial Team, 2019).

2.3.2.2 Blockchain

Blockchain is a digital distributed ledger. It provides a secure uneditable record of time-stamped digital transactions (Casino, Dasaklis & Patsakis, 2018), and a cryptographic signature identifies each block of the ledger. A key feature of blockchain is that it is a distributed database, meaning there are duplicate records in multiple computers, each acting as a node on the network.

The blocks in a blockchain comprise a list of transactions (Chandel, Zhang & Wu, 2020). Each block contains at least three items:

- i. Structured data about the transactions within that block;
- ii. Time-stamp and proof of work data; and
- iii. Reference to the parent block.

The new blocks are created through a process called ‘mining’ which involves validating the new transactions before they are added to the block.

Blockchain has a number of advantages, which include the following:

- i. **Immutability:** Records are stored permanently and cannot be altered;
- ii. **Trust:** The infrastructure gives users trust in the system;
- iii. **Disintermediation:** This reduces bureaucracy since there is no need for a central controlling authority;

- iv. **Self-sovereignty:** Users can identify themselves and control their data; and
- v. **Transparency:** Transactions can be readily scrutinized.

Blockchain is like building a trustworthy system in an untrustworthy world (De Filippi & Lavayssière, 2020). Blockchain technology is used for digital currencies, such as cryptocurrency. However, the technology can be deployed in several other applications. For example, it can ensure the integrity of data, supply chains, certificates and communication, amongst other things.

Interestingly, the World Economic Forum predicts that blockchain will be used to store 10% of the global GDP by 2027 (WEF, 2018). In addition, a study by talent.com puts the average annual salary of a blockchain developer in the United States at \$143,000* (Talent.Com, n.d.).

* This is as at the time of publishing.

2.3.2.3 Internet of Things

The term Internet of Things (IoT) refers to the connection of an increasing number of devices and objects over time to the Internet. IoTs are expected to contribute between 4-11% of the global GDP by 2025 (Edquist, Goodridge & Haskel, 2021).

The datafication of society is a result of the large amounts of data being generated in virtually every industry, and IoTs play a significant role in this. The IoTs create a bridge between the physical and virtual worlds, harvesting and analyzing data to enhance business processes. You can refer to my book, *Datafication of Society to Foster an Internet Economy* (Ibrahim, 2021).

IoT designers or engineers need to understand how sensors and sensing technology work. They must also be well versed in coding techniques, such as JavaScript and Python.

2.3.2.4 5th generation technology

Fifth Generation, or 5G, networks are the technology standard for broadband cellular networks whose deployment commenced in 2019. It is a successor to the 4G networks, which succeeded the 1G, 2G and 3G networks. Each new generation becomes available after about ten years as shown in Table 2.1

(Sakthidasan Sankaran, Ramprabu & Prakash, 2019).

Table 2.1: Network generations and their spectrum value

Network Generation	Year of Appearance	Spectrum Value
4G	2012	< 100 MHz
3G	2001	< 20 MHz
2G	1991	< 200 KHz
1G	1981	< 30 KHz

Furthermore, 5G networks offer major advantages over technologies that preceded it. These advantages include much lower latency, higher bandwidth, greater device density, longer battery life for nodes and greater network flexibility. According to the GSA (2021), as at the end of December 2021, around 200 mobile operators in seventy-eight countries/territories had announced 3GPP-compatible 5G service launches (either mobile or fixed wireless access), including about nine countries in Africa.

Interestingly, 5G goes beyond just being a new generation of technologies; rather it represents an era where connectivity becomes flexible and user-centric. It is expected to cover a third of the human population by 2025, is currently being deployed in a wide range of industries, including health care, banking and finance, automotive, logistics, precision agriculture and transportation, among others.

In addition, 5G will play an important part in the global economy, especially since it will provide the connectivity to support the digital or data economy. According to the United States Bureau of Labour Statistics, the 5G revolution is expected to last from 2019 to 2034, creating 4.6 million jobs in the United States and influencing 100% of the economy (Mandel & Long, 2020). Other regions of the world are expected to follow this trend, and individuals with the skills required to deploy 5G networks will benefit from the opportunities available.

2.3.2.5 Cloud computing

Cloud computing “means storing and accessing data and programs over the internet instead of your computer’s hard drive” (Griffith, 2013). IBM defines cloud computing as “on-demand access, via the internet, to computing resources – applications, servers (physical servers and virtual servers), data

storage, development tools, networking capabilities, and more – hosted at a remote data center managed by a cloud services provider (or CSP)” (Vennam, 2020).

According to IDC Research, custom-built and industry-specific applications are expected to be the bulk of the over 520 million applications developed and deployed globally between 2019 and 2025. This will be the core of digital transformation as business and technology merge into digital systems. This also demands an explosion of the amount of data created, especially through edge IoT technologies.

Gartner’s research on Infrastructure as a Service (IaaS), public cloud service indicated that \$64.286 trillion was the revenue generated by cloud companies in 2020 alone (Figure 2.8). This was a 40.7% increase over the 2019 revenue.

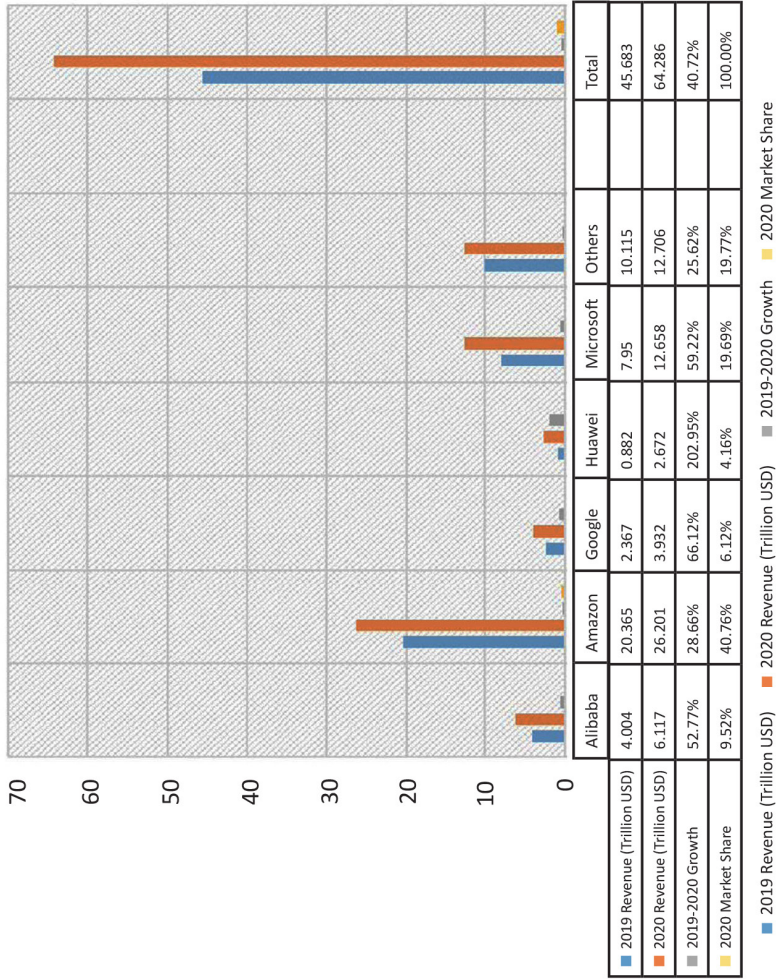


Fig. 2.8: Revenue generated by cloud companies from 2019-2020



The Evolving Skills Paradigm: Case Studies of Countries and Leading Tech Companies

This chapter presents case studies of some countries and leading tech companies and their initiatives for promoting skills development and adoption. The countries considered are the United States of America, Morocco, Finland and Switzerland, and the tech companies are Microsoft, Google, Amazon, General Motors, Apple and Nigeria's Chiniki Guard.

3.1 Countries

This section presents the four countries selected in the case studies, highlighting what made them stand out.

3.1.1 The United States: Executive Order to Prioritize Skills over Degrees

In June 2020, President Donald Trump signed an executive order that directs the US government, America's largest employer, to take the emphasis off college degrees and rather focus on the skills of applicants. Through this order, skills and competency-based hiring will replace degree-based hiring.

In doing so, the government can hire a more inclusive workforce and ensure that individuals with the most competent skills for carrying out the roles and responsibilities required of a specific position are those hired for that position (U.S. Government Publishing Office, 2020).

This decision by a national government is quite commendable. However, we need a similar approach in Africa and other developing countries. This will address the challenge of unemployability. It is in line with what big tech companies have practised. Top technology companies such as Microsoft, Google, Apple, Cisco, Huawei and IBM have relaxed their requirements for

college degrees within the hiring process.

In 2018, IBM reported that New Collar candidates accounted for 15% of all the IBM hiring in the United States, and as many as one-third of employees at IBM have less than a four-year college degree. New Collar jobs are job roles that prioritize skills over traditional degrees (Leaser, 2018).

In January 2018, I attended the Consumer Electronics Show (CES) in the United States. At the meeting, I had discussions with John Chambers, the Emeritus Chairman of Cisco; and Gary Shapiro, the President of CES. These interactions showed the level of importance that top tech institutions in the United States accord to the issue of skills.

Interestingly, this trend is increasing in popularity and changing how careers are created and structured. This strategy also helps individuals from underprivileged areas who could not necessarily afford a college degree but have the talent (Amla & Joshi, 2017).

3.1.2 Morocco: Skills as a Path to Relevance and Dignified Jobs

Morocco is a middle-income country in North Africa with a large working-age population. However, Morocco's economy has been facing challenges of low capacity to generate enough employment for its expanding working-age population, as the unemployment rate stood at 22.3% in 2019. In 2018, I had the privilege of visiting Morocco to get first-hand information about their policies and initiatives toward promoting digital skills in the country.

A 2021 report by the Worldbank on Morocco's job landscape stated that between 2001 and 2019, the working-age population grew by about 374,000 annually, while the economy created an average of 112,000 additional jobs per year – leaving an average annual jobs shortfall of 262,000 (Lopez-Acevedo, Betcherman, Khellaf & Molini, 2021).

In addition, 54% of the working-age population were classified as inactive. Furthermore, 29% of those aged 15 to 24 were classified as not in education, employment, or training (NEETs). This phenomenon suggests that a large number of inactive people in the working-age group, can hamper their long-term ability to contribute to the country's economic and social future (Lopez-Acevedo, Betcherman, Khellaf & Molini, 2021).

Furthermore, the significant growth in the working-age population created pressure on the labour market, but it also presented economic opportunities. The expanding working-age population turned out to be a strong force for economic growth, social inclusion, and development.

The Moroccan government has prioritized vocational education and skills to boost its citizens' skills. This is yielding results and enabling more Morroccans to get dignified jobs within and outside the country, including job opportunities in France, Canada and China.

In fact, China demonstrated its confidence in the capacity of skilled Moroccans by investing \$1 billion in the Mohamed VI Tangier Tech City, an industrial hub near Tangiers. The goal was to create 100,000 jobs for Moroccans through the tech city. Canada also created an expedited visa processing system for Morocco, and France, attracting more Moroccan students (International Consultants for Education and Fairs (ICEF), 2019).

3.1.3 Finland: How a Focus on Skills made Finland the Leader in Impactful Education

Finland has one of the best performing education systems in the world as shown by high rankings in different international studies surveys. For example, *The Economist*, in its "Educating for the Future" index, ranked Finland #1 (The Economist, 2019), while the World Economic Forum's Global Competitive Report 2020 ranked Finland #1 in digital skills (Schwab, 2019).

The Finnish government restructured their education system to equip students with incremental life skills. The system also recognizes the importance of early childhood education and ensures the recruitment of highly competent teachers with entry requirements of bachelor's and master's degrees for basic/high school and pre-school respectively.

Finland's national curriculum also emphasizes on the importance of a multi-disciplinary approach to education. It introduced the concept of 'phenomenon-based' teaching, which teaches students how to apply a variety of skills and knowledge in a single class. This approach is a good reflection of real-life problem-solving and gives pupils a clearer understanding of the world's complexity (Finland Toolbox, 2021).

Finland also undertook skill anticipation activities which were linked to

policy-making, especially in education. Finland's skills anticipation involves skills assessment, skills forecasting, skills foresight and employer surveys to steer the educational system towards meeting the needs of the labour market. The outcome of the processes are used in designing education strategies across national levels (European Centre for the Development of Vocational Training (ECDVT), 2017).

3.1.4 Switzerland: Skills and the Catch-them-Young Approach

Switzerland is a country with an outstanding performance in areas related to human capital. According to the World Economic Forum's 2019 [Global Competitiveness Report](#) (cited in Schwab (2019)), Switzerland has the most highly-skilled workers in the world. The index considered, among others, the skill set of graduates, quality of vocational training, and digital skills among the active population.

This achievement can be largely attributed to its **world-leading Vocational Education and Training (VET)** system, which is designed to enable easy access to the world of work.

The Swiss Vocational Education and Training (VET) model is a [dual-education](#) system which **combines learning in school with paid apprenticeships** in a company. The VET is the mainstream upper secondary programme which serves 70% of Swiss young people (Musseau, n.d.). However, less than a third of Switzerland's students under 25 go into tertiary education, as **there is less emphasis on degrees as opposed to skills**.

Furthermore, with a very low unemployment rate (4.94% in 2020 and 2.6% as at December 2021), this system can be said to be one of the main reasons behind the country's comparatively low youth unemployment rate (Trading Economics, 2022).

In his book titled, *Swiss Vocational Education and Training – Switzerland's Source of Richness*, Swiss economist and parliamentarian Rudolf Strahm provides adequate data that shows the Swiss dual VET system to be one of the key factors for the country's low unemployment rates and economic success (Strahm, 2010).

3.2 Companies

This section presents the key companies selected in the case studies, highlighting what they did that made them stand out. Most of the initiatives are very relevant for private and public sectors.

3.2.1 Google: The Gmail Story

Gmail is a free e-mail service launched by Google in April 2004. It was developed by Paul Buchheit, a Google engineer. The creation of Gmail can be attributed to Google's "20 percent time" policy (Xu, 2020) that encourages employees to spend approximately one-fifth of their time experimenting with their ideas and skills, working on a Google-related passion project of their choice or something resulting from their creativity. This policy made the staff more creative and innovative.

Gmail was birthed due to this policy and was inspired by the need to provide a solution to user complaints on the poor quality of existing email services such as storage limitations and difficulties in mail search retrievals.

At its launch, Gmail offered an unprecedented one gigabyte of free e-mail storage space per user, significantly higher than competing services such as [Microsoft's](#) Hotmail and [Yahoo](#) Mail. It also had a search-based feature, making it easier for users to find e-mails.

These features and many more as the years went by, made Gmail one of the most popular e-mail platforms in the world. As of 2022, there were more than 4 billion people using Gmail, an approximate one Gmail user for every two people around the globe. Interestingly, this very successful project resulted from time given to employees to sharpen their skills and express their creativity (Google, 2004).

I had the privilege of visiting Google headquarters in the United States in 2018, where I met the CEO and other staff. I was happy to discover that one of my students at the university was a technical staff at Google. Before that, I was invited to visit Microsoft headquarters in the United States in April 2017, where I spent a week touring their facilities and offices. The visit to Microsoft was indeed very productive.

3.2.2 Amazon: Must-Have Skills for an Amazon Engineer

Amazon is an American transnational technology company which focuses on

e-commerce, cloud computing, digital streaming, and artificial intelligence. Amazon's revenue for 2020 was \$386 billion, making it the biggest global retailer (Yuen, 2022).

One of the goals of Amazon is striving to be the most customer-centric company globally, and this has been a significant factor in its remarkable success over the years. Amazon's activities generate a lot of data, and the company has embraced data-driven innovation. They have used predictive analytics on customer data to create products and services to meet customer needs, leading to the company's expansion into more industries and markets.

Furthermore, skills in artificial intelligence, data science and analytics, cloud computing, and cybersecurity have become some of the highly required skills for Amazon employees. The company places a strong emphasis on providing its employees with in-demand and long-term skills.

In September 2021, it was reported that Amazon committed \$1.2 billion to provide 300,000 employees with access to education and skills training programmes through 2025 as part of its upskilling 2025 pledge (Amazon, 2019). In addition, the company pledged to train 29 million people worldwide on the use of cloud storage by 2025 to help meet the growing demand for individuals with cloud skills (Business Wire, 2021).

Based on experience, Jeffrey Bezos, the founder and CEO of Amazon, advises companies and institutions to focus on these three things:

- i. Customer-centricity;
- ii. Long-term thinking; and
- iii. Passion for invention.

The three issues are very relevant to start-ups, students and policy makers.

3.2.3 General Motors and the Story of Our Jelani Aliyu

General Motors Company was established in 1908 and is the largest automotive manufacturing company in the United States and is also one of the largest in the world. In 2018, General Motors ranked #10 on the Fortune 500 rankings of the largest United States corporations by total revenue (Webmaster, 2019). The company designs, manufactures, and sells both cars and automotive parts. Its key brands include Chevrolet, Buick, GMC, and

Cadillac.

In 2010, the company introduced the Chevron Volt designed by Jelani Aliyu, a senior creative designer at General Motors before his appointment as the Director General of the Nigerian Automotive Design and Development Council (NADDC) in 2017 and re-appointment in 2021. Jelani Aliyu is a Nigerian from Sokoto State.

Aliyu had the opportunity to hone his creative skills from when he commenced his educational journey in Nigeria to furthering his studies abroad and eventually working at General Motors where he made a huge impact in the automobile industry. In addition to designing the Chevrolet Volt, he was the lead exterior designer of the Pontiac G6.

His brilliant work on the design of the Chevrolet Volt led to it being the first and most popular plug-in hybrid car on the market. It was named the most fuel-efficient vehicle in January 2014 by the United States Environmental Protection Agency. The Chevrolet Volt became popular and was ranked as the world's all-time best-selling plug-in hybrid as of September 2018 (Kane, 2019).

According to Aliyu, General Motors was not concerned about his certificates when he was being hired. They were more interested in his skills. As such, the inspiring story I just described may not have been possible if General Motors only focused on traditional paper certificates and degrees. Truly skills are more valuable than paper degrees. However, if both of them are acquired, that is commendable. The degree is supposed to validate the skills.

3.2.4 Apple and the Billion Dollar HopStop Idea

A Nigerian serial entrepreneur, Chinedu Echeruo, started developing an app called HopStop around 2005. Apple later acquired this app for \$1 billion in 2013, with most of its functionality incorporated into what we now know to be Apple Maps. To put it in context, Chinedu's \$1 billion can cover the economic activity of 700,000 residents of sub-Saharan Africa, based on a per capita GDP income of \$1,484 in 2020 (Macrotrends, 2022).

HopStop was designed to provide free customized public transit directions for users in major metropolitan areas around the world. It offered detailed, door-to-door mass transit, walking, biking, taxi, bus, and subway directions in real time, as well as official transit maps for major cities worldwide, making it

very popular across the globe.

Furthermore, the utility of HopStop continued to grow to such an extent that its user base grew to as many as 5 million users monthly. The adoption rate was also quite impressive, quickly scaling up to 600 cities. This led to HopStop being named one of the top 100 fastest growing software companies in the US in 2011, after which Apple acquired it in 2013 and subsequently incorporated into Apple Maps (Access Bank, 2015; Hajian, 2017).

Chinedu used both soft and hard skills to achieve the feat of developing and selling HopStop. He had his secondary school education in Nigeria before moving to the United States to obtain a BSc in Finance and Accounting. Even though his course of study was not directly related to digital technology, he developed app-building skills and utilized soft skills like complex problem-solving, analytical thinking and creativity.

Interestingly, he was motivated to develop the app due to the challenge he faced when he arrived in New York; he found navigating the city difficult. So, he developed a solution and obtained a US Patent #7,957,871 for Methods and Apparatuses for navigation in urban environments (Hajian, 2017).

3.2.5 Nigeria's Chiniki Guard Wins Top AI Prize at GITEX

The Gulf Information Technology Exhibition (GITEX) is one of the biggest technology shows in Europe, the Middle East, Africa and Asia as at 2021. At the 2019 edition, GITEX invited some innovative start-ups to showcase their indigenous IT solutions to the world. The Nigerian start-ups contested with 750 other start-ups from 73 countries. Similarly, I led the Nigerian team to the conference and exhibition sponsored by the federal government of Nigeria NITDA and other government parastatals.

Chiniki Guard was one of these start-ups. It demonstrated an artificial intelligence-based security solution for retail stores and supermarkets to monitor, detect, and alert shop owners of shoplifting and suspicious behaviour in real-time. The start-up was represented by its CEO, Abdulhakim Bashir, a Nigerian from Katsina State.

Chiniki Guard went on to win the overall best start-up in the artificial intelligence category.

3.2.6 The Africa Development Center and Microsoft's Approach to Skilling in Africa

3.2.6.1 The global skilling initiative

The COVID-19 pandemic significantly increased the adoption of digital platforms, leading to an urgent need to bridge the tech skills gap across the globe. As part of its corporate social responsibility (CSR) efforts, Microsoft Corporation launched a global skills initiative to provide digital skills to 25 million people around the world. Microsoft President Brad Smith launched the initiative in July 2020.

The programme provided the beneficiaries with free access to content on various platforms such as LinkedIn Learning, Microsoft Learn, and the GitHub Learning Lab. In addition, participants were also able to obtain Microsoft certifications and access LinkedIn job seeking tools.

Furthermore, the framework for the Global Skilling Initiative was premised on the following areas of activity (Smith, 2020):

- i. A data-centric approach to the identification of in-demand jobs and the skills needed to fill them;
- ii. Free access to training content and learning paths required to support participants in developing skills required for the in-demand jobs; and
- iii. The provision of low-cost certifications and access to free job-seeking tools for those with the requisite skills.

Microsoft's data-centric approach gave insights into the skills that would be in high demand by 2025. Based on Microsoft's research, by 2025, the global workforce is estimated to absorb 149 million jobs, as shown in Figure 3.1. As mentioned earlier in this book, adequate research is important, and it is always useful to start a skilling programme with the future of work in mind.

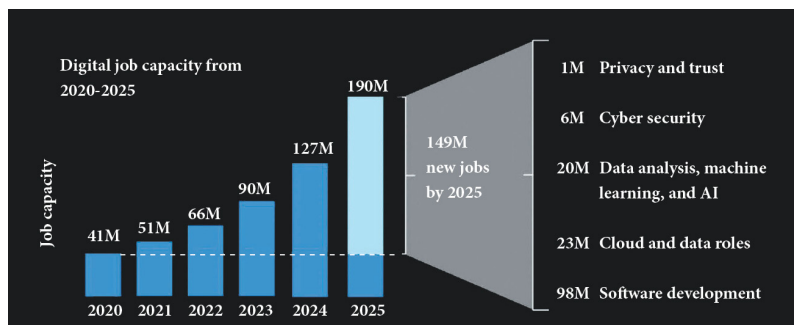


Fig. 3.1: Capacity of the global economy for absorbing digital jobs (2020-2025) (Smith, 2020)

3.2.6.2 Skilling through the Africa Development Center

Microsoft Corporation was established in 1975, and has been a key player in the global tech ecosystem over the last few decades. However, Microsoft is now paying more attention to the great opportunity of Africa as a global tech destination, not just for the sale of tech solutions but also as the source of such solutions. There is an increased realization that Africa can be the source of talent and innovative solutions. Other global tech giants are also beginning to focus on Africa for their tech talent.

The Africa Development Center (ADC) was established as a premier engineering centre for Microsoft in Africa. Microsoft’s desire to focus on Africa led to the creation of the ADC programme. According to Phil Spencer, executive sponsor of the ADC and Executive Vice President at Microsoft, “The ADC will be unlike any other existing investment on the continent. It will help us better listen to our customers, develop locally and scale for global impact. Beyond that, it’s an opportunity to engage further with partners, academia, governments and developers – driving impact in sectors important to the continent, such as FinTech, AgriTech and OffGrid energy” (Microsoft News Center, 2019).

Two centres were established across Africa – one in Lagos, Nigeria and the other in Nairobi, Kenya. I had the privilege of launching the ADC for West Africa, on behalf of the federal government of Nigeria, on 21st March 2022.

Some of the metrics across the African continent that inspired Microsoft to establish the ADC in 2019 include the following (Kpilaakaa, 2022):

- i. Talent pool in Africa: 432,000 developers, 871,000 IT professionals;

- ii. Future talent pool: About 1.2 Million (Science, Technology, Engineering, Mathematics) (STEM) students in Africa, about 22,000 STEM students from Africa in Universities in the United States of America (about 50% of the African students); and
- iii. The projection that Africa's workforce will grow to 159 million working-age workers, which is expected to be more than that of the rest of the world combined.

The ADC is expected to:

- i. Develop engineering products from Africa, made by Africans;
- ii. Upskill the tech ecosystem across the continent and build a pipeline for the centre and the tech ecosystem; and
- iii. Explore innovation with African products and local ideas for global.

Incidentally, I have been promoting the 'glocal' approach for many years, where tech ecosystems around the world are encouraged to think 'globally', while acting 'locally'. This approach encourages innovators and entrepreneurs to use local products and indigenous innovation to create solutions that will be good enough for the global tech ecosystem.



Tech-Focused Cities and their Approaches to Accelerating the Adoption of Skills

This chapter presents some cities and institutions around the world and their approaches to developing top tech skills successfully and consistently over the years. These include Silicon Valley, presented in Section 4.1 and the Indian Institutes of Technology presented in Section 4.2. Seoul, Shenzhen and Nigeria’s Yaba are presented in Section 4.3, Section 4.4 and Section 4.5, respectively.

4.1 Silicon Valley: Secrets of the City Called the ‘Gold Standard for Technology’

Silicon Valley is a region in the southern part of San Francisco, United States of America, regarded as the world’s innovation capital and the global centre of high-tech. The name ‘Silicon Valley’ was coined by Don Hoefler in 1972 as a reference to the start-ups of that time that used silicon chips to produce semiconductors (Messina & Baer, 2016).

In the company of His Excellency, the Vice-President of the Federal Republic of Nigeria, Professor Yemi Osinbajo, we took a tour of the Silicon Valley in July 2018. The trip was to under-study the Valley to adopt some of the strategies that have led to its tech companies’ success and attract Foreign Direct Investment (FDI). We have also initiated adopting these strategies within the digital economy sector.

Furthermore, according to the 2020 GDP per capita released by the International Monetary Fund (IMF), Luxembourg was the country with the highest GDP per capita at \$116,920 (IMF, 2020). If Silicon Valley were its own country, its \$128,834 per capita would make it wealthier than Luxembourg (Morgan & Wolverson, 2021). Figure 4.1 shows Silicon Valley’s GDP per

capita compared to other countries and regions. The growth rate of 51.27% between 2010 and 2020 is more than double the 23.22% growth rate in the United States. It also exceeds the growth rates of the GDP per capita globally (3.42%), in Africa (-8.87%) and in Luxembourg (10.11%).

Furthermore, the Silicon Valley area is also home to the highest number of tech jobs per capita, according to a 2021 study (Janssen, 2021). The research showed 705.6 tech positions for every 10,000 people in the area (Morgan & Wolverton, 2021).

So what is the secret of Silicon Valley's success in attracting and retaining talent with top tech skills, and being consistent in developing innovative tech solutions. Several factors have led to Silicon Valley's success story. However, I will focus on five that I consider being the greatest:

- i. History and past success stories;
- ii. Mindset – willingness to experiment;
- iii. Government-academia-private-sector partnership;
- iv. Mentoring; and
- v. Easy access to capital

Furthermore, Silicon Valley has gained a reputation for great success in technology innovation. Its history and past success stories have created an atmosphere of success for current occupants of the Valley. It is often said that success begets success, and the success stories of Silicon Valley have played a role in perpetuating its success.

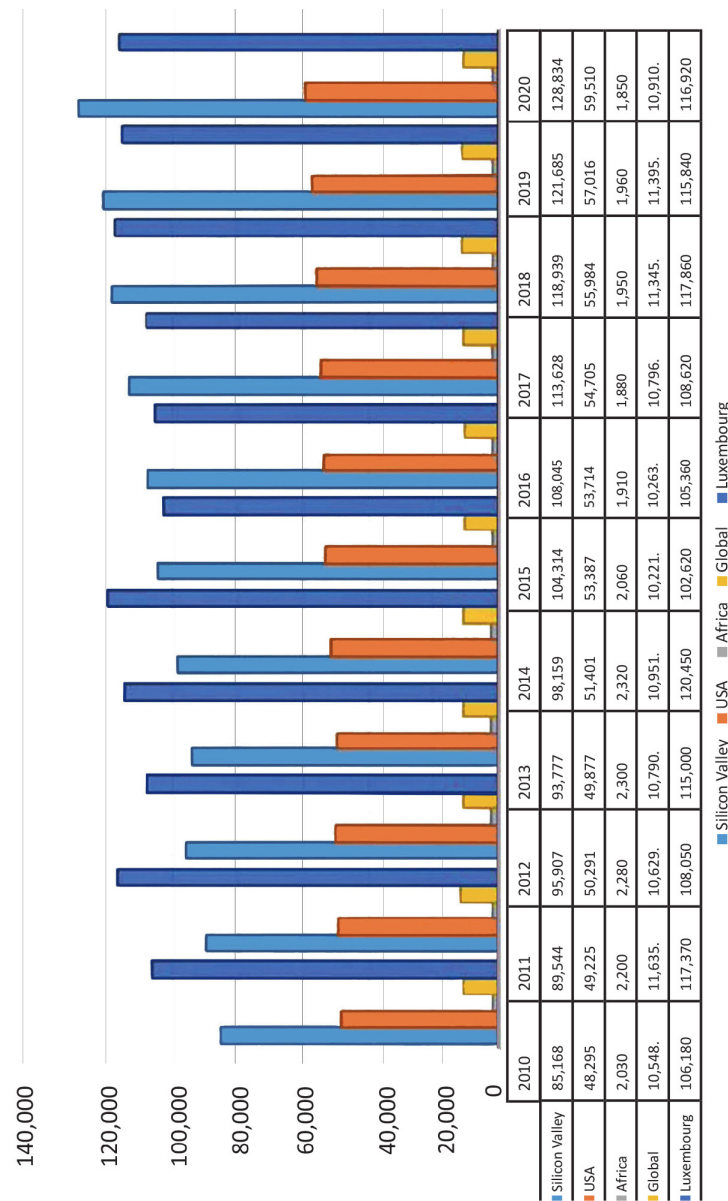


Fig. 4.1: GDP per capita of Silicon Valley and other regions (This was generated by the author using available data on the IMF site)

Failure is strongly perceived to be a negative word; however this is not the case in Silicon Valley. In fact, one of its most common mantra is “fail fast, fail often” (Taylor, 2018). There is even an annual conference about embracing failure, known as FailCon. The willingness to experiment and refusal to see failure as fatal has propelled many tech companies in the Valley to become successful global brands. An article in the Harvard Business Review had this to say about a study of 50 Silicon Valley entrepreneurs to find out why they were

so successful: they were “especially levelheaded about failure and comfortable with the inherent messiness of experimentation” (Martins, Dias & Khanna, 2016; Alton, 2018).

The partnership between the government, academia and industry creates an important tripod for reproducing success in the Valley. World-class academic institutions like Stanford and Berkley support entrepreneurial and tech talent flow. The business-friendly regulatory environment of the State of California and the enabling environment that the industrial sector provides serve as real advantages for the Valley.

Mentorship is Key to Success

There is an emphasis on mentoring in Silicon Valley, and the experience of successful entrepreneurs shows that mentoring plays a key role in transforming great ideas into high-impact innovations. A few examples of famous Silicon Valley Chief Executive Officers (CEOs) and their mentors are shown in Table 4.1.

The high density of wealthy investors and funding institutions makes it easier to access capital in Silicon Valley than in most other places. “There are thousands of wealthy investors in the area who organize as angel investors and venture capitalists, looking to put their money to work instead of paying hefty taxes on earnings to the US government each year. As a result, they’re willing to pour funds into a variety of different businesses, with the hope that a handful will return high dividends in the years to come” (Alton, 2018).

Table 4.1: Some famous Silicon Valley CEOs and their mentors

S/N	Name of CEO	Organization	Mentor
1.	Steve Jobs	Apple	Andy Grove (Co-founder of Intel)
2.	Bill Hewlett and David Packard	HP	Frederick Terman (considered to be the Father of Silicon Valley, together with William Shockley)
3.	Dennis Crowley	Foursquare	Ken Allard (former boss at Jupiter Communications)
4.	Mark Zuckerberg	Facebook	Don Graham (CEO of <i>Washington Post</i>), and Sean Parker (former member, Board of Directors at Spotify & Co-Founder of Napster)
5.	Bill Gates	Microsoft	Warren Buffett (CEO of Berkshire Hathaway)
6.	Larry Page	Google	Michael Bloomberg (Founder of Bloomberg L.P.), Eric Schmidt (former Google CEO and Apple Board of Directors member)
7.	Drew Houston & Arash Ferdowski	Dropbox	Ali and Hadi Partovi (iLike founders)
8.	Marissa Mayer	Yahoo	Larry Page (CEO of Google)
9.	Reid Hoffman	LinkedIn	Mark Zuckerberg (CEO of Facebook)
10.	Marc Benioff	Salesforce.com	Steve Jobs (former CEO of Apple)
11.	Paul Allen	Vulcan Inc.	Ed Roberts (known as the 'father of the personal computer')

Adapted from Bracetti (2012)

4.2 IIT: The Impact of Skilling on the Indian Institution that Exports Tech Talent to the World

Skills are very important for success in the Fourth Industrial Revolution (4IR), and it is worth noting that knowledge institutions are a primary platform for providing skills. There are thousands of knowledge institutions around the

world that provide one type of skill or another. However one institution stands out in its level of global impact in the area of tech skills. That institution is the Indian Institute of Technology (IIT).

The IIT was established in May 1950 and formally inaugurated in August 1951 by the first Prime Minister of India (IIT, n.d.). The IITs are dedicated to producing world-class chemical, electrical and computer engineers, among others. They have played a defining role in India's reputation as the leading exporter of tech talent to the world, especially to the United States (Kaushik, 2020). It is no surprise that many of the leading CEOs of multinationals and global institutions are of Indian origin, as shown in Table 4.2 (King, 2016; Kaushik, 2020; Bhattacharya, 2020). For example, Indians were more than two-thirds of the H1-B skilled immigrant US visas in 2020 globally, and this proportion has been consistent over the years (Bhattacharya, 2020).

Table 4.2: CEOs and Top Executives of Indian Origin in the Tech Industry

S/N	Organization	Name of CEO	Education
1.	Google	Sundar Pichai	Indian Institute of Technology (IIT), Kharagpur, India (BSc Mechanical Engineering)
2.	Microsoft	Satya Nadella	Mangalore University, Karnataka, India (BSc Electrical Engineering)
3.	Citigroup (2007-2012)	Vikram Shankar Pandit	Columbia University (BSc Electrical Engineering)
4.	SoftBank Vision Fund	Rajeev Misra	Indian Institute of Technology (IIT), Delhi, India (Chemical Engineering)
5.	Adobe	Shantanu Narayen	Osmania University, India (BSc Electronics and Communication Engineering)
6.	NetApp	George Kurian	Princeton University (BSc Electrical Engineering) (Started at IIT Madras)
7.	PepsiCo (2006-2018)	Indra Nooyi	Madras Christian College, India (BSc Physics, Chemistry and Mathematics)

8.	Nokia	Rajeev Suri	Manipal Institute of Technology, Manipal, Karnataka, India (BSc Electronics and Communications)
9.	Mastercard (CEO from 2010-2020, now Executive Chairman)	Ajaypal Singh Banga	Delhi University, India (BSc Economics)
10.	Cognizant	Francisco D'Souza (Co-founder)	University of East Asia, Macau (Bachelor of Business Administration)
11.	Novartis	Vasant Narasimhan	Harvard Medical School
12.	Diageo	Ivan Menezes	St. Stephen's College, Delhi, India (BA Economics)
13.	SanDisk	Sanjay Mehrotra	Birla Institute of Technology and Science, Pilani, India
14.	Micron	Sanjay Mehrotra	Birla Institute of Technology and Science, Pilani, India
15.	Twitter	Parag Agrawal	Indian Institute of Technology (IIT), Bombay, India (B.Tech in Computer Science and Engineering)
16.	Reckitt Benckiser	Laxman Narasimhan	College of Engineering Pune, India
17.	IBM	Arvind Krishna	IIT Kanpur, India (B.Tech Electrical)

18.	Infosys (Infosys has a market capitalization of over \$100 billion and has over 250,000 employees around the world)	Narayana Murthy (Co-founder)	IIT Kanpur, India
19.	Flipkart is an Indian e-commerce (later acquired by Walmart Amazon)	Sachin Bansal (Co-founder)	IIT Delhi, India
20.	Flipkart	Binny Bansal (Co-founder)	IIT Delhi, India
21.	Ola Cabs (Ola Cabs is a global ride-hailing company that was valued at US\$340 million in 2019)	Bhavish Agrwal (Co-founder)	IIT Bombay, India
22.	Ola Cabs	Ankit Bhati (Co-founder)	IIT Bombay, India
23.	Samsung STAR Labs	Pranav Mistry (President and CEO) (He introduced the Samsung Galaxy Gear smart watch in September 2013)	IIT Bombay, India (Masters in Design)
24.	MIT, National Science Foundation (elected into three US National academics –	Subra Suresh	Indian Institute of Technology (IIT), Madras, India

	National Academy of Engineering, National Academy of Sciences and National Academy of Medicine)		
25.	Google	Anjali Joshi (Former Google VP of product management)	IIT Kanpur, India (Electrical engineering)
26.	Quickr (Quickr is an online marketplace and classified ad company valued at \$1.5 billion in 2019 and has 5,000 employees)	Pranay Chulet (Founder)	IIT Delhi, India
27.	Google	Amit Singhal (Former Senior Vice President at Google and head of Google search team).	IIT Roorkee, India
28.	Syntel (Syntel is an IT consulting and outsourcing company that was acquired by Atos SE in 2018 for \$3.4 billion)	Bharat Desai (Co-founder and chairman)	IIT Bombay, India

29.	Palo Alto Networks	Nikesh Arora (CEO of Palo Alto Networks, former president of Soft-Bank Group)	IIT (BHU) Varanasi, India
30.	VMware	Raghu Raghuram	IIT Bombay, India
31.	Sun Microsystems (The firm that developed the popular Java programming language)	Vinod Khosla (Co-founder)	IIT Delhi, India
32.	Fable	Padmasree Warrior (Founder, President and CEO, Fable)	IIT Delhi, India
33.	Harman International (HAR) audio technology and electronics maker	Dinesh Paliwal (Former President, CEO and chairman)	IIT Roorkee, India
34.	Exotel	Arun Sarin (Former CEO of Vodafone Group)	IIT Kharagpur, India
35.	Juniper Networks (makers of network equipment and software, with over 9,000 employees and 2020 revenue of \$4.45 billion)	Pradeep Sindhu (Founder and former CEO)	IIT Kanpur, India

As shown in Figure 4.2, the top tech executives mentioned in Table 4.2 are all Indians, while 23 people, that is 63.89% of all those listed are affiliated to IIT.

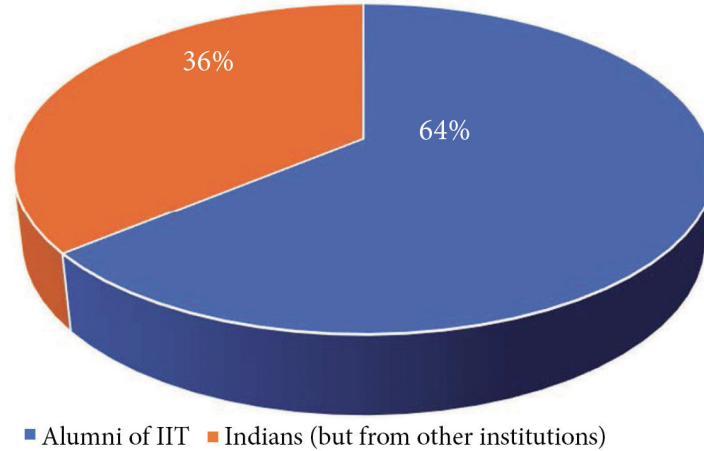


Fig. 4.2: Proportion of top silicon executives that schooled in IIT

Some other fascinating points to note about IIT alumni, include the following:

- i. IIT alumni have an \$1 trillion “annual revenue responsibility” (this indicates the overall revenue which IIT Alumni control or are responsible for across the globe in various roles);
- ii. IIT Alumni have generated around 19 millions jobs in the last 50 years; and
- iii. Each IIT Alumnus supports the creation of around 100 jobs (Indian Brand Equity Foundation (IBEF), n.d.).

In addition, admission into IIT is highly competitive, and less than 2% of applicants are successful. This is a much lower acceptance rate than Harvard. However, the impact of IIT in the global tech industry is not in doubt. The focus on high-tech skills has given Indians a good platform for success in the global tech sector, and this even goes beyond just IIT graduates.

An article, “The Rise of Indian-born CEOs in Silicon Valley” states that “In a multi-ethnic country with limited opportunities, where there is a population of over 1.3 billion people, competition is extremely fierce. Those who can advance in this type of environment are often ones who have learned the art of being resourceful, resilient and adaptable” (Liu, 2021).

Furthermore, according to late the Professor Munirathna Anandakrishnan, the then Chairman of IIT Kanpur, “The ‘teaching-learning process’ at the IITs are fundamentally different from most other institutions. Here, the senior

most professor is assigned to take classes for the junior most students – the first-year students. This is to ensure that the most senior professors and icons of specific subjects are easily accessible to the beginner at IIT (Madhumati, 2013)”

Mandal (2016) also noted that Anandakrishnan said that there is no “finality of the syllabus” at IIT; in other words faculty have the flexibility required to have a dynamic syllabus in tune with modern-day realities. The IIT alumni network is also helpful in supporting students of the school, and the IITs have a track record of good placements in Fortune 500 companies and other large corporations.

These discussions give us some insights into the things that make Indians, and in particular, IIT graduates to, thrive, and some of them include the skills the author has earlier mentioned in the book:

- i. Resilience and flexibility;
- ii. Ensuring a strong foundation (allowing experienced instructors to be responsible for developing foundational skills);
- iii. Ensuring that curricula are dynamic (rather than static or archaic); and
- iv. Leveraging networks to support career development.

4.3 Seoul: Setting the Pace in Ubiquitous Mobile Technologies

Seoul is the capital of South Korea, a country famous for its ICT infrastructure, high-speed internet and for being home to some leading global ICT companies such as Samsung, LG Electronics, Hyundai, etc. However, it is worth noting that Korea was not always regarded as an ICT powerhouse prior to the Fourth Industrial Revolution. In fact, in the 1970s and 1980s, the major export from the country were products like toys, shoes, clothing, consumer electronics, automobiles, machine tools, and ships (Drucker, 2002).

Forty to fifty years later, a focus on skilling and ICTs has transformed Korea into a country whose GDP per capita experienced a meteoric rise from \$87 in 1962 to \$10,307 in 1997 and has further grown to about \$35,000 at the end of 2021 (Lee, 2003; Kim, 2020). To a large extent, their growth rode on the back of exports led by the so-called Korean chaebols such as Samsung, LG, Hyundai and SK Group.

Furthermore, these chaebols, or conglomerates, accounted for about two-

thirds of Korea's exports and a great portion of the foreign capital inflow. As a result, they enjoyed access to foreign loans (with the government guaranteeing such loans) and concessions from government. The government also gave them performance quotas.

Government-chaebol cooperation was essential to the sub-sequent economic growth and astounding successes that began in the early 1960s ... The government provided the blueprints for industrial expansion; the chaebol realized the plan ... Another reason for the success of the chaebol was their access to foreign technology. Rather than having to develop new areas through research and technology, South Korean firms could purchase foreign patents and technology and produce the same goods made elsewhere at lower costs. Hyundai cars, for example, used an engine developed by the Mitsubishi Corporation of Japan (Library of Congress, 1990).

In addition, the Korean conglomerates were also very innovative and adaptable to new technologies. Companies created a number of subsidiaries to address different societal needs or take advantage of different business opportunities. For example, as at 2021, the Samsung Group had 237 subsidiaries (Samsung, 2021), LG consisted of over 140 subsidiaries (LG Electronics, 2021), Hyundai Motor had at least 55 (Yoon, 2022), and over 95 companies made up the SK Group (Impakter Index, n.d.).

Korea's workforce has been described as "highly disciplined, technologically competent skilled workers" (Kim, 2020). However, according to the Asian Development Bank Institute, Korean "Workforce development can of course be attributed to a number of factors including government policies, the personal efforts and commitment of the Korean people, and the human resource management of enterprises" (Lee, 2007).

The focus on skills was obvious in relevant government policies that led to the following (Lee, 2003):

- i. About one-third of the population (then over 13 million Koreans) received free training on the use of the Internet; and
- ii. \$600 million to train 740,000 ICT specialists, including 15,600 PhD holders.

The success story of South Korea and its dominance of the global mobile industry can be attributed to several factors, including:

- i. Their disciplined approach towards getting high-end technology skills;
- ii. The synergy between government and the private sector with regard to policy and its implementation;
- iii. Leveraging existing technology to create swift and more innovative solutions;
- iv. Provision of world-class broadband and ICT infrastructure;
- v. Having an export-oriented mindset; and
- vi. High level of innovation and willingness to diversify and create industries/subsidiaries based on societal needs.

4.4 Shenzhen: Speed and Skills at the Global Capital of Tech Hardware

Shenzhen hosts some of the world's largest tech companies, including Huawei, DJI, DGI, Tencent, ZTE, Alibaba and Baidu. Shenzhen's transition from being a fishing village in 1979 to becoming the de-facto factory for many global tech companies is truly phenomenal. According to the World Economic Forum, about 90% of the electronics used globally are produced in Shenzhen (Harris, 2017).

Apart from being famous as the tech hardware capital of the world, it is also renowned for the speed at which the products can be produced. 'Shenzhen Speed' is a term now synonymous with the speed with which companies in Shenzhen skilfully complete the production of technology related-hardware. One example illustrates this: "When Steve Jobs demanded that the iPhone should have a glass screen just a month before launch, Shenzhen made it happen: Factories spun up overnight and thousands of skilled engineers were immediately tasked to solve the problem. Designs that would take months to build elsewhere are produced in weeks here, if not days" (El Habre, 2021).

Incidentally, Shenzhen has been known for speed for many decades now. The Guomao Building in Shenzhen has 53 floors and was the tallest in China at the time it was built in 1985. Its efficient construction was completed in a record 37 months, with some floors even taking just three days to complete (Yunfei, Da & Jing, 2020).

Shenzhen's export also experienced remarkable growth from an export volume

of \$9.3 million in 1979 to about \$300 billion in 2021. This translates into a 32,257% increase in 42 years, or an average of 768% annual increase in exports over that period (El Habre, 2021; Xinhua, 2022).

The Shenzhen success story can be attributed to several factors, including:

- i. **Government's policy.** This led to the designation of Shenzhen as China's first Special Economic Zone in 1980;
- ii. **Imbibing a culture of innovation.** For example, in 2019, the World Intellectual Property Organization (WIPO) stated that China had filed more international patent applications than the United States, and half of these came from Shenzhen (El Habre, 2021);
- iii. **Reputation of speed.** Timely delivery of products has enhanced Shenzhen's reputation in the global tech industry. Being skilful is a requirement for swiftness. As such, the large concentration of skilled workers plays a key role in Shenzhen's speed of delivery;
- iv. **Ideal location.** China aims to replicate the 'Greater Bay Area' around Silicon Valley by functionally fusing Shenzhen with its close neighbour Hong Kong, and Macau to create a region where money and people move freely (Louise, 2018); and
- v. **Commitment to research and development.** The Shenzhen government is set to invest \$108 billion in research and development over five years (2021-2025). The research will focus on frontier areas like artificial intelligence, 6G, quantum technology, driverless vehicles and intelligent networks. The authorities aim to have its digital economy account for more than 31% of its GDP by 2025 (Rui, 2021).

4.5 Yaba: Catalyst for Nigeria's Growing Number of Unicorns

Yaba is a suburb in Lagos State, Nigeria. In the last decade, the region has earned some acclaim for its role in birthing several tech companies and has now been nicknamed 'Yabacon', comparing it to Silicon Valley.

Yaba is located between the Lagos Mainland and Island and has comparatively lower property prices than many other regions in the city. These features inspired the founders of the co-creation Hub (ccHub) to establish an incubation hub in 2011. This served as a catalyst for attracting, birthing or providing skilled employees for other hubs and tech companies.

Some of these companies have grown to become unicorns, that is tech companies with a valuation of at least \$1 billion. According to Techbytes, as of June 2021, there were over 600 unicorns in the world, raising \$442 billion in total and having a value of around \$2 trillion (Jude, 2021).

As of January 2022, there were a total of seven unicorns on the African continent, of which 5 have their roots in Nigeria’s entrepreneurial ecosystem, along with the influence of YabaCon. Table 4.3 lists the African unicorns, the country that influenced their establishment and the sector they focus on (Iwayemi, 2022).

Those of Nigerian origin account for close to 60% of Africa’s unicorns. It is also noteworthy that six out of the seven unicorns are in the fintech sector. Nigerian start-ups have created a pool of skilled fintech personnel, and this has resulted in companies having greater success than the traditional banks in Nigeria, as shown by their valuation in Figure 4.3 (Taksali, 2021; Lewis, 2021).

Table 4.3: African unicorns (January 2022)

S/N	Company	Country/Roots	Sector
1.	Fawry	Egypt	Fintech
2.	Opay	Nigeria	Fintech
3.	Wave	Senegal	Fintech
4.	Flutterwave	Nigeria	Fintech
5.	Interswitch	Nigeria	Fintech
6.	Andella	Nigeria	Software development and capacity building
7.	Chipper Cash	Uganda and Ghana	Fintech

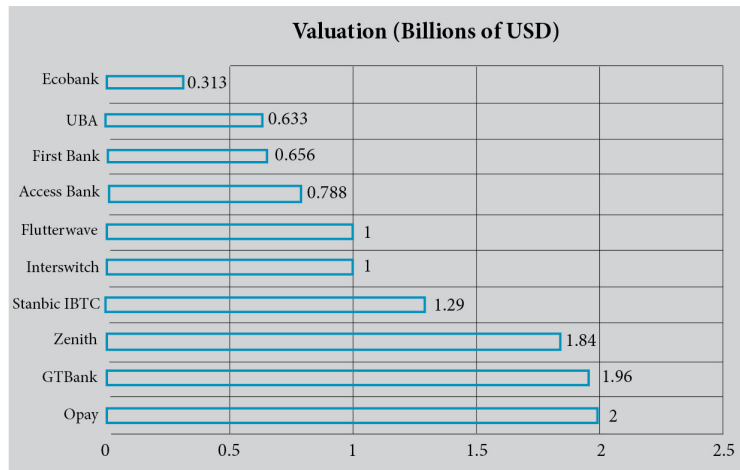


Fig. 4.3: Valuation of fintech unicorns and traditional banks in Nigeria

I was in Lagos in February 2022 for an engagement with ICT companies, start-ups and unicorns. Over 120 of them attended the meetings and interactive session. After the session, I visited some unicorns like Flutterwave which had a value of over \$3 billion as of February 2022.

The Nigerian unicorn fintechs have taken advantage of a need in Africa's most populous nation – the need for convenient financial services and a need to reach the large percentage of unbanked Nigerians.

In addition to identifying and meeting societal needs, Yabacon companies also benefit from a large number of educational institutions in the region, pool of eager, teachable and creative youths in the area, and all over the country.



Bridging the Industry-Academia Divide

This chapter discusses partnerships and corporate social responsibility, highlighting their benefits in capacity development and job opportunity. Section 5.1 presents the industry-academia partnership success stories of the University of Cambridge and that of Silicon Valley. Various models have been developed. The triple helix model for promoting innovation, based on the interactions between government, academia and Industry, is presented in Section 5.2. Section 5.3 presents a brief history and the win-win impact of corporate social responsibility. Further, Section 5.4 and Section 5.5 show the partnerships brokered by the author with leading tech companies and the attendant benefits to the country.

5.1 A Partnership that Adds Value

A good example of an industry-academia partnership is found in Cambridge. I spent some time in Cambridge and can attest to the city's reputation for world-class research. In addition, I attended the University of Cambridge, where I enrolled in a management course.

As part of the industry-academia partnership, the world-renowned University of Cambridge partnered with the industries in its environs to establish a science park. This park has made the innovation ecosystem in the region very successful, with over 1,000 technology and biotechnology companies emerging. It is noteworthy that the partnership keeps supporting the creation of new businesses that, in turn, support the goals of both the university and the industries. In addition, this partnership has been known to take advantage of informal networking events to initiate and strengthen collaboration (Centre for Cities, 2017).

Another success story of the industry-academia collaboration is found in

Silicon Valley through an institution known as Y Combinator. This Y Combinator is a start-up accelerator Stanford alumni established in 2005 to encourage students start companies, rather than merely take internships during holidays (Centre for Cities, 2017). Stanford University's partnership with Y Combinator has been very successful. Y Combinator is regarded as the world's most powerful start-up accelerator and *Fortune* magazine has described it as "a spawning ground for emerging tech giants" (Rao, 2015).

Furthermore, Y Combinator has invested in more than 3,000 companies collectively worth more than \$400 billion, about 25% of the entire GDP of sub-Saharan Africa. These companies have gone on to create over 70,000 jobs. Some of the companies include Stripe, Airbnb, Cruise, PagerDuty, DoorDash, Coinbase, Instacart, Dropbox, Twitch, Flightfox, and Reddit (Y Combinator, n.d.). I appreciated the impact of Y Combinator companies during my visits to Silicon Valley, and Michael Siebel, the Managing Director of Y Combinator was a guest at our Startup-Friday event at NITDA, while I was the Director General/Chief Executive Officer of the Agency.

In addition to industry-academia partnerships, there is also a growing trend of academia-public-sector-industry collaboration, what I like to refer to as an 'API' for accelerating tech innovation. Governments provide funding and policies, the academia supports research and knowledge transfer, while the industry provides the skills and products. It is generally referred to as the triple helix model for innovation and is described in the next section.

5.2 The Triple Helix Model

The triple helix is a model for promoting innovation that is based on the interactions between government, industry and academia, mostly represented by the university. It was introduced by Etzkowitz and Leydesdorff in 1995 and is depicted in Figure 5.1 (Etzkowitz & Leydesdorff, 1995). Its adoption in Silicon Valley and other regions of the world has been credited as catalysts for innovation in those regions.

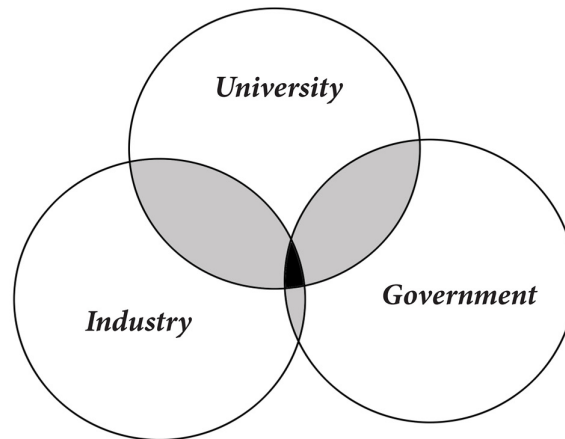


Fig. 5.1: The triple helix model

The government usually provides seed funding, policies, strategies, shares experience, infrastructure and other incentives to stimulate research and innovation. Academia carries out the research that underpins innovation. Their interaction with government and industry increases their likelihood of receiving support to sustain their research on one hand while ensuring that the research focus is in alignment with the needs of the society and the relevant industry on the other.

The industry depends on the government for the right policy environment and incentives. Its interaction with academia also aids in getting the employees and research output required to release innovative products to society. Before that, the industry supports the academia with various skills. These innovative products usually support the government by boosting the economy.

The triple helix model shows the importance of the partnership between government, industry and academia in fostering innovation. Some researchers have expanded the original idea of a triple helix model to a quadruple and quintuple innovation helix framework. The quadruple framework encompasses university (academia), industry, government and the public (Carayannis & Campbell, 2009), while the quintuple shows interactions between academia, industry, government, the public and the environment (Peris-Ortiz, Ferreira, Farinha & Fernandes, 2016).

5.3 Corporate Social Responsibility – History and Win-Win Impact

In this section, the author discusses corporate social responsibility (CSR), its history, its relevance to skills development, its importance and its win-win impact on both the company and society before discussing our partnerships with tech companies in Nigeria in the next section.

5.3.1 The History and Importance of CSR

In the Western world, the documented roots of CSR date back to the 1800s when philanthropists such as Andrew Carnegie and John D. Rockefeller challenged the wealthy to give back to society (ACCP, n.d.). This concept began to extend from the owners of businesses to the businesses themselves around the mid-1900s. Howard Bowen, the man, often referred to as the father of CSR, actively promoted the need for CSR in his 1953 book, *Social Responsibilities of the Businessman* (Bowen, 1953).

In his 1979 book, *A Three-Dimensional Conceptual Model of Corporate Performance*, Professor Archie B. Carroll summarized CSR as being based on a three-pronged approach (Carroll, 1979), as follows:

- i. Companies adopted principles (or ethics);
- ii. Created and executed formal processes (how they would respond); and
- iii. Developed policies (managing specific issues).

Big-tech institutions are now promoting digital related CSR projects as a way of giving back to society.

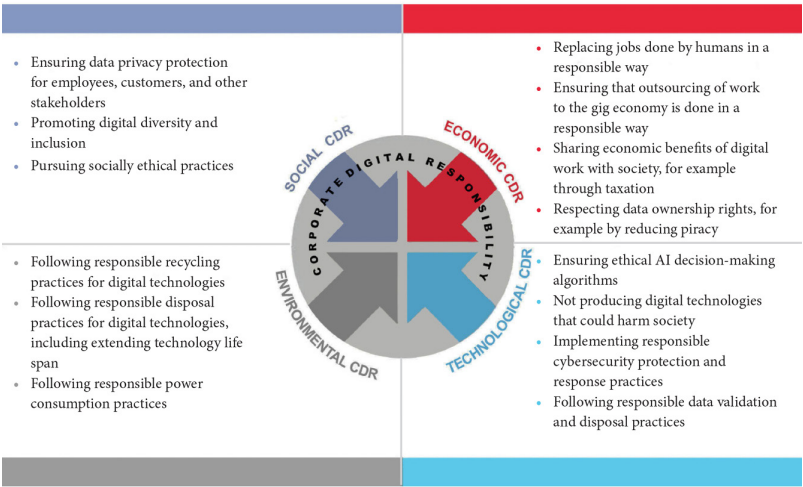


Fig. 5.2: The four aspects of CSR (Wade, 2020)

A Massachusetts Institute of Technology (MIT) article titled “Corporate Responsibility in the Digital Era” discusses the four aspects of CSR, namely the social, economic, technological, and environmental aspects of CDR, as shown in Figure 5.2.

Examples of CSR activities in the digital era include:

- i. Ensuring the adoption of ethical AI technologies;
- ii. Promotion of digital skills;
- iii. Support for responsible cybersecurity practices;
- iv. Promotion of digital identity and data protection programmes; and
- v. Effective utilization of data.

Furthermore, Google LLC has promoted the development and adoption of renewable energy. Microsoft Corporation is committed to supporting climate change efforts by becoming carbon negative in 2030, and Amazon plans to create 1 million new jobs in the Indian SME sector (Swan, 2020). Also, according to Huawei’s 2020 Sustainability Report, the company organized more than 650 charitable activities worldwide. Its flagship CSR programme, Seeds for the Future, has benefited nearly 9,000 students from 130 countries and regions (Jingwen, 2021).

5.3.2 CSR and Its Win-Win Impact

CSR may look like it only benefits the recipients. However, recent research shows that it benefits the companies that provide such services. For example, a survey by The Nielsen Global Survey of corporate social responsibility found that:

- i. 87% of respondents said they are more likely to buy products from a company that cares about CSR;
- ii. 55% of respondents stated that they are willing to pay extra for companies with CSR plans; and
- iii. 67% of correspondents will boycott brands with opposing social values.

Furthermore, research shows that big tech companies are promoting corporate social responsibility to:

- i. Compete for tech talent;
- ii. Compete for customers; and

iii. Elicit goodwill from governments

As the Minister of the Digital Economy sector, I have forged thriving CSR-based partnerships with leading tech companies to accelerate the adoption of digital skills by Nigerians. Some of these companies include:

- i. Huawei;
- ii. Microsoft; and
- iii. IBM.

5.4 Partnerships with Tech Companies in Nigeria

After briefly highlighting CSR and its potential win-win impacts, this section presents some of the partnerships brokered by the author and the attendant CSR initiatives that resulted from those partnerships.

5.4.1 Key Aspects of the Partnership with Huawei

The Memorandum of Understanding (MoU), upon which today's programme is based, covers a three-year period and has the following objectives:

- i. To support the development and promotion of Nigeria's digital economy;
- ii. To improve the ICT technical infrastructure required for the successful development of Nigeria's digital economy;
- iii. To develop no less than 300 'ICT Academies' in top universities, polytechnics and colleges of education in Nigeria;
- iv. To conduct training for no less than 10,000 top ICT students each year and a total of 30,000 ICT talents in a three-year period;
- v. To provide job and experience opportunities for certified students every year of the duration of the programme; and
- vi. To carry out Huawei ICT Talent Cultivation Project.

As part of the implementation of the MoU, Huawei is expected to provide internships for excellent students in ICT competitions. Huawei will cooperate with universities. In addition, Huawei is also expected to donate equipment to selected institutions as part of the Huawei ICT Academy in Nigeria.

Furthermore, Huawei is to facilitate the training of 30,000 students and the provision of 12,000 online testing quotas for the students who have completed

relevant courses and issue them an internationally recognized Huawei certificate.

The MoU Huawei shall conduct yearly ICT competitions for university students for the duration of this MOU. The partnership with Huawei is ongoing and has been very important to our students in higher educational institutions.

5.4.2 Key Aspects of the Partnership with Microsoft Corporation

Microsoft Corporation has been partnering with the Nigerian government for many years. However, since the author became the minister in charge the digital economy sector, we have accelerated these partnerships and laid a lot of emphasis on the need to empower Nigerians with emerging tech skills. Microsoft is partnering with us to deliver content on our online digital academies, including DigitalNigeria.gov.ng and the NITDA Academy. These efforts have contributed to us empowering over 500,000 Nigerians with digital skills.

Furthermore, the author has extended the skills' partnership with Microsoft Corporation. The collaboration is in line with the National Digital Economy Policy and Strategy to upskill up to 5 million Nigerians by 2024. As part of the partnership, Microsoft's Airband team is also expected to work with local partners to improve broadband connectivity and assist with developing and implementing of hyper-scale cloud services.

The new phase of collaboration between Microsoft Corporation and the Nigerian government will focus on three major development areas: skilling, connectivity and digital transformation. The partnership also aims to protect Nigeria's cultural heritage by deploying AI tools.

5.4.3 Key Aspects of the Partnership with IBM Corporation

We commenced a partnership with International Business Machine (IBM) in April 2020 with a focus on digital skills development to provide Nigerians with cutting-edge digital skills within the comfort of their homes.

The partnership leverages IBM's Digital-Nation Africa programme to provide the beneficiaries with over 280+ hours of free learning and 85+ courses on key emerging technologies such as blockchain, artificial intelligence,

big data and cloud computing.

The objectives of the partnership include the following:

- i. To create awareness and support in the development and use of digital tools and applications to improve the delivery of government services;
- ii. To create a pool of Nigerians with digital skills validated by globally recognized certifications;
- iii. To bridge the gap between academia and industry through sensitization on digital tools and skills; and
- iv. To lower the access barrier to digital tools for the citizens.

The areas of collaboration include the following:

- i. Introducing digital skills through IBM Digital-Nation Africa to enable primary and school students to get an introduction to the emerging technologies in the digital world:
 - a. gain an awareness of cloud and AI technologies and why they are important;
 - b. gain an awareness of data science, IoT and blockchain and why they are important; and
 - c. gain an awareness of security and why it's important.
- ii. Collaboration with the universities:
 - a. to engage and motivate students in learning about cutting edge digital technologies;
 - b. empowering the individuals with advanced skills to create innovative solutions that can both solve key challenges in key industry areas in line with the National Digital Economy Policy and Strategy of the Nigerian government;
 - c. enable students to acquire the right skills to fill the new jobs roles created by the latest digital technologies;
 - d. adoption of the platform to complement the under-graduate degree programmes helping ensure that students have the necessary skills to support the 2030 vision (AI, data science, IOT, blockchain, cloud, cybersecurity, etc.); and
 - e. introduction to other IBM university programmes such as academic initiative, skills academy, university awards, internships.
- iii. Activities with local technical partners:
 - a. transfer of knowledge (face-to-face and virtual webinars);

- b. hackathons/competitions in collaboration with both government and private sector to help drive innovation; and
- c. connection with the local business community.

5.5 The Role of the Partnerships in Supporting the Activities of the Ministry

Through the Federal Ministry of Communications and Digital Economy, the federal government of Nigeria, has developed policies and initiated programmes to ensure that we build a nation where digital innovation and entrepreneurship are used to create value and prosperity for all.

Amongst these is the National Digital Economy Policy and Strategy (NDEPS) which was developed as part of efforts to accelerate the development of the digital economy in Nigeria. NDEPS is anchored on eight pillars which address all the key areas that support the economy's development.

Given the nation's large, young, and entrepreneurial population, we recognize that digital entrepreneurship has the potential to become an engine of economic transformation in Nigeria. The digital services development and promotion pillar, therefore, support the development of the digital innovation and entrepreneurial ecosystem. The Nigeria Startup Bill has also recently been approved by the Federal Executive Council (FEC).

In addition, we established the National Centre for Artificial Intelligence and Robotics. We also developed the Nigeria Startup Bill (NSB), which has been approved by the Federal Executive Council after my presentation, and is awaiting approval of the National Assembly. So far, it has gone through second reading. These primary objectives are to create an atmosphere that would usher in an innovation-driven culture among the Nigerian populace.

The author also obtained the approval of the Federal Executive Council to build the National Innovation and Entrepreneurship Centre in Abuja, to be coordinated by NITDA, and also to serve as its office.

Our efforts show our commitment to developing high-level ICT talent in Nigeria and championed programmes as witnesses to this commitment. Skills development is indeed an obligation, not just a necessity. Therefore, efforts must be made to continue promoting it, to produce many more potential job

providers, rather than potential job seekers; to provide potential job employers, rather than just potential job employees.

6



Championing Skills Development through MIT REAP

As mentioned in the previous chapter, academia and industry play a vital role in stimulating innovation and strengthening the research capacity of any nation. With this in mind, as part of the practical steps taken, we explored the possibility of partnering with leading institutions worldwide to strengthen Nigeria's innovation and entrepreneurial ecosystem in 2018. As a result, I led a team from Nigeria to the US to partner with the Massachusetts Institute of Technology (MIT) on their Regional Entrepreneurship Acceleration Program (REAP). This chapter discusses the MIT REAP and how it was used to promote skills development in Nigeria during our modest efforts.

6.1 MIT's Impact on Entrepreneurship and Skills Development

The Massachusetts Institute of Technology (MIT) was established in 1861 and has played a key role in the development of modern technology across the globe. In 2021, QS World University Rankings ranked MIT as the number 1 university in the world for the 10th year in a row (MIT New Office, 2021).

Furthermore, the university has a strong culture of innovation, and as of June 2021, there were 98 Nobel laureates, 26 Turing Award winners, and 8 Field Medalists from the institution (MIT News Office, 2021). The MIT is also well regarded for entrepreneurship and has promoted the concept of innovation-driven enterprises (IDEs) instead of merely focusing on micro, small and medium scale enterprises (MSMEs).

The author has led a team that developed the National Digital Economy Policy and Strategy (NDEPS) for Digital Nigeria. NDEPS appreciates the importance of identifying and supporting Small and Medium Enterprises (SMEs), and it also focuses on encouraging many of these SMEs to go a step

further by aiming to become Innovation-Driven Enterprises (IDEs).

To further illustrate the impact of IDEs in the success story of MIT, imagine the institution as a nation of IDEs. A 2015 Report notes that such an ‘MIT-nation’ would have been the world’s 10th largest economy, with gross revenue falling between the GDP of Russia (\$2.097 trillion) and India (\$1.877 trillion) (Roberts, Murray & Kim, 2015).

Furthermore, the MIT REAP places and emphasis on innovation, research and entrepreneurship. This focus was a main attraction for us as it aligned with our objective of developing Nigeria’s digital economy by supporting the growth of digital innovation, digital entrepreneurship and enhanced research capacity.

6.2 Championing the MIT REAP Team in Nigeria

In a bid to ensure that we take advantage of the opportunities provided by the MIT REAP, the author initiated the process for Nigeria’s participation in the programme. As such, in 2018, he led a team that spent some months evaluating options on programmes that could help deepen the emerging innovativeness among our Nigerian youth and catalyze economic growth in the country. The team decided that the REAP programme offered by MIT is one of the best proven examples of such. Therefore, in January 2019, an application was made to MIT as ‘Team Abuja’.

The selection process was very competitive, involving about 600 team applications. Six teams were eventually selected, and ‘Team Abuja’ was listed as the first team, with the author appointed as the Champion of the Team by the MIT. Team Abuja successfully participated in the two-year programme. We joined MIT REAP in REAP’s 7th cohort. Other members of the cohort included teams from regions in Denmark, Japan, Saudi Arabia and Taiwan (Republic of China (ROC)). Later, the author inaugurated the MIT REAP advisory board and held the first meeting on March 5, 2020.

Similarly, the main purpose of our participation was to adopt and adapt MIT’s proven frameworks on accelerating innovation to create localized strategies for developing and sustaining innovation-driven enterprises. The MIT REAP provides a number of opportunities for communities around the world to engage with MIT in an evidence based, practical approach to

strengthening innovation-driven entrepreneurial ecosystem. Our participation was also inspired by President Muhammadu Buhari's fight against poverty and his focus on economic development.

MIT REAP is designed for high-level teams selected from regions dedicated to working alongside Faculty from MIT over a two-year period to promote innovation-driven entrepreneurship in the economy.

Team Abuja was made up of talented members with varied but valuable backgrounds. The team focused on the following areas:

- i. ICT;
- ii. Agriculture;
- iii. Energy; and
- iv. Construction.

The MIT REAP Team Abuja had stakeholders from relevant sectors of the innovation ecosystem in Abuja, including:

- i. National Information Technology Development Agency;
- ii. Petroleum Equalisation Fund (Management) Board;
- iii. TeasyPay;
- iv. Verdant Agritech;
- v. First Icon Mutual Capital;
- vi. Sigma Pensions;
- vii. Nile University of Nigeria; and
- viii. Abuja enterprise office.

6.3 More Details on the MIT REAP Process

The MIT REAP framework is based on a system developed by MIT. It also involves partnership with relevant stakeholders and adopting appropriate strategies, as shown in Figure 6.1.

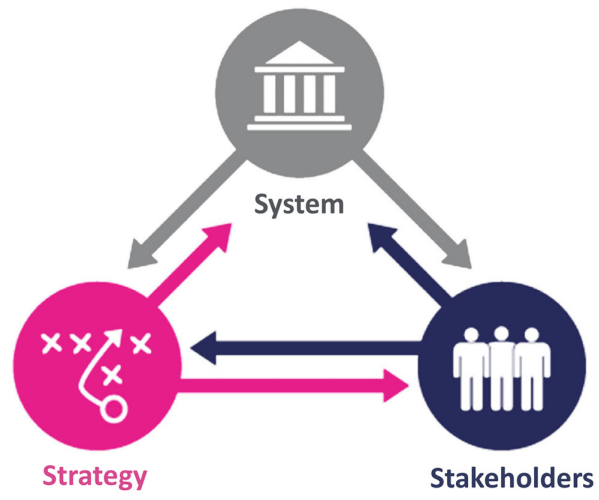


Fig. 6.1: MIT REAP framework (MIT, n.d.)

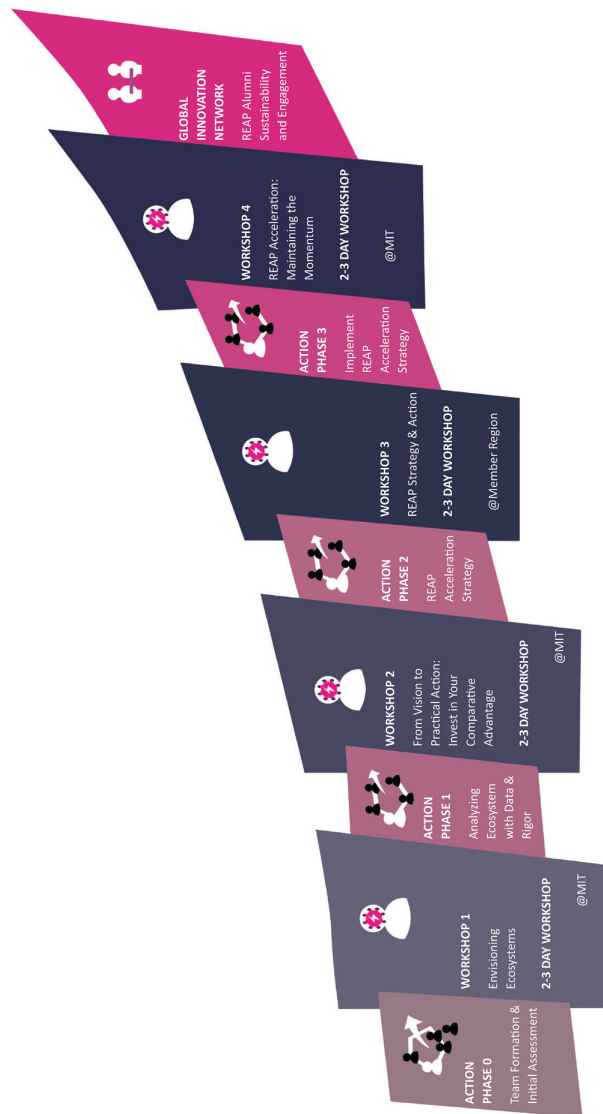


Fig. 6.2: The MIT REAP framework 1 (MIT, n.d.)

The two-year REAP process (Figure 6.2) includes four workshops and five action phases in-between the workshops, with the third workshop being hosted by one of the participating regions.

As mentioned earlier, the IDE approach is somewhat different from the approach of Small and Medium Enterprises (SMEs), and micro, small and medium enterprises (MSMEs). For example, SMEs have been known to be rather averse to risk, even though they are still considered very important to local economies (OECD, 2017). On the other hand, IDEs provide greater economic impact over time but are harder to nurture. IDEs are also more

qualitative than quantitative when compared to SMEs. Figure 6.3 compares SMEs and IDEs, to the average income change over time. REAP is focused on IDEs, and is therefore strategic and long-term.

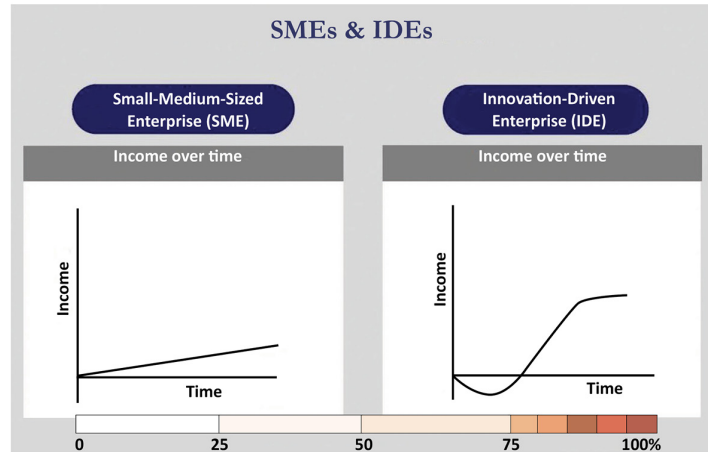


Fig. 6.3: Income generating ability of SMEs vs IDEs

Furthermore, the MIT REAP framework emphasizes the importance of Innovation Capacity (I-CAP) and Entrepreneurial Capacity (E-CAP). The I-CAP is the ability to develop and scale new-to-the-world innovations from inception to the market. On other hand, E-CAP refers to the ability to start and build new-to-the-world enterprises from inception to the market.

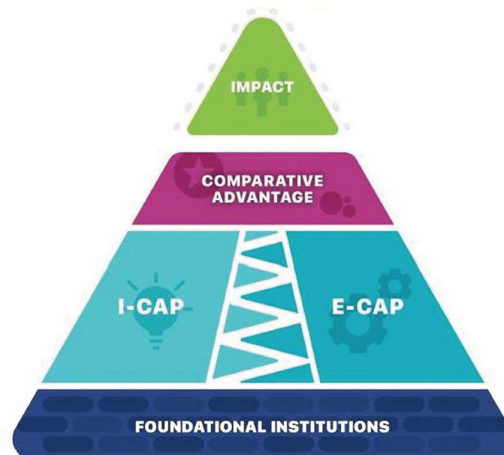


Fig. 6.4: The MIT REAP framework 2 (Budden, Murray & Turskaya, 2019)

The framework also involves the identification of foundational institutions, a focus on comparative advantages and strengths, and measuring impact, as in

Figure 6.4.

6.4 Some Activities of Team Abuja

Team Abuja was admitted into the MIT REAP in 2019 as part of Cohort 7 and the Team was in Cambridge (Boston) in October 2019 for Workshop 1. Workshop 2 was scheduled to hold in June 2020 in Boston, but the COVID-19 pandemic prevented the Team from travelling. Instead, the workshop held virtually with Team Abuja converged at Nile University for it. It lasted for three days, and consisted of lectures and discussions, case study analysis, programmatic deep dives, group work report-outs, and preparation for action phases. The Team also attended Workshop 4 at the MIT Campus in Boston.

Furthermore, as part of the activities of Team Abuja, several policies were analyzed to determine the best way to use them as a catalyst for skills development. The following were some of the policies analyzed.

- i. The Nigeria Startup Bill 2021;
- ii. Tech4COVID Policy Recommendations 2020;
- iii. Venture Capital (Incentives) Act 1993;
- iv. Various Regulatory Frameworks;
- v. Procurement Act 2007; and
- vi. Entrepreneurship Curriculum Review.

The following programme themes were also addressed:

- i. **Catch them early/finders keepers:** This was aimed at building and reinforcing interest in innovation from early age;
- ii. **Accelerate and commercialize innovation:** It was aimed at bridging the gap between business and R&D.
- iii. **Forging more channels** for government and corporate executives to experience local innovations;
- iv. **Project the ecosystem:** This was to raise the profile of Abuja as an innovation ecosystem;
- v. **Profile problems:** This was to get more 'painkiller' solutions in front of risk capital; and
- vi. **Reward** the change makers.

Team Abuja also had several short- to medium-term and long-term

initiatives, as shown in Table 6.1 and Table 6.2, respectively. The first phase of the MIT REAP process was concluded and we graduated from it at the end of 2021. However, we are still in the implementation phase. It was a rich and rewarding experience and we look forward to seeing the impact of the IDEs that the process has supported.

Table 6.1: Short- to medium-term initiatives of Team Abuja

	Indexed Programme(s)	Target Pipeline Point(s)	Expected Outcomes
Mentoring Initiative stakeholders’ interactive online facilitates interactions reneurs, MSMEs he occurrence of en entrepreneurship s, academics, operators and sts. Provide a form to enable wider orship	Accelerate and commercialize innovation	Ideation, polishing and operations	Positive growth across the entrepreneurial value chain and increased employment by creating higher-value products and services with value added where possible and more market linkage
Supporting Nile start-ups/incubation	Catch them early, accelerate and commercialize innovation	Education, ideation, and polishing	Creation of various early and successful enterprises

S/N	Initiative
1.	Entrepreneur N (EMI) – Key st: adoption of an platform that fe between entrep (while driving ti innovation-driv (IDE)), mentor corporates, hub venture capitali: virtualized platt reach for mento
2.	Startup Nile – University’s star system

3.	<p>Skill 'G' & i-FAIR Collaboration – Collaborating with the mentioned institution to deliver practical and innovative entrepreneurial training and prototyping</p>		Polishing	Cross-pollination of ideas, innovations, commercialization (patents & copyrights) and employment opportunities
4.	<p>Pathfinder – entrepreneurship training programmes that provide NYSC members from various back-grounds a knowledge base to partake and learn; form enterprises, or become more suitable for employment</p>	Catch them early	Education and ideation	Entrepreneurship acceleration and job creation
5.	<p>Funding – Set-up a stakeholders fund of funds using the traditional risk capital model. Expand angel network by educating a new base of angel investors and mentors</p>	Accelerate and commercialize innovation	Polishing	Reduced fear of failure by investing in start-ups/firms, commercializing, driving demand and creating sustainable jobs. Enable early-stage businesses valuable resources of funding, time and networks that they need to thrive

6.	General Collaboration – Bringing together other diverse ecosystem actors to work together and develop the ecosystem			Thriving ecosystem, recognized in the world
7.	Ecosystem mapping Exercise	Project the ecosystem	Ideation, polishing, operations and exits	Reliable data for planning and execution
8.	Cowpea project	Profile problems	Ideation	Opportunity to work with IITA and IDEs to jointly solve a current real problem. Nigeria showing capacity to export cowpeas – A high-impact outcome of stimulating AgTech and aiming to raise its proportion in the ecosystem from 21% to 30%
9.	Simpler business, tax and IP registrations	Catch them young	Ideation	The AEA implemented this for Abuja and is widening the base of engagement with educational institutions and hubs to benefit from this

10.	Bridge to mass challenge	Accelerate and commercialize innovation	Ideation, polishing and operations	Raise the profile of start-ups onto a global platform
11.	MIT REAP Lab Abuja	The EBC, project the ecosystem, accelerate and commercialize innovation	Ideation, polishing and operations	Sustain and localize <i>MassChallenge</i> -type initiatives
12.	Arewa Femtech fest	Accelerate and commercialize innovation	Ideation	Increase women participation in the ecosystem
13.	Legatum Foundry Fellowship Nominations	Project the ecosystem, reward the change makers	Operations	Put successful entrepreneurs onto the global map
14.	African Angel Academy and VC4A Drive	Project the ecosystem and profile problems	Polishing and operations	Deepen the angel networks focused on Abuja
15.	NERC Project	Accelerate and commercialize innovation	Operations	Developing a practical govt to IDE PPP arrangement

Table 6.2: Long-term initiatives of Team Abuja

S/N	Initiative	Indexed Programme(s)	Target Pipeline Point(s)	Expected Outcomes
1.	Make entrepreneurship attractive	Catch them early	Interest and education	Interest driving more students into STEM and entrepreneurship skills to provide the next generation of entrepreneurs and employees
2.	Reform curriculum	Catch them early	Education	Match the natural interest with a curriculum that does not discourage students
3.	Start-up Act	All programmes	Entire chain	A complete package of policies and incentives to bring about a sustainable ecosystem
4.	Fellowships and partnerships	Reward the change makers	Education	An MoU with the likes of Legatum and others to upskill young graduate entrepreneurs and other stakeholders
5.	NAVSA	Profile problems	Education and ideation	Demonstrate emerging technology deployments in agriculture at scale
6.	Kuje-Gwagwalada cluster formation	Accelerate and commercialize innovation	Operations	Leverage the area between the AfDB Agro-processing zone and the farming cluster of Kuje to locate an AgTech IDE cluster servicing both markets. Linking innovation to funding

6.5 Impacts of the MIT REAP

MIT REAP Team Abuja's must-win battle is fostering collaboration and promoting successes. This section outlines foundational activities on the MIT REAP and their impacts realized or anticipated. As mentioned, the author of this book is the champion of the MIT REAP in Nigeria and the chairman of its council.

Brief descriptions of these initiatives have now been presented, work done

on them, and the impacts made through them or anticipated to be made.

6.5.1 Entrepreneur Mentoring Initiative (EMI)

EMI is an online platform for the entire ecosystem interaction and data aggregation. The online portal was designed to facilitate interaction between the micro, small and medium enterprises (MSMEs) while driving innovation-driven entrepreneurship (IDE), mentors, academics, corporates and venture capitalists.

As the development of the platform is completed, it will be used to provide business development services, entrepreneurial training, access to finance by Nigerian entrepreneurs and data collection from these. Users of the platform include start-ups, mentors, academics, corporate organizations and venture capitalists. Impacts of the EMI initiative are increased ecosystem collaboration, access to funding for innovation, capacity building, access to opportunities and information gathering for informed decision-making.

6.5.2 Collaborations/Partnerships on Start-up Programmes

Collaborations and partnerships are major components of the MIT REAP programme. Accordingly, we collaborated with various players in the innovation ecosystem on several programmes, including Startup Nile, Skill 'G' & i-FAIR collaboration, Arewa Femtech Fest, African Angel Academy, Simpler Business, Tax and IP Registrations and Legatum Foundry Fellowship 2022.

Startup Nile was a programme designed to create an interactive platform for start-ups, academics and industry. Skill 'G' & i-FAIR collaboration was a programme aimed at matching start-ups with funding and other partnerships. Arewa Femtech Fest is a start-up programme to increase women participation in technology innovation. African Angel Academy (AAA) and Venture Capital for Africa (VC4A) drive were capacity-building and mentorship programmes on angel investment. Simpler business, tax and IP registrations is an initiative of the Abuja Enterprise Agency (AEA) to ease business in Nigeria by centralizing physical access to the different government agencies. Legatum Foundry Fellowship is a USA-based organization that identifies and mentors IDE start-ups to thrive.

The REAP Team was an active contributor and facilitator in these programmes. Furthermore, a memorandum of understanding (MOU) has

been signed with the academia partner – Nile University on the simpler business, tax and IP registrations programme, to support student entrepreneurs. Impacts of these engagements include increased awareness creation of the opportunities in the ecosystem and advanced networking among start-ups (and other ecosystem members).

6.5.3 The Cowpea Project

This project provided an opportunity where REAP members worked jointly with the International Institute of Tropical Agriculture (IITA) and IDEs to stimulate AgTech, raising its proportion in the ecosystem from 21% to 30%. After various engagements and brainstorming with IITA, cowpeas was identified as the product to demonstrate achieving Nigeria’s must-win battle (MBW). Currently, Nigeria is one of the highest producers globally, but Nigeria cannot export cowpeas due to food safety concerns.

Based on the lessons learned from the engagements, Nigeria’s economy will soon benefit from the REAP efforts on this project. We expect shipment of cowpea to the EU and acceptance on delivery very soon.

6.5.4 Bridge to MassChallenge

MassChallenge is a non-profit organization supporting innovation and entrepreneurship through collaboration and development. Through engaging *MassChallenge*, Bridge to *MassChallenge* Nigeria was created in July 2021 to focus on identifying sector-agnostic IDE potential start-ups and supporting them with access to capacity building through boot camps, global mentors, and industry experts and access to funding.

The REAP Team and other stakeholders, conducted a stake-holder mapping through an online engagement with the different players in the Nigerian ecosystem in July 2021. Each stakeholder group consisted of 8-10 representatives across Nigeria from government, hubs, academia, industry, entrepreneur, corporates/NGOs and risk capital (investment). *MassChallenge* identified and sourced 30 top start-up applicants through industry-leading research and vetting methodology. At the end, the judges identified the ten highest-potential start-ups who would participate in a final round of judging by the top leaders in the innovation ecosystem.

The outcome of this effort is that the top ten start-ups were selected to

participate in a tailored accelerator programme that gives them the right resources at the right time to grow their businesses. In addition, *MassChallenge* brings together the entire ecosystem to support its entrepreneurs: investors, corporations, government, the non-profit sector, media, and universities.

6.5.5 MIT REAP Lab Abuja

The MIT REAP lab is a physical innovation lab designed to enable the team to drive capacity building from the REAP programme. It serves as a testing ground or sandbox environment for the REAP initiatives.

The key objectives of the lab are to complement offerings of existing hubs, provide skills and tools that are harder to find across the ecosystem, enable demand growth through open executive briefing centre (EBC) facilities, and to serve as a control environment to assess impact of new initiatives.

Efforts toward completing and commissioning the laboratory have reached an advanced stage. The lab is expected to be finally commissioned in the second quarter of 2022.

6.5.6 The Nigeria Startup Bill

Through the REAP programme, there have been more deliberate efforts to create an enabling environment for innovation and entrepreneurship. This led to the draft of the Nigerian Digital Innovation and Entrepreneurship Policy (NDIEP) as an attempt to implement NDEPS. The input from NDIEP has been used to develop the Nigeria Startup Bill 2021 and Team Abuja members have been involved in the processes from inception.

The Nigeria Startup Bill project is a joint initiative by Nigeria's tech start-up ecosystem and the presidency, championed by the author. The objectives of the bill are to harness the potential of Nigeria's digital economy through co-created regulation, and to ensure that Nigerian laws and regulations are friendly, clear, planned and work for the tech ecosystem. Another objective is for the bill to contribute to creating an enabling environment and to supercharge investment in tech start-ups.

At the time of writing, the Nigeria Startup Bill had been created and validated by Ministries, Departments and Agencies (MDAs), endorsed by the

ecosystem, the Ministry of Justice and the Federal Executive Council approved it after my presentation. The President, Federal Republic of Nigeria, has transmitted the final draft to the National Assembly for consideration. So far, it has gone through first and second readings. On April 19, 2022, I was in the National Assembly to defend the bill before the committee under the leadership of the House Leader. The defence was very successful.



Summary, Conclusions and Recommendations

This chapter summarizes our modest efforts on the promotion of skills development rather than relying on mere paper qualifications and degrees that cognate skills cannot validate. After the summary, the author made some concluding remarks in Section 7.2. Finally, recommendations were made to governments, public and private enterprises, academia, venture capitalists and start-ups for effective and sustained development of the Nigerian entrepreneurship ecosystem.

7.1 Summary

The first chapter introduced the primary motivation for the book – promoting the acquisition and application of skills. It also discussed the need for a paradigm shift from possession of mere certificates/degrees to a focus on skills or, better still, possession of certificates and degrees that can be validated by the cognate skills of the certificates/degree holders. The paradigm shift is necessary to overcome the problems of evolving work requirements, unemployment and unemployability while empowering skillful people the opportunity of freelancing that is becoming increasingly popular worldwide.

Having given a background on the necessity and importance of skills, I then focused, in the second chapter, on the meaning of skills and the various types of skills, especially those needed in the Fourth Industrial Revolution and perhaps, beyond. The chapter also distinguished and discussed non-technical skills that are transferable and technical skills that are job-specific. The need to have the right mix of both technical and non-technical skills was emphasized to allow owners of these skills to thrive in the disruptive Fourth Industrial Revolution era. Digital skills, among the technical skills, are arguably among the most critical in the 4IR era and have been somewhat elaborated on in the chapter.

To buttress the need for the paradigm shift to skills rather than mere certificates, I presented case studies of some countries and tech companies, highlighting how they promoted this paradigm shift. For example, the ‘merit system’ introduced by an Executive Order of President Donald Trump promoted the increased use of skills and competency-based assessments in the federal hiring process of the US government. Similarly, the prioritization of vocational education by the Moroccan government enabled Moroccans to get dignified jobs within and outside the country. The fact that Switzerland had the most highly-skilled workers in the world in 2019 was attributable largely to its world-leading vocational education and training system, which was designed to enable easy access to the world of work. The chapter also highlighted how companies place a premium on specific skills rather than generic degree-based skills that may not always be validatable by the degree holders.

In Chapter 4, I discussed some cities and institutions worldwide highlighting their approaches to attracting, nurturing and retaining top tech skills, as well as being consistent in their success stories over the years. Coverage included Silicon Valley, described as home to the highest number of tech jobs per capita and the Indian Institutes of Technology, known for their reputation as the leading exporter of tech talent to the world. The key factors that led to the success stories of these cities and institutions have been highlighted in the chapter.

I discussed partnerships and corporate social responsibility and the roles they play in skills development, application and job creation, and enhancing the technology ecosystem in Chapter 5. I also discussed the triple helix model for promoting innovation. The chapter provided a brief history and importance of corporate social responsibility, and key aspects of partnerships brokered by the author with major companies and the attendant CSR initiatives that resulted from those partnerships.

Building on the coverage of partnership in Chapter 5, I discussed the MIT Regional Entrepreneurship Acceleration Program (REAP) in Chapter 6. MIT REAP is a dynamic global initiative that engages with communities worldwide to strengthen innovation-driven entrepreneurial ecosystems and transform economies. The chapter presented how the author championed the MIT REAP in Nigeria – through Team Abuja – along with various stakeholders, highlighting the activities and programmes. The chapter also presented

potential benefits accruable to the Nigerian innovation and entrepreneurship ecosystems due to these activities and programmes.

7.2 Conclusions

There is a preponderance of certificate and degree holders in Nigeria and other developing countries, just as there is a preponderance of complaints about the lack of skills by many certificate and degree holders. Ideally, a certificate or degree from a good institution should embed and ensure skills, but practical experiences show that this is not the case in many instances in Nigeria and other developing countries around the world. This book, *Skills Rather than Just Degrees*, aims to draw attention to this danger and to encourage all stakeholders to give skills their rightful important place in our educational systems.

In presenting the importance of transitioning to skills from degrees, I surveyed some leading economies, tech companies, cities and institutions, highlighting the key strategies they employed, including a strong emphasis on skills rather than certificates, that kept them ahead of the competition in a sustainable way.

I documented some of the modest activities by learning from the initiatives and programmes of leading economies, tech companies, cities and institutions. In addition, I championed activities aimed at enhancing awareness, innovation and entrepreneurial development and the overall advancement of the innovation and entrepreneurship ecosystem in Nigeria and other developing economies.

Skills form the foundation of innovation and entrepreneurship, and digital skills are the currency of the digital era, characterized by disruption and transformation. Of course, the best outcome is having certificate and degree holders with the requisite skills to validate the certificates/degrees. If this is not obtainable, it is better to have skills without degrees than to have degrees without skills. By providing skills, we are providing potential employers, rather than potential employees.

7.3 Recommendations

The nature of work and careers is changing fast, and in the future, the right skills will be prized over academic qualifications alone. [According to the World](#)

[Economic Forum](#) (2020b), more than one billion jobs, almost one-third of all jobs worldwide, will likely be transformed by technology in the next decade. There will be a rapid influx of roles at the forefront of the data and AI economy, and new roles in engineering, cloud computing and product development. Therefore, Nigeria and other developing countries need to urgently prepare in order to partake and remain relevant and active players in the inevitable disruptive future.

I make the following recommendations for Nigeria and other developing countries to develop the skills profile of their citizens and for enhancing their innovation and entrepreneurship ecosystems:

- i. Transform education and training institutions to become knowledge-based institutions focusing on skills development. This may begin by identifying some institutions as special purpose vehicles model knowledge institutions for developing of high tech skills that serve the purposes of the present and likely future job requirements.
- ii. In particular, there is a strong need to make strategic and smart investments in the early years education and training for today's – and tomorrow's – workforce to sustain economic transformation with equity. Universal foundational skills – cognitive and socio-emotional – of children, youth, and adults should be prioritized by investing selectively in technical skills tied to growing sectors and implementing reforms to ensure value for money in education and training programmes.
- iii. (ii) Promote the adoption of modern teaching and learning methods – team-based learning, project-based learning, practical application, business exposure, etc. – that promote both technical and non-technical skills, which empower learners to be adaptable, resilient and creative.
- iv. Facilitate and promote internship and mentorship by hand-holding amateurs to become inventors through training on positive thinking and embracing failure as a stepping stone to success. Proper mentorship prepares citizens for jobs, entrepreneurship, and research while developing in them a culture of inquiry and thirst for experimentation.
- v. Facilitate partnerships between government, academia and industry to bridge the gaps between theory and practice, mentor and mentee, as

- well as between start-ups and access to funding.
- vi. Invest in research and development. While skills development is important and necessary for a country's meaningful participation in the transformation era, it may not be sufficient to place the country in a competitive or leadership position in the race towards development. High and sustained investment in research – basic and applied – is necessary to provide the opportunity to break new frontiers and provide direction for the industry.
 - vii. Create an enabling and business-friendly environment. This should attract indigenous and foreign investors into the innovation and entrepreneurship ecosystem that would make it flourish.

I am convinced that when these recommendations are implemented faithfully along with other case studies discussed in this book, they will enhance the visibility, development and leadership of Nigeria and other developing countries, economically and technologically.

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Review and Praise for *Skills Rather Than Just Degrees*

Prof. Isa Ali Ibrahim's Book – A Wake-Up Call To Africa

The digital realities of this contemporary era can best be described as

disruptive. Nothing is the same anymore. The frontiers of knowledge have never been so assaulted that nothing seems impossible anymore. Obsolescence stares at any human enterprise that is fixated because of the torrential wind of technology, the wind of change that is sweeping the entire human ecosystem. As one of the foremost agents of change, our educational system has attracted the severest criticism under the prevailing circumstances owing to its snail-paced response or palpable inability in addressing the new paradigm shift confronting man's existence on the planet earth.

Isa Ali Ibrahim's book, *Skills Rather Than Just Degrees*, could not have been published at a more auspicious time than now. The book reveals the underbelly of the education system, especially in Africa, when it comes to addressing real-life global issues. It beams a critical light on our educational curriculum and the mindset of the drivers of the system. The curriculum has remained basically inelastic and so has resisted re-jigging even in the face of irrelevance. Legacy thinking holds sway, thus emasculating any attempt at innovation and skills-driven initiatives. As a consequence, our schools have continued to produce graduates equipped with head-knowledge that has no connection with their hands and minds (technical, emotional, cognitive and cross-cutting digital skills).

Ibrahim amplifies the need for the institutionalization of the triple helix model as a veritable tool to recalibrate our participation in the knowledge-driven global economy. For the educational institution to be skill-oriented, there must be an operational confluence of academia, industry and government to address common problems facing humanity. The current situation where these parts of society work in silos explains why our indigenous efforts at industrialization lack focus, relevance and sustainability in Africa.

As currently configured and operated, our formal education curriculum may not be sufficiently primed to accommodate aspects of the informal system that is strong in skills training. Our workshops and laboratories are merely cosmetic and pale simulations of the real world of work and so fall flat in equipping the students for life outside the campus. Therefore, there is a need for the 'gown and town' to interface under an apprenticeship system of education designed to equip students of tertiary institutions with skills.

Ibrahim's insight resonates with the novel thinking that students should now

occupy the driver's seat while their teachers serve as coaches. The new role of the teacher would now have to be how to assist the student to actualize their national inclination rather than the old method where the system literally 'forces' the student to be what it wants them to be. Stretched, this raises questions as to how and where the sabbatical leave of staff should be spent – in another university doing the same thing or in industry to be exposed to real-life experiences?

Isa Ali Ibrahim had his scholastic foundation at the Abubakar Tafawa Balewa University, where he earned his first and two master's degrees. As the vice chancellor of his alma mater, I make bold to say that the author is a product of rich intellectual heritage. We are proud of him and associate with his numerous intellectual exploits and all the accolades he has won for himself and the nation.

His book has unveiled an important area of national interest, and we hope that a robust and dispassionate discourse will ensue.

Congrats, the Great Balewites!

Professor M.A. Abdulazeez, FNIP

Vice Chancellor

Abubakar Tafawa Balewa University (ATBU), Bauchi

2022

Hidden Treasures Revealed – The Book, *Skills Rather Than Just Degrees* by Professor Isa Ali Ibrahim (Pantami)

Less than 24 hours ago, before the request for my review of this book, the author had mesmerized the audience I was part of with his in-depth knowledge and passion for communications and digital economy. Having heard from the author and having read this book, I can justifiably state that indeed the book reveals the hidden treasures in communication and digital economy such that the reader will have no difficulty understanding the importance of skills, communications and digital economy and the application

of such knowledge to solving current societal challenges such as employability, unemployment and underemployment in developing economies such as Nigeria.

Skills Rather Than Just Degrees is a masterpiece from a master digital strategist. Written in 7 chapters, with 19 figures, 6 tables, a list of abbreviations and references, the book, in its simple language is a book that is easy to read and understand. The author relied on his vast experiences acquired through various degrees, certificates and skills to put down the very essential information needed in this digital era.

In Chapter 1, the book, in no mistaken terms states what skills are, what a workforce is, and the combination of a skilled workforce as the ultimate goal for innovation-driven entrepreneurship in a rapidly evolving work environment. Chapter 2 lays out the requirements of the 4th Industrial Revolution (4IR) as skills for the future which includes artificial intelligence, robotics, cloud computing, creative thinking, amongst others. In Chapter 3, case studies of selected countries and high-tech companies were presented with robust statistics to take the reader through initiatives for promoting skills development, applications, adoption, policy formulation, executive orders and the production of highly skilled and competent employable citizens. The Gmail story, Amazon, General Motors, Apple, and Microsoft stories were all extensively discussed as global approaches in the high-tech ecosystem through innovation-driven entrepreneurship. In Chapter 4, using examples such as Silicon Valley, the Indian Institute of Technology and Nigeria's Yaba, the author presented unique approaches to the development of top tech skills, wealth creation and rising GDP per capita for countries and companies.

Isa Ibrahim, in Chapter 5, posited that bridging the industry-academia divide is a prerequisite to enhancing capacity development and creation of job opportunities for the citizenry. The triple helix model promotes innovation, the emergence of tech/biotech companies, high-impact research with tremendous benefits of the partnership between nations and high-tech companies. The academia-public-sector-industry (API) collaboration, as proposed by the author, will accelerate tech innovation in which government provides funding and policies, academia support with high-impact research and knowledge transfer while the industry provides the skills and products. The author described corporate social responsibility as a win-win impact for all

stakeholders. This chapter ends with the author's role in fostering many industry partnerships with high-tech companies such as Huawei, Microsoft, IBM and the abundant benefits to government, ministries and agencies in Nigeria.

Chapter 6 lays out the benefits of the MIT REAP in Nigeria and the development of skills, entrepreneurship, innovations, mentoring, start-ups, spin-offs, MassChallenge (capacity building), the Nigeria Startup Bill, amongst others.

In the concluding Chapter 7, the global IT citizen and author of the book drew the reader's attention to the crucial issues of the book, that is the need for the production of skilful graduates rather than graduates without skills. He reiterated the need to tilt the balance in favour of skills rather than just degrees. He also discussed education curricula reviews are needed to ensure that digital skills which form the foundation of innovation and entrepreneurship of the digital era, are emphasized to equip the certificate/degree holder with the requisite skills. The author's recommendations, if implemented, would transform educational institutions with a focus on skills development, lead to the adoption of project-based learning, promote internships/mentoring, facilitate partnerships, promote investments in high- impact research and development and overall create business-friendly environment that would attract indigenous and foreign investors into innovation and entrepreneurship in Nigeria and other developing countries.

Professor Isa Ibrahim's book, *Skills Rather Than Just Degrees*, is a must-read from beginning to end. I have no hesitation in recommending this book to all men and women of goodwill all over the world. Every reader, whether in government, agencies, ministries and parastatals, businesses, investors, administrators, and students will find the book a worthy companion and veritable source of information to change the ways things are done and transform our digital economy. The time to do away with the production of unemployable citizens is now: Skills! Skills!! Skills!!! Rather than Just Degrees.

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July 2022

Skills Rather Than Just Degrees

The modern workplace is a realm, and many a time consists of people working from different locations. While some of the workforce may be full-time employees, others may be on contract or part-time. Co-workers can work together for many years without meeting physically. For the modern workforce to survive and succeed in the modern workplace, it must acquire modern time skills for better service delivery.

The Honourable Minister of Communications and Digital Economy, Professor Isa Ali Ibrahim (Pantami), a Professor of Cybersecurity and an expert in digital economy, has made a deliberate attempt in this book, *Skills Rather Than Just Degrees*, to address the major problem facing modern workforce – lack of skills of modern times.

This book provides the answer to the problem of unemployment and unemployability in Nigeria. The author has shown that the way out of this quagmire is to shift towards the provision of broad skills and abilities required to be successful in modern society. The skills, as contained in the book, include learning skills – creativity, critical thinking ability, collaboration and communication; literacy skills – information, media and technology literacy; and life skills – social and leadership skills.

Although we may not anticipate the technology of tomorrow, this book has provided the idea to prepare for career success by focusing on the fundamental skills required for the changing times. The tools the workforce use today to execute jobs may be obsolete in the next ten to twenty years. However, the soft and hard skills one acquires, which are the major focus of this book, will last a lifetime.

In a nutshell, Professor Isa Ali Ibrahim Pantami's *Skills Rather Than Just Degrees* is a work of an erudite scholar that will serve as reference material for scholars, researchers, students and society at large.

Professor Sagir Adamu Abbas, *FMAN*

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