

Smart Futures Tunisia

Exploring the Digital Skills of Tomorrow

Implemented by

What could and should Tunisia look like in 2035?

Smart Futures Tunisia

Commencing a Foresight Journey

What COULD and what SHOULD Tunisia and its digital economy look like in 2035? This was the guiding question of the foresight journey on which Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH embarked with multiple stakeholders that are shaping the future of Tunisia. Jointly, a visual future scenario was developed and discussed to create a visionary basis for recommendations on how the Tunisian society can develop the skills that will be needed in 2035. This report entails the main results of the foresight journey, including the visual future scenario, an accompanying narrative and thoughts regarding future jobs and skills in the digital economy. First recommendations are formulated, including steps on how the foresight journey could - and should - be continued.

Globally, policy-makers, development organizations, corporations, non-governmental organizations and many more institutions are increasingly referring to foresight methodologies as a way to creatively approach future planning.

Instead of trying to predict the future, foresight allows for an interactive, visionary, but still systematic way of thinking about the future, or, more precisely, the multiple futures that could - and should - occur. Foresight is therefore all about developing a joint vision of desirable futures and using this as a basis to develop strategies, policy recommendations or necessary measures for multiple stakeholders.

The aim of Smart Futures Tunisia is specifically to commence a foresight journey for Tunisia and its digital economy with a focus on questions related to labour markets and digital skills that will be crucial in the future.

While many interviews were conducted to prepare and validate thoughts, an on-site Workshop in Tunis over 2.5 days served as a core component of Smart Futures Tunisia.

Throughout the event, various interactive sessions took place, all inviting and guiding participants from many different fields, including start-ups, NGOs, companies and public representatives, to think out of the box and jointly create a desirable future scenario for Tunisia in 2035. Implications for labour markets and the skills demand in Tunisia were discussed as well as first recommendations on how the Tunisian population can be prepared for the digital transformation that already is in full swing.

The present document contains a narrative description of the future scenario that was developed by participants, including the working steps that were accomplished to get there. It furthermore includes inspirational job profiles of the future that were derived out of the future scenario. With this, Smart Futures Tunisia provides a basis for further deep-dives that elaborate on specific tech areas or recommendations in more detail.

Let's continue this dynamic journey and shape Tunisia's digital economy together!

1 Future Scenario

What could and should Tunisia look like in 2035?

2 Future Jobs

What are the jobs and digital skills of the future?

3 Recommendations

What needs to be done on the road towards 2035?

I would like to live in a future where...

- ... excellent education and digital literacy is affordable for all
- ... Tunisia is shining with a strong economy and a stable social and ecological environment
- ... people are more tolerant and accepting of their differences
- ... opportunities & good life conditions are the same for everyone, everywhere
- ... everyone takes responsibility to make the world a better place
- ... there is accessible health care
- ... free and competitive markets reign without monopolies
- ... systems are in place to ensure that institutions, people and the planet are respected
- ... technologies do not erase important values, emotions or connections between people & countries

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Future Scenario Narrative

The future scenario envisions Tunisia in 2035 by particularly exploring how urban areas, smaller cities and rural areas will look.

Living

In 2035, Tunisia is a place with more dedicated space for parks and trees in the city, which will have significant visual effects on cityscapes and also architecture. New buildings in cities will be larger than today and much “greener” with gardening possibilities that are integrated in their architecture, be it on roofs or walls in the form of vertical gardens. This will contribute to better air quality and CO₂ reduction, and also provide shade, which will be more and more necessary to escape the temperatures that are expected to rise. New constructions will also without exception follow energy efficiency principles with solar power being the main energy source.

Looking into houses, Internet of Things (IoT) solutions will have become a major component when it comes to ensuring a good interaction between people and the variety of smart devices in their homes. They will help to foster responsible energy usage as well as sustainable and healthy living and consumption. This could include IoT sensors for wastewater and congestion monitoring, lighting sensors and fire detection systems, real-time air quality monitoring as well as smart energy solutions that help make data-backed decisions for better energy storage and distribution.

Larger buildings, such as compounds, will have integrated recycling hubs that allow for customized on-site recycling and reusing of selected materials. 3D printing could become a technology that is used at a household level and integrated in such recycling hubs that transform specific waste into filament for 3D printers.

Waste that cannot be recycled through local in-house solutions will be collected by more automated public waste management, with artificial intelligence (AI) based collection schedules and route planning.

Deep Dive Questions

How “smart” will Tunisian buildings be in 2035?

Will digitalisation decrease the ecological footprint of Tunisian cities? How?

“E-government could contribute to more efficient services and also higher credibility, when it comes to unlocking financing opportunities for the country.”

Amel Saidane
Techentrepreneur, Founder & CEO
Betacube, Tunisia

Public Services

One area that is expected to become the subject of strong digitization is the public sphere. Significantly more “govtech” and “e-government” solutions are expected to exist in 2035, meaning any type of digital service that allows citizens to communicate with public entities and participate in political decision-making. This could include tax and land management, business registrations or local governance. A digital platform will exist for these purposes, with a biometric mobile ID being the backbone of this system and allowing every citizen to access those services.

The digitalization of public services will increase transparency and trust in public institutions, for instance by displaying how public funds are spent and decisions are made and to show possibilities of how citizens can participate. Yet, it is unclear how fragile this trust will be and to what extent people will use those services. Cybersecurity standards are certainly a strong requirement in this regard, particularly when it comes to more complex processes such as elections or identity certifications. However, if cybersecurity can be ensured, e-government solutions could contribute to more efficiency in public services, successes in the fight against corruption and overall high credibility of public and administrative processes.

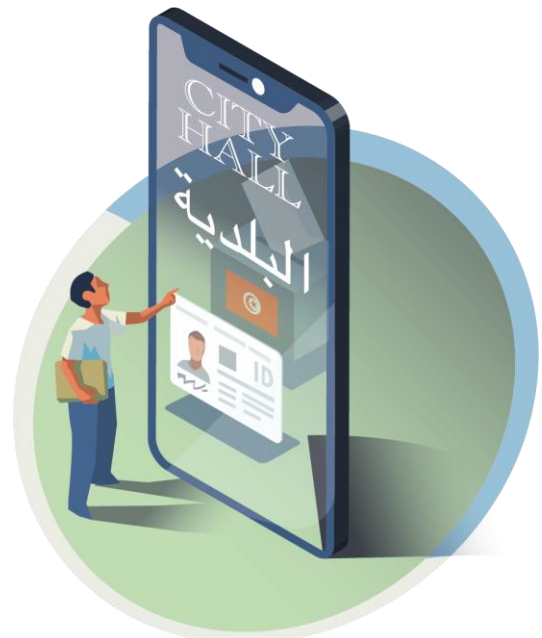
With this, a physical city hall is still likely to exist in 2035, but its purpose, services and offers will increasingly shift towards becoming a centre for people to meet, exchange and participate in public governance.

In city halls, booths that bundle various types of digital public services will facilitate communication and interaction with citizens. Nevertheless, human public servants will act as “Digital Services Scouts” and complement the scene by helping people to operate the machines.

Deep Dive Questions

How will the current trade barriers evolve/be solved in the next 10-15 years?

Will people trust a digital government platform in 2035?



“The development of the Internet of Things will mainly depend on regulatory aspects, on the protection of personal data, which is very important.”

Khaled Dridi
Director
PwC, Tunisia

“There is a clear trend towards private education. The number of students who join private education is increasing by a two digit number.”

Houda Ghozzi
 Founder
 Open Start up International, Tunisia

Education

When it comes to education and learning, a significant trend towards more open access to international and innovative content is expected.

In particular, private universities and educational institutions will play a major role with regards to the use of digital technologies, including hologram teachers or augmented reality teaching content that will allow students to have more direct and authentic learning experiences. Gamified learning will also be more popular with the adaptation of VR technology and the metaverse. While some of these courses will still require physical presence in educational institutions, “home schooling” will be much more prevalent, with virtual classrooms in the metaverse and more flexible possibilities for students to shape their curriculums, projects and schedules. The more basic digital offerings will also increase accessibility to education in the remote areas of Tunisia.

Moreover, digitalisation will contribute to the liberalization of curriculums and certifications, which will be driven by the already-mentioned

increased access to educational content from all over the world and the lowered importance that employers will give to traditional educational paths. As digitization leads to more transparency with regards to people’s achievements, other “proofs” of competence or “digital track records” will compete with formal education certificates when it comes to employability.

Employers will also more actively have entered the market as education providers, offering specific skills training in Technical and Vocational Training Centers that focus on applied learning journeys.

Deep Dive Questions

Will technology increase the inclusiveness of the Tunisian education sector?

Will children in primary schools still be taught by human teachers in 2035?



“With the new law for mobile payment and mobile identity, e-commerce is something that will certainly further develop.”

Khaled Dridi
Director
PwC, Tunisia

E-commerce

Another area that is expected to witness significant digital advancements is e-commerce. The regulatory conditions surrounding commercial activities will be much more flexible by 2035 and thus favour remote transactions (allowing e.g. the ownership of credit cards, international financial transactions or investments).

Digital payment solutions will therefore also predominate any formal transaction. An “African Digital Coin” could exist to facilitate transactions within Tunisia and abroad. However, the informal sector is still expected to play a strong role in 2035, making cash transactions irreplaceable for any form of informal trade. In addition, tokenization will overall have become prevalent, allowing institutions and individuals to trade any type of asset without the need for a third-party intermediary.

E-commerce will have grown considerably by 2035, not only as a distribution channel for larger commercial players, but also for consumers and individuals who will to a large extent have become “consumer entrepreneurs” that buy and sell products and services through dedicated digital platforms.

This will mainly affect the way in which people trade consumer goods, including fashion, home appliances and electronics, thereby giving products not only one but several

lives in the hands of different users. But also single-consumption products, including food, media or also services will to a large extent be bought through e-commerce platforms, leading to a much more decentralized commercial landscape.

From a social perspective, advancements in e-commerce will provide growing opportunities in the field of women entrepreneurship. In particular, it is expected that e-commerce platforms will allow people with physical or social mobility restrictions to set up their micro-businesses from home and thus earn income more flexibly. Furthermore, the elderly will also benefit from increasing and improved e-commerce opportunities, particularly as the delivery of products bought remotely will have advanced significantly with regards to their reliability and accessibility. AI-based features will help elderly people when it comes to finding the right digital offers and making use of them.

From an environmental perspective, more efficient and climate-neutral solutions are expected to prevail. With regards to last-mile delivery, this will include traceable drones that deliver products to micro depots or other pick-up stations, thereby making e-commerce more convenient and trustworthy.

Deep Dive Questions

How will e-commerce have affected Tunisian cityscapes by 2035?

What are the main products and services that will be traded through e-commerce?

“FinTech is very important because it's going to enable a lot of other sectors. It's going to open doors for any type of service that can be paid or used remotely. It can enable a lot in terms of eCommerce. It has such massive potential, but large parts are happening in the informal market, it's all cash and delivery.”

Amel Saidane
Techentrepreneur, Founder & CEO
Betacube, Tunisia



Health

Digitization will furthermore also lead to significant changes in the health sector, affecting all steps of a patient's journey, including the booking of appointments, communication with doctors and medical staff, diagnostics and treatment. Digital health platforms will be a major infrastructural element in this regard and provide transparency about doctors, services, availability of medicine in pharmacies and prices of health services. The backbone of this system will be built on digital health files that are connected to health insurances but owned and managed by patients. Automatic medical transcribing could reduce doctors' time spent on bureaucratic tasks and potential errors by automatically adding medical notes to patients' health data during doctors visits. Data security of such sensitive data will play an important role and advanced security measures will be in place.

Overall there will be many more wearable technologies and apps that allow for more automated diagnostics and treatment monitoring.



This will lead to a more decentralized health system, with telemedicine and medical hubs being important intermediaries between patients and doctors.

Robots could even become a major element of routine treatments at home and automated systems could become smart detectors of emergencies. VR technology will play a significant role in the health industry, e.g. in surgeon training, treatment of mental disorders or physiotherapy treatment. Selected hospitals will be equipped with automated ("robot") surgery equipment for specific treatments.

Given the current challenge of access to health-care in remote areas, small cities spread throughout the country will be equipped with telemedical hubs by 2035 . There, patients will be attended by basic medical staff and have access to digital diagnostic solutions as well as medical advice from medical specialists from both Tunisia and abroad (e.g. Tunisian diaspora).

Deep Dive Questions

Will digitisation increase access to health care for marginalised populations in Tunisia?

How will new technologies affect the quality of health services?

“The adaption of new technologies in agriculture will depend not only on the returns to those technologies but also on the purchasing power of farmers.”

Keith Wiebe
Senior Research Fellow
International Food Policy Research Institute, USA



Water

As water scarcity and thus shortages will become more dramatic in the future, new technologies such as “Kumulus”-style Atmospheric Water Generators will be placed at strategically relevant locations such as schools and hospitals to ensure the population’s access to clean drinking water.

Given the dryness and water scarcity that is expected in the future, desalination stations will become a widespread technology to generate clean drinking water. Requiring more space, they will largely be located in rural settings.

Deep Dive Questions

What will be major tech innovations in food production in Tunisia by 2035?

Is digitalisation a lever when it comes to tackling water or food scarcity and equity in access?

Food

“Less meat and less sugar!”

Overall, eating habits and food preferences are shifting towards healthier ingredients, sustainable production processes and organic agriculture, as well as more sustainable solutions in food logistics and production that will reduce food and food-related waste. Media campaigns will be a major driver in this regard as well as a traffic light system to signal healthy food and new digital solutions that trace food production and supply.

Agricultural processes will have remarkably changed by 2035. The increasing automation and digitalization will predominate in many large-scale and small-scale farms, turning some of them into smart farms running on IoT and AI-based technologies. These smart farms will be highly autonomous and reduce the need for on-site presence of farm owners and workers. Harvesting robots, instead, will be the main type of workers in close proximity to plants with farmers monitoring and operating them. Nevertheless, some tasks will still be executed by agricultural workers. Smart Farm Operating Centres will exist in cities and towards the outskirts of cities. From these places, people will be able to operate the smart farms remotely. New ways of food production that are more efficient and independent from seasonal fluctuations will exist at the outskirts of cities in the form of hydroponics and aquaponics farms producing vegetables and fish in a more sustainable way.

Work

Overall, the value of human capital in Tunisia is expected to increase even more through digitalization and access to international educational content as well as remote work opportunities. The previously mentioned flexibilization of financial regulations, in particular receiving international payments, will boost remote work opportunities, be it from home or from dedicated competence and innovation centres that offer their services to international clients. Thus, new human resources will be integrated into the job market, particularly women who currently suffer from mobility restrictions due to family obligations. Through home office possibilities and liberalization of international payments, they will be able to offer their work on the international job market.

Digital tools will assist most of the working population, ranging from easy everyday tools e.g. video calls or collaboration tools to algorithms for decision making or metaverse meetings.

Deep Dive Questions

Which sectors in Tunisia will be affected by strong automation in the next 10-15 years?

How can digitalisation contribute to unlocking insufficiently considered resources?

Waste Management

At the outskirts of large cities, more recycling facilities will have been built. Automation through pick and place robots will be prevalent in recycling facilities - just like in any type of industrial facility with automation potential.

Both residual and organic and electric waste management will be further improved by AI-based solutions that optimize waste segregation, collection and processing as well as composting facilities in cities and farms that will also be able to process new types of materials such as bio-plastics. Plastic waste will therefore be less prevalent due to green product design and new materials used for packaging, as well as take-back schemes with reusable packaging solutions with digital back-ends. Improved material recovery from e-waste will provide important resources and materials for new products.



“Tunisia has the highest rate of women researchers in the region. But their employment opportunities are limited. I believe that there is a huge entrepreneurial potential for them to launch businesses based on innovation. But it needs a good ecosystem that brings incentives and encourages women.”

Lamia Chaffai

CEO

Education for Employment Foundation, Tunisia



Energy

With Tunisia having extensive solar and wind resources, energy will to a large extent be generated through solar power, and, secondly, wind mills. Besides these renewable energy solutions, oil and gas will in 2035 still be a relevant source of energy though.

The landscape of energy providers will be more decentralized with pay-as-you-go offers having become a widely used option for many Tunisians. Besides being more sustainable, these models will also contribute to making access to energy more equitable and affordable.

While large windparks and solar parks will have become a recurring element at the outskirts of cities and in rural landscapes, smaller solar panels will be practically everywhere, e.g. on building roofs, particularly on new buildings, but also some of the older buildings. They will even be integrated in innovative materials such as painting for some new flagship buildings. All kinds of elements of physical city infrastructure, such as bus stops, will also be equipped with solar panels. Similarly, new vehicles will have solar panels integrated into their body, including roofs and doors.

New forms of energy, including hydrogen, are likely to become more popular with new technologies for producing green hydrogen and significant price reduction by 2035 such as Power-to-X innovations.

Altogether these energy producing facilities will provide the energy that is required both in Tunisia and abroad. Energy exports to Europe are likely to increase, given the resource scarcity and energy shortages that are likely to prevail in 2035 on a global level.

Energy storage is likely to see a significant improvement. Greater energy density, increased safety, and faster charging speed will characterize the new energy storage solutions in Tunisia.

On a consumer's level, educational campaigns on energy-saving possibilities will be spread through various channels in the public domain and on different levels, including campaigns in schools to educate children about the need for and solutions to save energy, social media campaigns, and billboards. A variety of apps will exist that help consumers identify ways to optimize their energy consumption based on AI and IoT technologies.

Deep Dive Questions

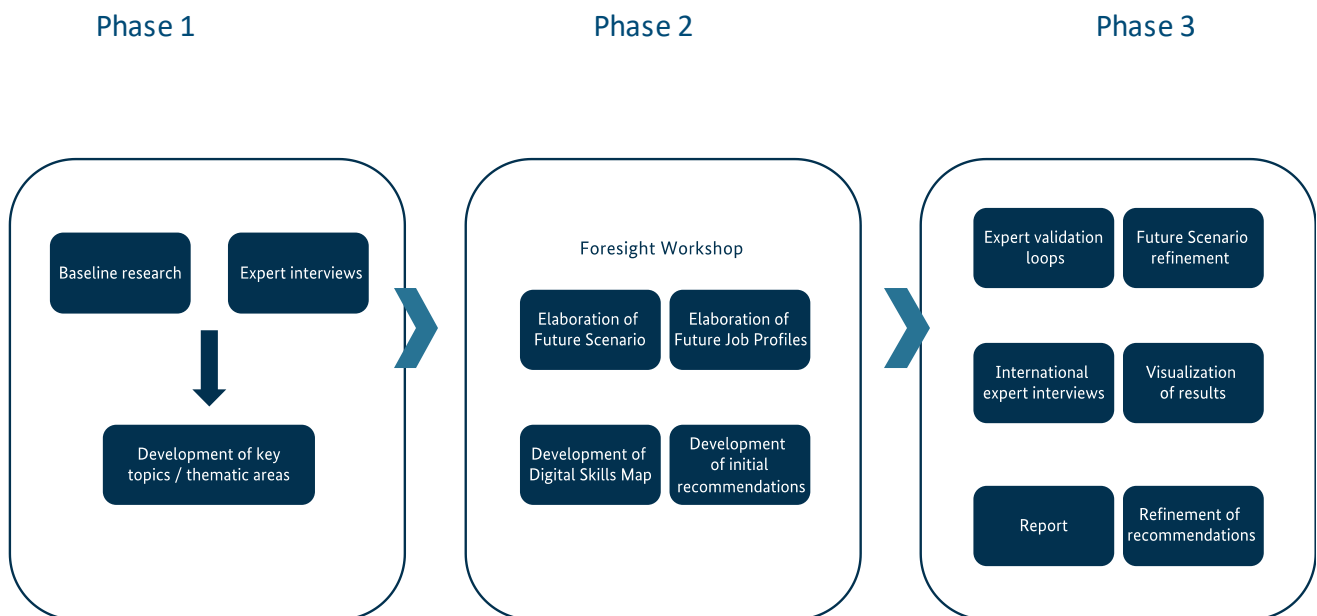
Which new technologies / energy carriers will play a significant role in Tunisia in 2035?

Can digitalisation contribute to ensuring the affordability of access to energy?

Smart Futures Tunisia Foresight Methodology

Foresight is a tool used by companies, organizations and governments for strategic decision making and creative planning. Future planning can be challenging due to complex and dynamic economic, environmental and social challenges. Instead of trying to predict the future, foresight allows for an interactive, visionary, but still systematic way of thinking about the potential future scenarios. Developing future scenarios can be helpful in handling these complexities by providing visions of a desirable future that can serve as a basis to develop strategies, policy recommendations or necessary measures for multiple stakeholders. Moreover, it can initiate an ongoing learning process for strengthening future thinking skills, and over time to re-evaluate the scenarios and further refine them.

The Smart Futures Tunisia foresight journey has been structured into three phases:



Phase 1:

First, desktop baseline research was conducted to understand the current technological trends in Tunisia. Thematic areas and key topics were pre-identified and were further elaborated on and prioritized through interviews with various experts and stakeholders including start-ups, NGOs, companies and public representatives. The interviews were furthermore already initiating a future thinking mindset, envisioning how Tunisia could and should look in 2035.

Phase 2:

On 20-22 September 2022, a 2.5-day foresight exercise was conducted in Tunis as part of Smart Futures Tunisia. The workshop served as a core component of the foresight journey.

Start-ups, NGOs, companies and public representatives worked together on developing a joint vision of a desirable future of Tunisia focusing on questions related to labour markets and skills that will be crucial in the future.

When conducting a foresight exercise, it is necessary to apply the right mindset. Firstly, future thinking can be challenging but it is very important in foresight. Secondly, it is crucial to keep in mind that the future is not something set, but is constantly in the making, it is actively influenced and created day by day. Finally, a key guiding principle is that there is not only one, but multiple future scenarios, which can differ e.g. by region. During the workshop, this future thinking mindset was applied through the interactive working sessions and exercises.

Throughout the event, four interactive sessions took place, all having different objectives that built upon each other:

Working Session 1: Future Scenarios Building Blocks

Brainstorming ideas on future scenarios by going through various building blocks of societies and economies (e.g. work, mobility, food)

Working Session 2: Future Scenarios Digital Deep Dive

Developing concrete scenarios within thematic areas and one overall scenario for 2035

Working Session 3: Future Jobs

Developing digital future jobs and roadmaps using the results of the previous two sessions

Working Session 4: Scenario Recommendations

Generating initial recommendations on how to reach the scenarios, thematically and specifically with regards to digital skills

Phase 3:

The output of the foresight exercise - the future scenarios, future job skills and job profiles and the recommendations - were refined through expert validation loops and additional expert interviews. Through a collaboration with an illustrator, the scenarios were visualized into a big futuristic picture of Tunisia which gives a tangible future scenario to the reader. Finally, the narrative description of the scenarios was compiled, inspirational job profiles were derived and recommendations were summarized in the current report.

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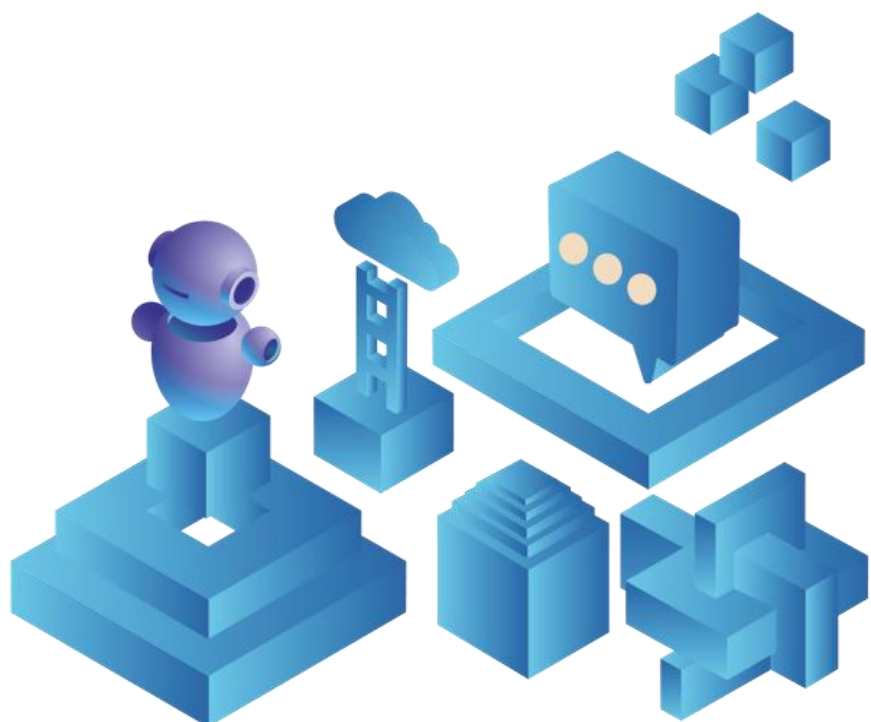
What could new jobs look like in 2035?

The digital transformation is happening at a high pace. Picturing concrete jobs of the future is certainly not an easy task. If we think of the developments that have occurred over the last 13 years, we can assume that change is likely to happen at least as rapidly.

Based on the future scenario that was developed during the Smart Futures Tunisia journey, and the prioritization of participants of working sessions and expert interviews, thematic areas were selected. Within these thematic areas such as e-commerce or healthtech, concrete job profiles of the future were created to make the vision for 2035 as tangible as possible.

Over the next pages, the various thematic areas and corresponding job profiles will be presented. However, they should not be understood as a comprehensive list of occupations in the future of Tunisia. Many of today's jobs might certainly continue to exist in a similar fashion. Unexpected events may occur and significantly influence future labour markets. COVID-19, with all its devastating effects, has nevertheless served as a massive catalyser for the digital transformation in many countries including Tunisia.

The job profiles instead serve as an inspirational basis for further discussions about the digital and non-digital trends that are to be expected and that are desirable (or not) in various areas of life, business and the Tunisian economy.



Digital Jobs Map

Through the expert interviews and the foresight workshop, a digital jobs map was developed. In order to drive digital transformation, it is not only tech-specific digital skills that are necessary, they are simply one of the layers needed. The necessary future digital competencies were categorized into four pillars, which are the following:

1. Digital literacy and data literacy

A big part of the population needs to be equipped with digital and data literacy. This includes media competencies and the use of online communication tools, but moreover the ability to use various digital tools and services (from Fintech to digital health to E-commerce) as core competences in multiple fields of work and everyday life. In addition, people will need basic data privacy and data security knowledge to be able to prevent the misuse of their personal data.

2. Tech-specific skills

This pillar entails specific digital technical skills as a prerequisite for many digital jobs of the future. As technology is rapidly evolving, the necessary skills are constantly changing and tech experts will need to quickly adapt to new tech trends and master the skills needed. This includes coding skills (frontend & backend development), design skills, machine learning and artificial intelligence expertise, and skills related to emerging technologies such as 3D printing.

3. Digital product skills

The availability of a technology is the first step of creating a digital product. However, it is also necessary to implement new technologies and conceptualize digital products. A basic understanding of technology is needed, but what is more important in this pillar is the ability to know how to use new technologies to conceptualize, build, implement and scale innovative digital solutions in various fields. Such digital product experts then need to be able to work with tech-specific skill experts who will develop such digital products and solutions from a technology point of view.

4. Digital transformation skills

This is the highest-level pillar. Experts with digital transformation skills have an excellent understanding of the technological, economic and social ecosystems and drive the digital transformation. They will be able to build such ecosystems including incubator and accelerator programs, new funding mechanisms, and need to work in multi-stakeholder alliances with Governments, companies, startups, civil society, academia and all other relevant players.

The digital skills needed will definitely not be limited to using whatever digital tools, but relate to autonomously creating solutions out of advanced technologies.”

Amel Saidane
Tech Entrepreneur, Founder & CEO Beta cube

“Tech and methodological skills must be intuitively integrated into the whole education system from elementary school to university. Students must get a digital feeling, to present online and to handle and operate standard programs.”

Riadh Basli
Business Unit Manager
INFOMOTION GmbH, Germany

How do we ensure that all segments of the Tunisian population benefit from the digital transformation?

Agtech & Foodtech

Food production will remain a very important industry in Tunisia. Although many smart farms will emerge, traditional farming will still be relevant and some farms will only adopt a couple of smart farming tools but remain traditional in other fields. Overall, farmers will have to be able to deal with digital tools such as software for resource optimization, fertilization or pest control. In smart farms, the skills will have to go deeper into e.g. data analysis and IoT installation and administration. Furthermore, IT professionals without a background in agriculture will be needed to program the software used in smart farms. Water treatment and irrigation specialists will also be needed. There will be jobs in R&D, developing innovative solutions, in e.g. 3D food printing or vertical farming.

Smart Farm Developer

The Smart Farm Developer is responsible for maintaining, debugging and continuously improving the digital processes of smart farms and developing the various software applications for the farm.

Farm Drone Operator

Farm Drone Operators are robotics experts specialized in drones. They operate and maintain drones that monitor, measure and analyze the growth and health of plants, as well as take part in sowing and disease reduction and prevention processes.

Farm Robot Operator

The Farm Robot Operator is responsible for the operation and maintenance of robots in smart farms. They have strong robotic skills including design, engineering, operation and use of robots for farming.

3D Food Print Expert

The 3D Printer Specialist works in R&D, continuously developing new food technologies and food solutions and also works on projects that are already using this technology.

Water Treatment & Smart Irrigation Specialist

They are responsible for creating and managing the smart farm's water strategy and irrigation systems. They have a solid agriculture/water management background with excellent IT & IoT skills.

Agtech & Foodtech

Harvesting Robot Trainer

The Robot Trainer is responsible for the initial training, adjusting and controlling of all robots and the AI solutions in smart farms. The Robot Trainer also collects data and adjusts the robots based on team discussions. Advanced programming and AI skills are necessary.

Sensors Specialist

The Sensors Specialist collects data by installing and adjusting IoT sensors that measure the growth and health of the soil, the plants and the produce including moisture, soil nitrogen content, etc.

Smart Farm Center Operator

The Smart Farm Center Operator is responsible for delegating and directing agendas, managing strategies and communicating with the farmers and other employees. They have a biotech/biology background with advanced IT skills, specifically in IoT and data analysis.

Smart Farm AI / Data Analyst

The AI / Data Analyst has an overarching role of collecting and analyzing data across the fields of smart farming. They compile the data and present it in a structured way to the relevant teams. They have a basic understanding of all fields in smart farming and excellent AI and data analysis skills.

Fintech

Fintech is the backbone of many sectors and activities. It can unlock the potential of e-commerce as well as provide access to services e.g. in the fields of education and health. Specialists in digital payments and international transactions will lead the development of this field. App developers will create fintech apps, which will unlock the potential of e-commerce. Data security is very important in digital transactions, thus specialists in this area will be needed as well.

Digital Payment Specialist

Digital Payment Specialists have a good understanding of fintech as well as Tunisian local regulations and market demands. They work on creating new fintech solutions for digital payments and develop digital products in close collaboration with the App Developer.

App Developer - Frontend & Backend for Fintech

The App Developers' role in Fintech will be to design and implement solutions that foster the digitization of the financial sector in Tunisia, incl. peer-to-peer instant payment, international transfers, etc.

Data Security Specialist - Biometrics

Biometrics experts work on the safety of identification and access control. They use e.g. fingerprints, face, voice, or iris for identity verification.

International Transactions Specialist

International Transactions Specialists work closely with the government on bringing into force regulations that will enable easy international financial transactions to and from Tunisia.

Data Security Specialist - Cryptography

Cryptography experts work on all levels of data security measures including encrypting data to secure sensitive information from malicious third-parties.

E-commerce

E-commerce will see a significant development in the B2B, B2C and C2C sectors. User experience will remain very important, UX/UI specialists and graphic designers will work on design, structure, improved personalized customer journeys, etc. Augmented reality and metaverse specialists will bring innovative custom experience tools. Algorithm specialists and digital content creators and digital marketing specialists will make sure that users see the most relevant content for them also by building new marketing channels. Logistics managers will be assisted by digital tools and automated guided vehicles (AGV) to make logistics more efficient. Drone operators will work on automating last-mile delivery using drones.

App Developer – Frontend & Backend

The App Developers' role will be to design and implement innovative e-commerce solutions in close collaboration with the UX & UI Designer. They need to be highly skilled with coding experience.

Augmented Reality / Metaverse Specialist

AR/Metaverse Specialists develop innovative tools in e-commerce using these mixed reality and virtual reality technologies, e.g. seeing in AR how a clothing item would fit on us or going to the metaverse to shop for furniture.

E-commerce Logistics Manager

Logistics Managers ensure that products move efficiently and cost-effectively through the entire supply chain. They use digital tools that optimize logistics through AI or smart technologies, as well as automated guided vehicles (AGV), from tasks in the warehouse to last-mile delivery.

Last Mile Delivery Operator

Last Mile Delivery Operators operate different last-mile delivery vehicles, including e-scooters, drones, cars and electric minivans. The importance of automatized solutions will increase as they will handle logistics and perform deliveries in an efficient and safe way.

User Experience Designer & User Interface Designer

UX designers develop digital user journeys that attract customers and improve their shopping experience, while the user interface designers create visually appealing digital interfaces and solutions. Both are creative and highly experienced with digital tools.

Digital Marketing Specialist

Digital Marketing Specialists use digital marketing channels to attract customers. They are creative, have a profound business and marketing knowledge, basic IT skills and a very good understanding of digital marketing channels.

HealthTech

With the health sector becoming much more digital, health professionals will need to be upskilled with digital skills. The continuously incoming health data needs to be stored, analyzed and managed. Moreover, as telemedicine is getting more and more common, tasks in telemedicine such as system operation will arise. New jobs in R&D in the medical field will arise from the uptake in medical wearables and personalized medication.



Digital Health Professional

Digital Health professionals will advise patients with various health-related topics using digital health solutions. They will use the cloud, digital diagnostic solutions and digital health data as well as solutions that suggest treatments based on AI.

Digital Health Data Analyst

Digital Health Data Analysts need a basic medical understanding and advanced data analysis skills. They convert the big amount of health data gathered into a digestible form for health professionals and insurances as well as digital health solution developers.

Telemedicine System Operator

Telemedicine System Operators responsible for telemedicine offerings take care of communication and diagnostics tools. They operate the various devices and tools (including wearables) and act as contact persons for users, mainly medical staff and patients.

Data Security and Privacy Expert - Medical Data

Data Security and Privacy Experts work on the safety of very sensitive health data. They are IT experts with very good understanding of (health) data privacy and data security policies and are able to develop and implement sophisticated strategies and measures.

Mobility

Vehicle production will remain secondary to mobility services in Tunisia in 2035. Thus, jobs in this industry will also predominantly be in the mobility service sector, e.g. operating and managing the shared electric mini buses. Data analysts and programmers will need to update and maintain in-car software, with services such as traffic monitoring. Infrastructure for mobility services will have to be developed, which will also lead to new jobs, e.g. mobility infrastructure planner.

E-vehicle Systems Coordinator

The electric vehicle system coordinators ensure that the various elements needed for e-vehicles are in place. They need solid engineering skills to understand how a decentralized charging infrastructure needs to be set up in the context of various electric offerings (scooters, minibuses, last-mile-delivery).

Electric Vehicles Maintenance Specialist

Electric Vehicle Maintenance Specialists understand electric vehicles' structures and back-end software. They repair and maintain electric vehicles and the interface to related devices.

Mobility Infrastructure Planner

Mobility Infrastructure Planners have a good understanding of infrastructure and policies for urban and rural areas and of Tunisian mobility habits. They plan innovations and design and coordinate various digital and non-digital offers as well as stakeholders to improve the overall (public) mobility infrastructure.

Shared Mobility Platform Manager

Shared Mobility Platform Managers develop digital solutions for shared mobility offerings that integrate various modes of transportation in order to increase the effectiveness and efficiency of moving. They need excellent digital product skills to conceptualize, operate and maintain these platforms.

Charging Station Operator

Charging Station Operators are engineers specialized in electric vehicle charging. They plan, operate and maintain the charging stations for the various e-vehicle offerings that are appearing in the public domain in cities and in the semi-public domain such as gas stations.

E-scooter Service Operator

E-scooter Service Operators set up, operate and maintain a network of e-scooters that will play an important role as a mode of transportation in smaller cities in Tunisia. This includes managing the logistics, fleet and charging stations.

EdTech

Educators need to be upskilled with digital skills to be able to confidently use new digital tools in education technology. Tunisia will not have a major role in developing these edtech tools, but will mostly be importing them, with the exception of some specific teaching platforms. Since skills needed in the workforce are changing quickly, integrating them into the curriculum is an important task that will be allocated to competencies managers. Moreover, the teaching assistant hardware (e.g. teaching robot) will need AI specialists and experts to maintain and update them.

Digital Change Facilitator

Digital Change Facilitators work with educational institutions. They consult on the different digital solutions that exist, support the implementation and are responsible for digital upskilling to enable educators to manage and teach on digital platforms.

Teaching Platform Developer

Teaching Platform Developers are IT professionals who create and maintain the platform for teachers and students to exchange material and communicate online. They need a good overview of existing solutions and implications on the effectiveness for different learning purposes.

Digital Learning Content Creator

Digital Learning Content Creators are educators with digital skills to create material to be taught online (e.g. self-assessment quizzes, video tutorials). They will require skills that relate to more content creation with innovative technologies (incl. Augmented / Virtual Reality, Hologram technologies, and the Metaverse).

Digital Competencies Manager

The Digital Competencies Manager is monitoring the local and global employment market and defining skills and competencies that need to be taken into the curriculum. They are in connection with industry players who give them input as to which digital skills they need.

Digital Skill Educator

Digital Skill Educators specialize in IT skills to ensure that the population is able to handle the variety of digital solutions that prevail and help them to increase their digital literacy and data literacy skills.

GovTech

Since digitalization plays an important role in GovTech, a lot of jobs in this sector will require different levels of IT skills. Programmers will create and maintain the digital ID and a GovTech metaverse environment, while E-Gov experts will assist citizens with the digital platform and various digital services. Hardware operators will manage the data centers and since there is a lot of sensitive data, cybersecurity experts will play a crucial role. Jobs with basic understanding of digital platforms and advanced management skills and consumer-oriented views will be needed to lead the digital transformation in the governmental sector.

Data Centre Operator

Data Centre Operators are IT experts that specialize in hardware, particularly servers that store citizen data. They will manage the data centres that act as a backbone for new digital services including the Mobile ID. They need a profound understanding of cybersecurity and data centre operations.

Cybersecurity Expert

Cybersecurity Experts work on policies, regulations and technologies to protect governmental data from digital attacks. They need profound know-how on international cybersecurity norms and cyber defense.

E-government Service Scout

E-government Service Scouts have a good understanding of front-end govtech tools. They help citizens understand and use the digital govtech tools and services either virtually or at the physical city hall. They have good communication skills and a good understanding of the various digital offerings.

E-government Expert

E-government Experts have an overview of the various digital solutions that exist for public services and activities. They advise and implement the solutions and ensure they operate smoothly and safely, in particular the new Mobile ID for Tunisians. For this, they require advanced IT-skills, particularly with regards to cybersecurity.

Data Security and Data Privacy Expert

Data Security and Data Privacy Experts work on the safety of very sensitive governmental data. They are IT experts with a comprehensive understanding of data privacy.

Metaverse Developer

Metaverse Developers have excellent programming skills and develop the governmental metaverse where citizens can log in and arrange governmental tasks or engagement, e.g. lengthen their driving license or participate in democratic processes.

Greentech

Greentech is becoming more important as a way to reduce human impacts on the natural environment through technology. In greentech, job creation in R&D and green infrastructure maintenance will be the most relevant. Solar panels, wind turbines and recycling centres all need to be maintained. In R&D, new, green materials will be developed and product designs will adapt to circular design. IoT will play a big role in green solutions as well, so experts in IoT and sensors will be needed in the Greentech industry.

Recycling Expert

Recycling Experts plan the recycling infrastructure of cities, plan and manage educational campaigns and work in R&D to develop further recycling processes and tools. They have a good understanding of AI-based recycling solutions, incl. waste segregation, collection and processing.

Solar Panel Maintenance Operator

Solar Panel Maintenance Operators will need to take care of the solar panels that are prominent everywhere in Tunisia. This will include the repairing and installing of solar panels as well as recollecting and dismantling panels at the end-of-life stage.

Greentech R&D

Greentech R&D is working on developing new sustainable technological solutions, e.g. with regards to new energy carriers such as green hydrogen.

IoT Sensors Expert

IoT Sensors Experts research and develop new IoT tools, devices and solutions for private and public purposes that monitor a variety of topics including air pollution levels, (food) waste quantities or room temperature optimization at the household level.

Green Product Designer

Green Product Designers re-think and re-design products to be more sustainable (e.g. packaging, reparability). Sourcing from digital platforms that pool recycled materials, as well as know-how on recyclable materials and implications on the lifecycle phase during or after use will be important in this regard.

Wind Turbine Maintenance Operator

Since more and more wind turbines will provide a larger share of the energy in Tunisia, the Wind Turbine Maintenance Operator will manage the wind parks outside of the city including the repairing and installing of turbines.

Who are the players that will be at the forefront of developing Tunisia's human capital for the future digital economy?

1 Future Scenario

How could and should Tunisia look in 2035?

2 Future Jobs

What are the jobs and digital skills of the future?

3 Recommendations

What needs to be done on the road towards 2035?

Smart Futures Tunisia Recommendations

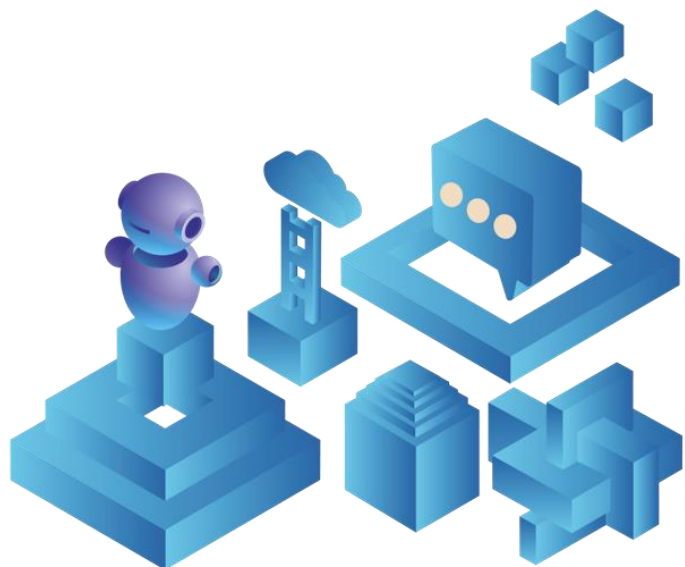
The development of the future scenario was all about asking oneself: “What could and should Tunisia look like in 2035?”. Open-mindedness and visionary thinking were explicitly supported in the methodological design of the foresight exercise.

Based on this, first thoughts were exchanged to initiate the collection and elaboration of recommendations regarding measures that need to be taken in order to achieve the desired scenario. The list of recommendations includes various types of required measures, including:

1) Foresight Journey Recommendations

2) General Recommendations

3) Thematic Area Recommendations



1) Foresight Journey Recommendations

Foresight exercises are long-term processes. They can even be understood as dynamic processes with an open end. Within the project duration of Smart Futures Tunisia, the focus lay on the development of a future scenario, the involvement of key players that shape the digital future of Tunisia and initial thoughts on needed measures in order to achieve the jointly developed elements of the future scenario.

Further methodological steps are recommended to continue the refinement of the future scenario and related future skills, but especially also to build upon the achieved results and define the short-term, mid-term and long-term measures within and across the different thematic areas that were discussed. This can be done in a follow-up process that focuses on backcasting and the elaboration of a comprehensive set of recommendations.

Future Scenario Development and Future Jobs Refinement

The future scenario process should continue by involving diverse stakeholder groups into the elaboration of the scenario and the job profiles. It should initiate processes and formats to include future scenario impulses and aspects into the scenario:

- Young Voices of Tunisia: develop formats for young people and students (e.g. through schools and universities) to reflect on and refine the future scenario and the jobs of the future. This could e.g. be in the form of a city-wide or nation-wide idea competition “Smart Futures Tunisia 2035”.
- Creative Voices of Tunisia: work with creatives, artists and musicians to let them reflect on the future scenario and see how they envision Tunisia in 2035
- Experienced Voices of Tunisia: work with elderly people and develop formats to engage them in the future scenario process
- Expert Voices: engage with stakeholders and experts from specific sectors to engage them in the refinement of the scenario and the job profiles in specific thematic areas

Backcasting

Within a foresight process, backcasting refers to the phase that is dedicated to working “backwards” from the desired future scenario to specific policies and programs that link this vision to the present. Short-term, mid-term, and long-term measures need to be defined in a way that divides the path towards the future scenario into feasible and digestible steps for relevant players. With this, backcasting requires a different, more linear mindset than the development of the future scenario.

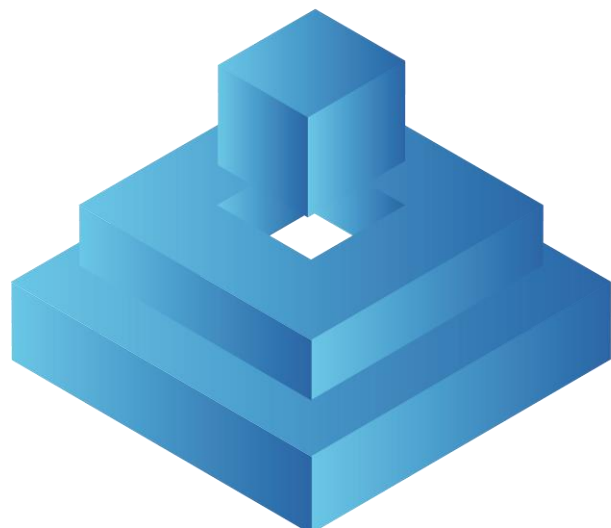
Ideally, the process would involve a group of experts with diverse backgrounds, but good capability of performing the difficult task of bridging the desired future to the present conditions. In addition, data modeling experts would contribute to the backcasting activity by validating the findings through sophisticated data-modeling approaches that include major trends of population changes, migration, economic development etc.

Recommendation Elaboration

The recommendations should be further elaborated on, re-visited and re-validated by relevant experts and stakeholders. For that, working sessions with relevant stakeholders and experts need to be initiated.

Developing roadmaps and setting milestones are important for a successful implementation of the recommendations. Recommendations with high potential of implementation should be prioritized and a process should be initiated with selected stakeholders to develop these recommendations.

During the foresight exercise, explicit time slots were dedicated to formulating recommendations on how the desired future scenario could be achieved. Recommendations that were expressed outside of these dedicated sessions were also collected and added to a list of recommendations that participants ranked with regards to their perceived importance.



2) General Recommendations

The general recommendations include any types of measures that were perceived as necessary to advance the digitization or the development of (economic) sectors and areas of life in general.

Broad-based Digital Literacy Programme and e-Inclusion Measures to Close the Digital Divide

While Tunisia globally ranks 2nd with regards to the share of IT graduates, profound digital skills are concentrated among specific groups of the population with favourable social capital or advantages in accessing equipment and an internet connection. In order to exploit the potential of digitization nationwide and include all segments of the population, various challenges need to be tackled, including regional inequalities, lack of equipment in poor settings, gender or age-related inequalities and barriers to develop future-proof digital skills. Overall, a “digital culture” needs to be promoted across the wider population through campaigns, educational training, incentive schemes and capacity building opportunities with particular focus on those segments of the population who face particular obstacles. In addition, any measure promoting digitization across sectors and areas of life needs to be assessed with regards to its inclusiveness of people with restrictions in accessing or using tech solutions. Adaptations in the design of those solutions need to occur systematically.

Cyber Security Capacity Building

As displayed in the Future Scenario of Tunisia in 2035, the digital transformation of various areas of life and economic sectors will lead to more and more cyberspaces emerging and providing a platform for all kinds of activities to happen. In order for Tunisia to reap the potentials of digitization in the economic, social and political sphere, cyber security technologies need to be put in place at a broad scale. Particularly in the context of desired market liberalization, increasing international transactions and digitization of public services, technologies need to support the establishment, maintenance and protection of trust and data security within Tunisia while at the same ensuring that communication and interaction with important partners (such as e.g. the EU) is facilitated through common or compatible cybersecurity norms. The demand for a Tunisian workforce with skills that can facilitate this process is thus likely to increase significantly.

Capacity building measures can cover a wide range of topics that promote cybersecurity awareness, education and training e.g. public awareness campaigns, cybersecurity research and development, professional training, and national education programmes and curricula. Overall, measures should be designed in a way that complements Tunisia’s National Cybersecurity Strategy 2020 - 2025.

“Data protection regulations do not allow Tunisians to access data in EU countries in many IT projects. Governments should find an agreement to make sure that the IT security in Tunisia is recognized by the EU Commission, so that it would be possible to work in Tunisia with data in the EU and accelerate working with Tunisian IT companies .“

Riadh Basli
Business Unit Manager
INFOMOTION GmbH, Germany

3) Thematic Area Recommendations

Measures dedicated to promoting overall development and capacity building in the thematic areas included in the Future Scenario.

Promote green (Tech) Culture

With its geography and natural resources, Tunisia has the potential to become a pioneer in Greentech and benefit from international revenue streams. Solar power, wind power and green hydrogen, for instance, will become more and more important sources for both the domestic and the international energy market. On labour markets, expertise in the development and implementation of greentech solutions will therefore rise considerably in the next years and Tunisians could provide important human capital for the sustainable transformation of their country and abroad.

However, to move towards such a scenario, the greentech culture in Tunisia needs to be strengthened. From a young age, the topic of environmental sustainability and greentech solutions should be integrated in the curriculum of schools or info sessions at primary education institutions. Public education campaigns on energy or water saving opportunities, as well as healthy food and sustainable agriculture can similarly foster green thinking and contribute to a cultural change in Tunisia. Initiators of such campaigns could be both private or public players, including for instance foundations, companies or ministries as well as international organizations such as UNEP, the World Food Programme or GIZ.

Establish private or PPP Smart Farming Training Centres

Agriculture is one of the most important economic sectors in Tunisia with tremendous transformational potential. Given the availability of significant human capital in this area and the globally growing need for high-quality and affordable food, digitization of the agricultural sector in Tunisia should be supported with the aim to increase productivity and thus competitiveness in the long run. Smart farming training centres could be set up (e.g. as Public Private Partnerships (PPP)) to upskill farmers or train new smart farm professionals. Skills provided to established farmers should include data analysis for improved digital water, energy and soil management as well as general basic digital literacy and tools to make use of digital marketing opportunities. From an engineering perspective, it will require product development skills in the areas of robotics, drones and space data based solutions.

Players across all sectors should be included in such smart farming training centres, e.g. foundations such as Fondation Tunisie, the Agricultural Ministry (Ministère de l'Agriculture, des Ressources Hydrauliques et de la Pêche Maritime), private companies, and institutes and training centers such as INAT (Institut National d'Agriculture de Tunis), ESAM (Ecole Supérieure d'Agriculture de Mateur), Lycées Agricoles, CDC (Caisse des dépôts).

“Greentech and cleantech are on the top of the agenda of the whole world. It's almost not on our agenda at all. It has to be put on the agenda.”

Amel Saidane
Techentrepreneur, Founder & CEO
Betacube, Tunisia

“We need to connect students with start-ups, start-ups with industrials and industrials with investors. All these players in the innovation value chain should work together, change together and have rising competencies together.”

Anas Rochdi
Chief Innovation Officer
Novation City, Tunisia

Create an Innovation Lab for Digital Diagnostics

The Tunisian health care system suffers from significant infrastructural gaps but also includes strong human capital. With more and more opportunities for digital diagnostic solutions emerging, including wearable technologies and telemedicine tools, Tunisia should ensure its involvement in the development of further solutions and digital diagnostics service provision. To do so, an Innovation Hub for Digital Diagnostics should be created where start-ups, established players of the health sector and educational players collaborate to promote the advancement of digital diagnostics. The Hub could also host demo labs or pilot projects launched by intersectoral collaborations, thereby providing a physical space to attract interested parties such as potential customers and investors. It could also partly act as a think tank that drives the development of a roadmap for digital diagnostics in and from Tunisia. Involved parties could include the Tunisian Ministry of Public Health, Universities, the Cluster HealthTECH, GIZ, USAID or EFE Tunisie.

Strengthen the Infrastructure for Telemedicine

To close the infrastructural health care gap, Tunisia should also invest in telemedicine as an option to provide better services to people that have restricted access, for instance, in rural locations. Telemedicine hubs could be created in villages, accompanied by health workers that help patients to handle the provided solutions. To allow the development of more telemedicine solutions in Tunisia, however, legislations need to be liberalized (e.g. digital payment) and advancements in the implementation of the digital administrative back-end (e.g. digital health files) need to be made. Domestic doctors might have to be convinced to transition towards more telemedicine offers in their work through campaigns and discussions with the syndicate. However, Tunisian medical diaspora can also be leveraged when it comes to the supply of human capital. Similar to the previous recommendation, players that should be involved in this endeavor include Ministries (Health and ICT), but also the Tunisian National Medical Council (Conseil National de l'Ordre des Médecins de Tunisie (CNOM)), as well as the Tunisian Health Association, Private health and ICT Companies and the Cluster HealthTECH.

“There's a lot of competencies in health tech in our universities and research centers, but it stops there. Helping researchers and students to take their scientific research from an academic stage to a start-up stage is something that could be very interesting for our innovation ecosystem. We should show them that it's possible to combine academic and entrepreneurial journeys by sharing success stories.”

Hichem Radoine
Co-Founder & Senior Partner
Connect`Innov, Tunisia

About Smart Futures Tunisia

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This report is part of a foresight journey that is constantly being shaped. We look forward to seeing how the results will be elaborated on and how this dynamic journey will be continued.

