

Digital innovation profile: Oman

Digital innovation ecosystem: Strategies and recommendations for accelerating digital transformation



In Partnership with:

Digital innovation profile: Oman

Digital innovation ecosystem:
Strategies and recommendations for
accelerating digital transformation

Acknowledgements

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Foreword by MTCIT

Governments are keen to strengthen their national innovation ecosystem and enable it as a booster to economic activities. It also opens up boundless horizons for people for creativity, innovation and continuous development.

In this regard, the ministry has worked with ITU along with local stakeholders to study and analyse the reality and future of the digital innovation ecosystem in the Sultanate. Over the last four decades, the Sultanate has invested significantly in developing the infrastructure for digital innovation, including the legislative and regulatory system for the communications and information technology sector, the fixed and mobile communications networks, as well as building local capacity through higher education and professional programmes. As a result, the Sultanate plans to maximize the benefits from that digital sectors to supplement the digital innovation environment and reap many social and economic benefits.

The ministry efforts to study and analyse the digital innovation ecosystem are in line with the Oman Vision 2040 directions that emphasize the role and adoption of advanced technologies in the economy. The ministry has developed the digital economy programme and the efforts of this project support the achievement of the goals of the digital economy programme. This project concluded with a set of initiatives that the ministry will implement in cooperation and integration with the various relevant authorities in order to achieve the objectives of the digital economy programme as well as the objectives of Oman Vision 2040.

We would like to express our gratitude to ITU and our local stakeholders who have contributed towards this work.

Ministry of Transport, Communications and Information Technology
Sultanate of Oman

Foreword by ITU



Innovation and entrepreneurship are the engines of digital development, driving the creation of new technologies and the growth of new industries that improve our lives and connect us to new opportunities. The Sultanate of Oman understands the importance of these two concepts in building a sustainable, progressive, and digitally connected society. Oman has made tremendous strides with various ICT investments and its Digital Economy Program and continues to address opportunities toward the Oman Vision 2040.

This Digital Innovation Profile, conducted in partnership with the Ministry of Transport, Communications and Information Technology (MTCIT) of the Sultanate of Oman, aims to accurately assess the country's digital ecosystem capacity and maturity to help Oman and its stakeholders navigate the digital innovation landscape. The aim is to help Oman to continue building new capabilities for a competitive, sustainable, and ICT-enabled economy that accelerates the development of the digital economy toward achieving Oman's vision.

This work required an assessment of the current state of the digital innovation ecosystem in Oman, identification of areas of improvement, and presentation of recommendations through a process of research, one-on-one interviews with experts, and co-creation workshops with local stakeholders, including members from the public sector, private sector, finance, academia, entrepreneurs and support networks.

I want to thank all the national stakeholders who participated in the co-design of the assessment, particularly the MTCIT staff and the team of the International Telecommunication Union (ITU) that facilitated the process.

I hope this profile will serve as a valuable resource for policymakers, entrepreneurs, the private sector, and other stakeholders in Oman. I additionally hope it will guide decision-making and investment in areas critical for the country's growth and development.

I look forward to seeing the positive impact this Digital Innovation Profile will have on the future of Oman. ITU is ready to continue to support the Sultanate of Oman in the next phase of this relationship to see the results of these recommendations.

A handwritten signature in black ink, appearing to read 'Dr. Cosmas Luckyson Zavazava'.

Dr Cosmas Luckyson Zavazava
Director, ITU Telecommunication Development Bureau

Digital Innovation Capacity



15+ development and tech indicators reviewed

250+ country-specific documents reviewed

Desktop Research



87 ecosystem stakeholders' roles analysed

Stakeholder Identification



33 stakeholders directly engaged in activities

Stakeholder Engagement



2,500+ ideas captured through 3 workshops

Co-Creation Workshops



42 recommendations & best practices presented

National Stakeholders' Event



\$74 billion present-day GDP boosted

Execution of Recommendations



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1 Introduction

Oman is embarking on a long-term development strategy: the Oman Vision 2040. This strategy is based on key pillars that are associated with strategic priorities, such as the economy and development pillar, and the priority of economic diversification. The Ministry of Transport, Communications and Information Technologies (MTCIT) has developed the digital economy strategy to contribute to economic diversification by enhancing the contribution of the information and communication technology (ICT) sector to the national economy. Oman continues to digitalize its key sectors, support the innovation ecosystem, and reform related policies to accelerate digital transformation and the country's capacity to innovate. Various factors contribute to the performance of the ICT sector including innovation. MTCIT, jointly with ITU, commissioned this study to better understand digital innovation.

Digital innovation profiles are an important element in the ITU series of snapshots of ICT-centric innovation ecosystems. Each profile assesses and summarises the opportunities and challenges in a country's ICT ecosystem. The at-a-glance format of the report enables international comparisons and provides a measurement overview of an ecosystem's capacity to accelerate digital transformation as well as its capability to integrate digital innovation into its national agenda. The digital innovation profile is an accurate diagnosis of digital innovation ecosystem health to develop strategies and inform national policies for accelerating digital transformation.

Digital innovation profiles offer a rapid and straightforward means of analysing and optimising an ICT ecosystem. This analysis then helps navigate through a country's fast-moving ICT/telecommunication landscape to enhance the competitiveness of the ICT sector and unlock the potential for a sustainable digital transformation to support the country's transition into a knowledge economy. Further collaboration with ITU can target specific engagements, including the implementation of appropriate, co-developed, bankable projects of high value in the national context.

All digital innovation profiles are developed by experts specially trained to apply the ITU Digital Innovation Framework. This framework features highly structured workshops and facilitated assessments, designed to build national capacity, enhance on-the-ground skills and powerfully accelerate digital transformation. The framework process equips ITU Members States with the tools to assess and monitor their ICT innovation ecosystems and offers evidence-based assessment and concrete recommendations to change the dynamics and propel the country towards digital transformation.

The analysis and the positions expressed in this report reflect the opinions and research of the national expert, working within the ITU Digital Innovation Framework process, and with guidance from the ITU-D Digital Innovation Ecosystems cluster.

2 Background and context

The Sultanate of Oman is a high-income country on the south-eastern coast of the Arabian Peninsula and a member of the Cooperation Council of the Arab States of the Gulf as shown in Table 1.

Table 1: Key indicators

Key indicators	
Population: 5.1 million (2020)	ITU Digital Development Dashboard [2022]: <ul style="list-style-type: none"> Population coverage by at least 4G mobile networks (2021): 98 per cent. Households with a computer at home (2020): 96 per cent. Mobile-cellular subscriptions per 100 inhabitants: 135. Fixed broadband basket as a percentile of GNI per capita (2021): 3.5 per cent. Individuals with advanced skills (2020): 8 per cent.
Population density: 16 km ²	Global Innovation Index [2022]: 79/132
GNI per capita: USD 29 908 (2021)	Global Entrepreneurship Index [2019]: 33/137
Region: Arab World, Gulf Country	Global Competitiveness Index [2019]: 53/ 141
	Ease of Doing Business [2020]: 68/190

Oman enjoys a 96 per cent literacy rate among its adult population. Yet, there are two pressing challenges to be met: high youth unemployment – around 49 per cent (World Bank, 2019) – and a youth bulge, with 50 per cent of its population under 25. The country has spared no effort in overcoming this challenge through a policy to rely on the citizens of Oman that aims to replace expatriate workers with trained Omani personnel in the private sector and to support small and medium enterprises (SMEs). The National Programme for Enhancing Diversification (Tanfeedh) to raise employment levels of Oman citizens in the sectors of tourism, petroleum, logistics and manufacturing has been in action since 2016. Subsequently, there has been notable success in the banking sector with a 95 per cent rate of Oman citizens in leadership positions. For example, the Central Bank of Oman has successfully followed its own progressive policy in the financial sector over a long period. It has periodically reviewed and monitored sub-sectoral targets that banks must achieve including for senior management.

The Ministry of Education has enforced several comprehensive recommendations for technology-assisted instruction across the entire national curriculum in primary and secondary education through the provision and distribution of tablets and other electronic devices. In 2020, at the height of the COVID-19 pandemic, the Telecommunications Regulatory Authority (TRA) connected more than 600 villages and 141 schools in partnership with the Oman Broadband Company.

As of 2020, oil and natural gas extraction accounted for 51 per cent of Oman's gross domestic product (GDP) (Trading Economics). The service and agriculture sectors constitute the remaining of its economy at 48.14 per cent and 3.02 per cent, respectively (Statista, 2022). In recent years,

the price fluctuation of petroleum has strained GDP expansion and fiscal and current account balances (Brookings Institute, 2021). With the threat of an expected oil reserve depletion within the next 20 years, the country is reviewing its economic and financial strategies to potentially move away from natural resources. Through its Oman Vision 2040, Oman has identified manufacturing, tourism, transport and logistics, mining, and agriculture and fisheries as the five core industries to spearhead its new economy and accelerate job creation for Oman citizens.

Since its launch in 2013, the Public Authority for Small and Medium Enterprises Development (Riyada) has led successful efforts to develop and support the creation and sustainability of the SME sector. This is particularly aimed at creating job opportunities and value for the national economy. The SME Development Fund provides varied funding schemes, entrepreneurial support, and skills development opportunities. As of 2017, the country accounts for more than 30 000 SMEs, which is estimated to contribute 15 per cent of its GDP.

The country enjoys modern telecommunication infrastructures and a liberalised telecommunication market, with six mobile network operators for a population of 5.1 million inhabitants. In April 2016, the TRA issued the Access and Interconnection Regulation Decree to encourage sustainable competition in the industry. To further boost the competitiveness in the industry, the country has developed several Smart City projects in partnership with private sector actors, and launched 5G mobile network services that have resulted in its significant adoption by local consumers. As of 2022, mobile telephone subscription and penetration stands at 140 per cent and mobile broadband subscription at 121 per cent (TRA market and Telecom Postal indicators - January to June 2022).

As of December 2021, mobile broadband Internet penetration in Oman stood at 114 per cent while fixed-mobile Internet penetration stood at 74.7 per cent (TRA report).

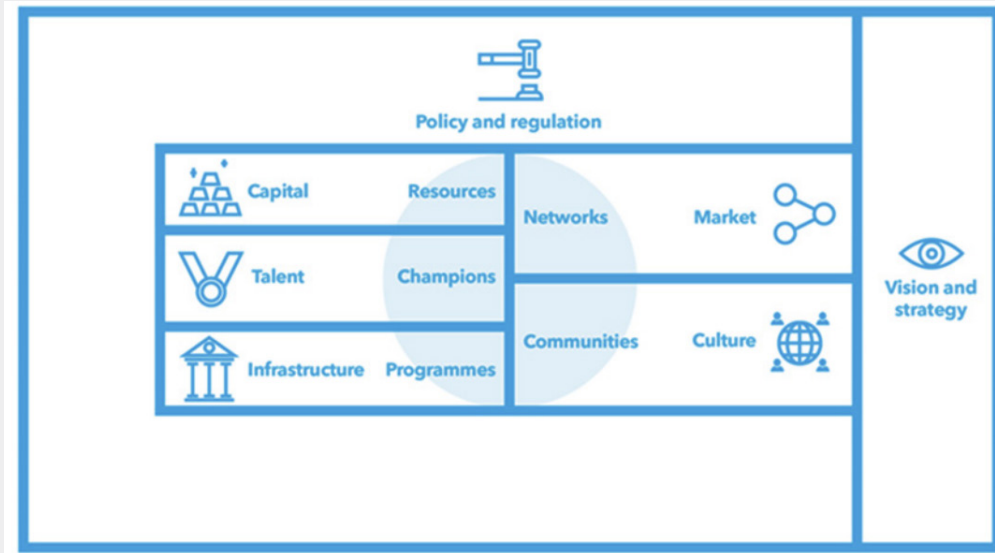
The World Intellectual Property Organisation (WIPO) ranks Oman 76th out of 132 countries in its Global Innovation Index (2021). According to management consulting firm Arthur D. Little (February 2021), the ICT sector contributes 2.1 per cent of the total GDP, with exports of high technologies and ICT services only accounting for 0.8 per cent and 0.3 per cent, respectively, of the country's total trade.

The Oman Vision 2040 aims to boost the country's ICT market to OMR 2.2 billion (USD 5.6 billion) by 2024. In line with the vision and the Oman National Strategy Framework for the ICT sector, Oman has planned to accelerate the digital transformation of public administration, strengthen digital societies, and enable business digitization in key economic and strategic sectors. In January 2022, the MTCIT even revealed its executive plan for the digital transformation of the government by 2025 and, announced an OMR 170 million investment provision over five years.

3 Current Landscape

Understanding the ecosystem assessment canvas

Figure 1: Ecosystem assessment canvas



The ecosystem assessment canvas offers an overview of the seven components that make up the innovation ecosystem. It helps assess both the challenges and opportunities for the components essential to building a vibrant and innovative digital ecosystem.

Figure 2: Ecosystem assessment canvas and its related issues

PILLARS	Vision & Strategy	Capital	Market	Infrastructure	Talent	Culture	Policy
ISSUES	<ul style="list-style-type: none"> Scope and objectives Aligned Digital strategies 	<ul style="list-style-type: none"> Appropriate Demand side resources Continuum of Supply side resources 	<ul style="list-style-type: none"> Integration of economic sectors Market access domestic and international 	<ul style="list-style-type: none"> Inclusive digital infrastructure Resilient & secure broadband Infrastructure Soft infrastructure 	<ul style="list-style-type: none"> Talent appropriateness Champions 	<ul style="list-style-type: none"> Sustainable culture of entrepreneurship and innovation Communities 	<ul style="list-style-type: none"> Comprehensive and grassroots innovation policies & programs Legal frameworks

Building upon the ecosystem assessment canvas, the image above presents the main issues of an enabling environment that, if achieved, can accelerate digital transformation in the economy.

The following section of the chapter contains insights on the current landscape of the ecosystem, across the seven components, as gathered through interviews and group discussions during the co-creation workshops with local stakeholders; and validated with the help of secondary research and review of relevant sources.

3.1 Vision and strategy

- *There is a well-developed vision and some supporting strategies and frameworks to achieve the national ambition; however, there is a need for strong operationalisation and allocation of funds.*
- *There is consensus on most of the common issues in the ecosystem, with ICT innovation considered to be an enabler for the national priorities and the development of key sectors.*
- *Stakeholders have ambitions to achieve the national priorities; the public sector is seen as a catalyst for transformation and trust-building but needs to play a more prominent role in informing and leading innovation.*
- *There are demonstrated efforts to support the national vision but there is room for more sustainable collaboration and partnership among stakeholders.*

In January 2021, His Majesty Sultan Haitham Bin Tarik launched Oman Vision 2040, which sets out the transition of Oman from an oil-based economy to a more diverse knowledge-based economy. The vision outlines detailed strategic directions, key policies, clear milestones (short, mid, and long-term) and KPIs linked to global indexes for implementation over the next two decades of national socio-economic development. The vision is further supported by various strategies, one of which is the National Innovation Strategy, led by the Ministry of Higher Education and Scientific Research and Innovation (MHESRI). The role of modern technology is laid out as a strategic direction for economic diversification, ensuring competitiveness, embracing the fourth industrial revolution (4IR) and attaining fiscal sustainability. Its role has also been defined as a supportive enabler for the service-based sectors, smart cities and environmental management. In addition, the National Innovation Strategy acts as the national observer for innovation in Oman and offers guidance on how institutions can prioritize their initiatives to achieve the vision.

The Sultanate of Oman, mainly through the Ministry of Transportation and Communications Information Technology (MTCIT), demonstrates several technology-focused strategies such as the Digital Oman Strategy or e-Oman (2003), the National e-Commerce Strategy, the National Broadband Strategy, the National ICT Strategy, and the 4IR, the National Postal Strategy, the Industrial Strategy 2040, as well as the National Strategy for Research and Development 2040. All these strategies were revamped and compiled into a single national programme for the digital economy. Despite a certain degree of awareness in the ecosystem regarding these governing documents, there is a need for strong operationalisation and timely allocation of funds for implementation.

The National Programme for Enhancing Economic Diversification (Tanfeedh) has previously addressed these challenges through its “working lab sessions”. Further, there seems to be consensus among stakeholders that more effort is needed to make technology innovation a national economic priority. In addition, the ecosystem needs to develop a common vocabulary around innovation and priority sectors as a potential flagship proof of concept for economic impact.

Stakeholders in Oman seem to have a common understanding of prominent issues, including: (i) unequal distribution of Internet infrastructure, (ii) lack of local talents with advanced skills, (iii) need for reviews of regulations, and (iv) lack of sufficient investments and funds in the ecosystem. Further, while all stakeholders show a clear understanding of their respective missions, many – except public and semi-private sector actors – remain unclear on how their efforts contribute to the larger vision and strategies, and whether the public sector is even aware

of their contributions. It is understood that this low visibility of the players in the ecosystem (public and private sector actors) is due to inadequate cross-collaboration and too few long-term multilateral partnerships across stakeholders.

Finally, the roles and responsibilities of each public actor operating in the ICT sector, whether policy-maker, regulator or operator, are well defined. However, more awareness needs to be raised to facilitate collaboration and information outreach between stakeholders and the public sector. The recent changes in government have prompted broader alignment and integration of efforts among ministries and authorities, and more adjustments are on the way.

3.2 Infrastructure and programmes

- *Oman has robust energy and telecommunication infrastructures, however, there are challenges concerning its coverage, pricing and usage.*
- *There has been a lot of investment in soft infrastructure, knowledge centres, and training facilities; however, some infrastructure needs additional funding to create appropriate programmes to achieve impact.*
- *Soft and hard infrastructures are unequally distributed between rural and urban areas. However, there have been some efforts to bridge the gaps through government initiatives such as the Oman Satellite Project (Afaq Initiative).*
- *Oman is a small market that has the potential to be competitive due to its geographical location and investment in infrastructure. Yet, more incentives and programmes are needed to unleash the talent potential and address the regional and global market needs.*

Oman enjoys reliable energy and electricity infrastructure and world-class renowned telecommunication infrastructure, resulting in fast, reliable Internet connectivity services. Since the country has 21 submarine cable systems for fibre optic connections to Asia and Europe, consumers across the country have shifted from direct subscriber line (DSL) access to optical fibre in recent years. The rollout of fifth generation (5G) mobile connectivity has shown positive success in a market with an already stable 3G and 4G coverage. This has paved the way for quality, consistency and, possibly, more technology innovation, such as in the field of Internet of Things (IoT).

However, two challenges stand in the way of this infrastructure development: (i) the lack of penetration of Internet services in some rural areas hinders access to digital government services (ii) the restriction of some voice-over-IP (VOIP) services affects critical components of innovative business models. It is worth noting that with the recent COVID-19 pandemic, the public sector has softened these restrictions to support the delivery of public and private education and other services online. Through partnerships with the local private sector and international players, Oman has opened data centres in Muscat and provided several cloud services through multiple cloud service providers to businesses, industries, and other third parties.

Oman innovators appreciate easy access to minimally-taxed hardware equipment and materials. They are also supported by the presence of most international technology companies and their warehouses on the national territory. Besides, if any equipment is unavailable locally, they are readily available for online purchases. To further encourage the adoption of technology equipment, the government has funded a scheme that provides economically-disadvantaged families with essential IT equipment at home. However, technology adoption faces some limitations in the accessibility and availability of material. These include: (i) high costs of advanced machinery, (ii) lack of distribution of specific components within the country due to

a small consumer market size, (iii) restrictions in accessing specific institutions on a membership-only basis. Having said that, some local innovation centres, such as the Innovation Factory, the Data Academy, and Oman Makers, have allowed access to various machinery and technology tools to all citizens.

Since 2010, the country has seen the creation of several soft infrastructures. Government ministries have opened innovation parks (e.g Innovation Park Muscat, the Innovation Hub by the Oman Arab Bank), knowledge centres (the Sultan Qaboos University's Innovation and Technology Transfer Center, the Center of Excellence for Advanced Telecommunications technology and IoT), education facilities (Makers Oman), incubators (SAS Center) and research centres (Innovation Factory, the Oman Research and Education Network, the Industrial Innovation Center and The Research Council – now merged with the MHESRI). These have allowed for an increase in the number of hackathons, boot camps, training programmes, seminars, workshops and competitions for innovators. These initiatives have further encouraged the private sector and academia to follow suit. Today, most big private companies (mainly telecommunications, oil and gas) and universities have incubators and accelerator programmes open to the broader public and students. Most stakeholders consider these soft infrastructures as reasonable basic steps towards entrepreneurial innovation. However, more funding is required to ensure these spaces can take their beneficiaries to the next level and attract new potential innovators.

The capital city of Muscat and big urban centres, such as Salalah, enjoy good Internet and mobile network coverage and services, unlike most rural areas and areas near oil fields. This disparity was particularly highlighted during the COVID-19 pandemic when many education and business operations faced disruption. Reportedly, the coverage discrepancy is justified by a large surface area (309 501 km²), uneven terrain, and dispersed population clusters. In 2020, at the height of the COVID-19 pandemic, the MTCIT, in partnership with the TRA, began to connect villages through satellite Internet to reach 600 villages by 2022. Such initiatives show significant potential, especially with the establishment of Space Communication Technologies LLC (as part of the National Satellite Programme initiative) that aims to build a national satellite communications infrastructure to reduce dependence on optical fibre.

Similarly, soft infrastructure is largely concentrated in the capital. Nevertheless, with the support of the private sector, the government has rolled out various training programmes to build ICT skills and create technology exposure projects in rural areas. Such decentralisation efforts are necessary to guarantee the inclusion of rural communities that form at least 14 per cent of the total population.

The technology markets of the IoT, virtual or augmented reality, blockchain, artificial intelligence (AI), big data, and software-supported services such as delivery, customer relationship management, e-commerce, transportation and banking are considered cluster opportunities for consumer markets. The significant financial technology developments led by the Central Bank of Oman (such as the National Payment Systems and, fintech regulatory sandbox, open banking strategy, financial technology (fintech) specialised education programmes, and the National eKYC Platform) are introducing a new dynamic for competitiveness. Stakeholders believe the country has a high potential and has already taken its first few steps to becoming competitive.

3.3 Talent and champions

- *A large pool of human capital is available, but it needs more soft skills, international exposure and strong mentorship.*
- *Human capital with theoretical knowledge of technical skills is available. There is a need to support more practical experience and advanced technology training.*
- *There are efforts by some universities to run soft skills training and entrepreneurial courses.*
- *The university-educated talent pool is slowly moving towards innovation. There is some collaboration between universities and companies, but changes in the curricula are slow to meet market needs.*
- *There are efforts to identify and recognise champions but many role models go unrecognised and do not play an active role in inspiring others with their success stories.*

Oman enjoys high-value ratio of human capital, with 50 per cent of its population aged under 25. Young innovators are described as passionate, creative and hard-working individuals with great interest in digital innovation. Nevertheless, they still miss essential business building and operations skills such as sales and marketing, critical thinking, project management, financial management, human resources management, and client management. Even though many of those skills can be obtained through on-the-job experience, there is a real need for more training, mentorship and exposure to enable innovation. Moreover, young innovators need to be trusted and allowed to prove themselves to join the ranks of the few entrepreneurs with notable local innovations.

The past few years have seen a growth in programming skills among Oman citizens with numbers of graduates (from ICT courses to PhDs) exceeding 1 500 per year (25 per cent of all graduates). Unfortunately, it is also the second-highest unemployment group in the country. Most graduates that make their way into programming or ICTs come out of university with insufficient practical skills. More experienced talent is usually headhunted by large private companies locally or abroad, leaving start-ups to turn to cheaper outsourcing hubs like India or invest in on-the-job training.

Even though advanced technologies are being taught in universities, it is usually hard to find experienced talent that specialises in drone technology, AI, IoT, machine-to-machine learning and data mining. This limits the scope of the employment policy in some areas. In January 2022, the Central Bank of Oman signed a cooperation with the College of Banking and Financial Studies (CBFS) to introduce the Fintech Professional Diploma. A month later, in February 2022, it signed a cooperation agreement with the Sultan Qaboos University (SQU) to develop courses in financial innovation and technology, but also to benefit from scientific and practical experiences in the academic field, financial technology and innovation fields and research and development.

Furthermore, many young innovators still cannot find the right opportunity and place to grow and showcase talent as technology engineers or ICT professionals. The overall maturity of the innovation ecosystem and the early-stage nature of the country's technology industry cannot keep up with the demand for work placement. However, the Tanfeedh programme reinforces training and rehabilitation programmes based on industry needs to empower the national workforce; and provides financial incentives to young graduates in their entry-level jobs.

Despite some trailblazing efforts by the public sector (such as the Upgrade and the Manafa programmes by MHERI) to encourage the youth talent pool to enter entrepreneurship, Oman has not yet seen a sufficient number of thriving start-ups. While many young people take their

first steps into entrepreneurship and create innovative solutions, they rarely solve local problems. This has a cascading impact on their long-term financial sustainability. Further, while efforts have been made within academia to bridge this gap, their initiatives are not unified across the education spectrum that includes primary, secondary, and tertiary education, whether private or public.

Lastly, while ecosystem champions have been mentioned across all stakeholder groups and applauded by a select few for their resilience and breakthroughs in a nascent industry, these champions are not widely recognised as role models. The ecosystem believes that recognising, celebrating and marketing successful stories, even among the smallest of groups, is needed to inspire potential innovators to view entrepreneurship as a viable career path.

3.4 Capital and resources

- *Some funding is available for early stages through public and private actors. Funding mechanisms such as crowdfunding, angel investment, and venture capitalists (VC) need incentives and support to attract investors.*
- *There may be challenges in investment requirements and opportunity matching. Growth stage funding can be a challenge, and there are missed opportunities in regional funding from Gulf countries.*
- *There is limited funding for basic research. While some applied research funding is available, it is not sufficient to enable commercialisation or encourage technology transfer at scale.*
- *Despite the economic free zones and efforts made to attract investors, there is low foreign direct investment (FDI) in the ICT sector. Thus, it might benefit from a review of the regulatory and incentives framework.*
- *Support networks such as incubators and co-working spaces have been affected by recent economic challenges and require financial support to create effective programmes for impact.*

The past five years of budgetary challenges and reforms in the country have translated into lower spending and lower investments, making fundraising for the growth of start-ups and SMEs difficult. Some start-up seed funding or idea-stage investments are available through private sector programmes, government banks, government schemes and sponsorships programmes and university incubation centres. Often, innovators turn to family funds as a source of angel investment. The Innovation Development Oman (IDO) and the Oman Technology Fund, both under the Oman ICT Group (now known as ITHCA), are not enough to cover the demand for growth funding. In November 2021, the Capital Market Authority approved a legislative system for crowdfunding activity within the country, bringing another fundraising opportunity for innovators.

The research and development sector faces similar challenges in terms of capital resources. There is limited funding available and most of it comes from private companies and government schemes. The MHESRI has led, among many other efforts, two demonstrable initiatives: (i) the Block Funding programme, which funds institutions and research-performing companies, and (ii) Ejaad, an online membership-based collaborative platform where academia, government and industry actors engage in innovation activities and research related to renewable energy, oil, gas, and water industries. However, these efforts are insufficient to promote the transfer of technologies at scale. There is a clear need to promote intellectual property (IP) and provide financial incentives to researchers and universities to enable them to take their research beyond the four walls of the university libraries.

Meanwhile, the country has witnessed most international investments through its free zones, where global companies can settle with benefits ranging from 100 per cent ownership to tax exemptions on the import and export of goods. However, except for the UK Oman Digital Hub¹, FDI in the ICT ecosystem has been low. Currently, the MTCIT is examining the possibility of attracting more FDI to the ICT sector.

The public sector has also been making considerable efforts to launch and fund incubators and co-working spaces. However, the recently reduced government budgets, especially since the start of the COVID-19 pandemic, have significantly affected their operations and scale-up. Private co-working spaces, on the other hand, are rare as their business models do not appeal to investors.

3.5 Market and networks

- *There is no known formal network to advocate for ICT innovation exclusively. However, informal groups and a few formal organisations could play a catalytic role.*
- *The lack of visibility of ecosystem actors and their services limits collaboration but platforms like Innovate Oman might improve the dynamics.*
- *Despite laws for public procurement that advocate for a quota for SMEs, innovative ICT start-ups struggle to access contracts due to the lack of agile procurement frameworks.*
- *Oman is a small market that offers a good testbed before scaling initiatives to the regional or international levels. However, more support is needed to access these markets from regulatory and programme perspectives.*

Though the stakeholders want a formal ICT network, no such network exists yet that can advocate for the interest of the digital innovation ecosystem. Associations such as the Oman Chamber of Commerce, the Oman Information Technology Society and the Oman Education Technology Society are viewed as potential bodies that may lead as an example for the ecosystem. Meanwhile, informal networks exist on WhatsApp groups or through the personal efforts of individuals. However, the absence of formal networks and a known, shared mapping of all stakeholders limits the possibilities for multi-stakeholder collaborations.

The ecosystem has a positive perspective on the availability of a domestic consumer market, particularly for innovations in the oil and gas, banking, manufacturing and tourism industries. Nevertheless, the increasing demand from young people for consumer technologies cannot outweigh the reality of a small available market, around 5 million population, where ICT use remains lower than ICT access (WIPO, 2021). This perspective has frequently justified a low level of investment in local technologies among investors. But, at the same time, because of its favourable geographic position and geopolitical stability, Oman has been considered a good testbed for ideas with the potential for regional and global expansion.

When it comes to public procurement, the recent reduced government spending has changed the landscape of contracts. As per the policy, 10 per cent of government public contracts must be awarded to SMEs, irrespective of the sector. However, the recent plans for digitalisation of public administration have not, reportedly, led to public procurement opportunities or ICT-based opportunities for start-ups or SMEs. In fact, government projects are usually awarded to companies with more extensive portfolios and proven maturity. In addition, SMEs and start-ups find the tender application process lengthy and complex. However, efforts from the government

¹ https://omanstartupclub.com/ecosystem_supporter_companies/uk-oman-digital-hub

are underway. Earlier in 2022, the MTCIT launched the Jadara programme to facilitate the promotion of locally-developed technology products by start-ups to reach government entities.

Despite the efforts of the Ministry of Commerce, Industry and Investment Promotion and other ministries, the ecosystem seems to be missing the opportunity to export its ICT production, estimated at 0.4 per cent in 2018 (World Bank). Currently, export efforts are led by personal outreach from start-ups and SMEs to expand their services to other countries in the Arab State region. There are also trade opportunities that are active regionally, with Saudi Arabia and other Gulf countries, and in countries with historical ties in Southern Africa and the United Kingdom.

3.6 Culture and communities

- *Several events are organised to foster digital innovation and ignite communities. However, they are often ad hoc, unstructured and lack support to create impactful digital innovation communities.*
- *Many initiatives have catalysed an entrepreneurial culture in the past few years, especially among the younger generations. However, this culture is still nascent and requires more support to build momentum.*
- *Attitudes towards risk and entrepreneurship need more push to translate into positive outcomes.*
- *Many young women are graduating in ICT fields but not necessarily heading into entrepreneurial endeavours in technology. Women, however, do hold leadership roles across all sectors.*

Oman hosts events such as annual conferences, seminars, prizes and other boot camps, led by private companies, the government and research centres within universities. These events are frequently used to share challenges, discuss new technologies, learn from each other, and build networks. One Comex, the official technology show, is an annual flagship event in Oman. However, more events such as this are required for innovators, who look to meet their needs to conferences outside of Oman, particularly in neighbouring Dubai. The ecosystem would benefit from more conferences in Oman to support connections between investors and innovators (start-ups and SMEs). The Oman Start-up Hub platform (OSH) is undoubtedly a solid step toward satisfying this need.

These events have nurtured the conversation around entrepreneurship and innovation beyond the ecosystem. Motivated by creating social impact and finding alternatives to unemployment, young Omanis are slowly joining the ranks of entrepreneurship and innovation. Students start as early as their university years, and younger ones are tasting risk through entrepreneurship workshops in primary and secondary schools. Efforts like these have inspired a few success stories, and the last five years have seen a steady increase in company registration, particularly in the technology sector.

While the younger generation has developed some risk appetite, potential pitfalls keep innovators very alert to legal frameworks. Failure is difficult to accept and ends in disappointment, and entrepreneurs are lucky to be able to turn to their supportive families, as is common in Oman culture. Many have reportedly shown exemplary patience through the highs and lows of entrepreneurship. At the same time, in some cases, family and social responsibilities have pushed many innovators out of the path of risk-taking and toward stable and sustainable employment.

The ecosystem prides itself on being an equal-opportunity environment for all. Reportedly, women hold leadership positions across businesses and constitute the majority of graduates and PhD holders in university ICT departments. However, this education does not necessarily translate into entrepreneurial endeavours and leadership in the technology sector in particular. To initiate a change, Tawasul, a private enterprise, launched the Mulhimat programme to provide business mentorship and coaching opportunities for SMEs run by women entrepreneurs. The ecosystem believes more is needed to support women and showcase their talent. Further, rural communities, too, are not represented in large numbers. In 2021, the Ministry of Agriculture, Fisheries and Water Resource, in partnership with the Oman Development Bank, launched the "Rifi" programme to support rural women in entrepreneurship.

3.7 Policy and regulation

- *The public sector is engaged with innovation but requires a framework for fast and agile execution.*
- *There are some connections between the public sector and other ecosystem stakeholders but these connections need sustainable frameworks for collaboration and partnership.*
- *Intellectual property protection is possible but the process is viewed by innovators as lengthy, complex and expensive.*
- *Research and development, produced by universities, is slow to translate into commercial projects due to low incentives and ineffective technology transfer initiatives.*
- *ICT policies are well developed and cover cloud governance, information security, cybercrime, ICT services and access, government open data, database security, and social media. However, with fast-changing technology, more efforts are needed to unlock the potential of key sectors.*
- *Some education policies need to be reviewed to incentivise collaboration and quickly adapt curricula to industry needs.*
- *Finance policies have made improvements to the fintech sector, and more improvements are underway.*
- *SME policies have good support, especially for procurement. However, they need the flexibility to leverage 4IR technologies.*
- *Industrial policies cover almost all key sectors and have been able to reinforce the structural reforms for economic diversification and prosperity.*
- *Trade policies cover the country's primary industry, the possibility for FDI, and the need to create employment opportunities through the development of trade.*

While the Oman Vision 2040 has stimulated innovation in the public sector, not all public sector entities are equally engaged with innovation and innovators. The public sector has also become aware of the need to be more customer-centric to ensure long term and successful engagement with its beneficiaries. In recent years, the public sector has focused on creating policies, frameworks, strategies and guidelines to support the implementation of the vision and the digital transformation of many of its public administrations. Further, it has pushed ICT and entrepreneurship initiatives within the public primary, secondary and tertiary education systems. However, the slow execution and little agility in implementing the regulations and initiatives have made the public sector miss out on opportunities for innovation in e-governance in the most effective manner.

The public sector shows a culture for public consultations on regulations and policymaking through workshops and roundtables. Stakeholders, too, described most of the public sector as accessible and open to discussing challenges. However, not all public sector actors are equally

connected to all stakeholders; they are sometimes slower to communicate across other sectors and groups. On the policy front, the landscape varies between over-regulation, absence of regulations, and uncovered grey areas in many legal frameworks for advanced technologies. This leaves innovators feeling hesitant about the use of developing technologies.

Despite significant developments by the Ministry of Commerce, Industry and Investment Promotion (MCIIP) through their National Intellectual Property Strategy and other policies, innovators still find the process of registering intellectual property (IP) to be complex, expensive and slow. Besides, innovators feel apprehensive about spending money on IP registration that may not yield any return on investment. Moreover, research and development policies are slow to translate into the transfer of technologies and the commercialisation of research solutions.

As far as ICT policies are concerned, regulations, frameworks, policies, laws, and guidelines comprehensively cover cloud governance, information security, cybercrime, ICT services and access, open government data, database security, and social media. Oman scores 85.33 (out of 100) on the ITU ICT Regulatory Tracker², which shows good regulatory authority and competition frameworks for ICT and telecommunications. However, the policies require adjustments to the predicaments of advanced technologies (such as drones and cloud service) and clarification of grey areas regarding their access and use. So far, revisions to policy have been slow due to security concerns; and innovators refrain from experimenting in a few areas fearing infringement of the law.

The National Strategy for Education 2040, meanwhile, has made significant reforms to the system. It champions the need for greater technology integration, more research and development, and an increase in the transfer of technologies. It even supports the enhancement of technology in the areas of education infrastructure, learning and teaching, and capacity building. However, there is a need for policies to encourage collaboration and fast adaptation of curricula to meet industry needs.

The biggest policy bottleneck is the modern financial mechanisms. Angel investors and VCs cannot invest in a company/start-up or provide equity without being legally considered a business partner with legal responsibilities and liabilities. No legal framework covers risk financing tools such as safe and convertible notes. Consequently, investment firms are increasingly registering outside the country, in jurisdictions that allow for more favourable financial tools. In March 2022, the Capital Market Authority approved the licensing of the country's first global crowdfunding platform operator. Furthermore, the Central Bank of Oman is in the process of revising the Banking Law to lay down a suitable regulatory and legal framework for financial technologies.

Other than policy efforts in the finance sector, the Central Bank of Oman has led notable efforts to support citizens, entrepreneurs, investors, and citizens such as (i) encouraging digital payments and innovation widely through mobile payment services to boost mobile-based payments for both SMEs and citizens; (ii) licensing payment service provider and encourage financial technologies to boost the digital market; (iii) providing platforms to process payments digitally via 24X7 RTGS, payment gateway, mandate management and direct debit, QR payments, among many others; (iv) waiving the fee on the transactions during the COVID19 pandemic and supporting the community.

² <https://app.gen5.digital/tracker/about>

The Public Authority for Small and Medium Enterprises Development (Riyada) has supported the creation of Omani-owned SMEs, both financially and in capacity building. It has instituted a 10 per cent reservation for all public contracts to be awarded to local SMEs, regardless of the sector. However, SME creation remains hindered by the financial sustainability and administrative complexities of opening a business. Furthermore, start-ups and business owners of small or larger firms are still suffering from the instability of business rules and regulations.

Industrial policies cover the main key sectors through (i) the Sustainable Agriculture and Rural Development Strategy towards 2040, (ii) the Oil and Gas Law, (iii) the Manufacturing for Wellbeing Strategy 2040, (iv) the National Tourism Strategy, (v) the Oman Logistics Strategy, and (vi) the Banking Law. Most policies mention the use of modern technologies to increase the efficiency of production and the production of raw materials locally. These frameworks are part of the economic diversification of the country.

Finally, trade policies cover all key non-ICT industrial sectors and aim to (i) develop human resources, (ii) increase private sector competitiveness, (iii) enhance ease of doing business, and (iv) position the country as a commercial hub. It also emphasises the export of high-tech and value-added components through partnership building. Moreover, there is an increasing need for specific incentives and technology innovation support policies for start-ups such as financial exemptions and support packages to enable local start-ups to grow within and outside Oman. These efforts are under way as the Ministry of Transport, Communications, and Information Technology is developing a technology start-up label, which will be dedicated to all technology start-ups in Oman. The label will bring incentives, regulation exemptions, and proactive measures along to support the growth of technology innovation products in the country; including access to public procurement opportunities.

4 Ecosystem challenges and opportunities

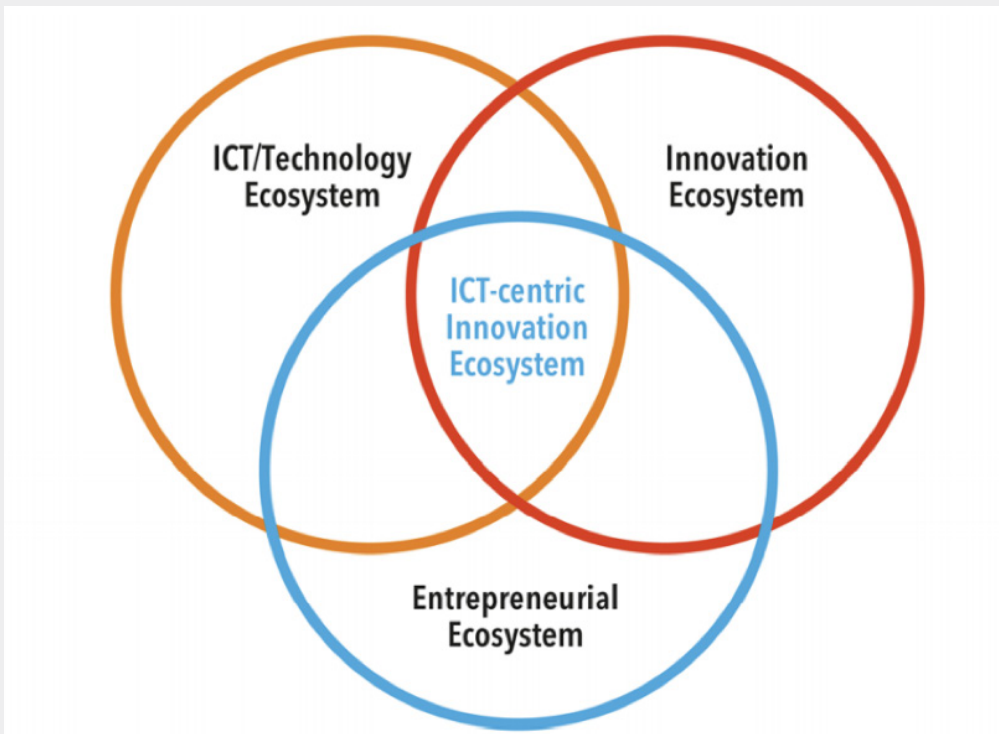
The three ecosystems essential to Oman’s digital transformation journey are:

- (i) the innovation ecosystem (universities, research institutes, and the public sector);
- (ii) the ecosystem of entrepreneurs (innovators and support organisations; and
- (iii) the technological ecosystem (high-tech, ICTs, technology business-to-business (B2B), and manufacturing companies).

Understanding the ICT-centric (digital) innovation ecosystem

The three ecosystems – innovation, entrepreneurial, and technology – are closely linked to developing a country’s digital transformation landscape. At the intersection of the three ecosystems lies the ICT-centric innovation ecosystem, also referred to as the digital innovation ecosystem.

Figure 3: Engines of growth



The following sections contain a brief analysis of each of the three ecosystems and ends with an overview of the challenges and opportunities in the three interconnected ecosystems, as gathered through interviews and group discussions during the co-creation workshops with local stakeholders. Detailed analysis of the challenges has been presented under section 3 (Current Landscape) while detailed recommendations are covered in section 9 of this report.

4.1 Innovation ecosystem

The innovation ecosystem – including research institutes, universities and public sector entities such as national innovation agencies and public sector funding, and private sector and other actors involved in commercialisation – plays an invaluable role in the national journey of innovation, especially in the launch of an innovation.

- *The Oman Vision 2040 has undoubtedly sparked a new ambition for the ICT-centric innovation ecosystem through some critical policy-making and the development of soft infrastructure.*
- *The lack of well-planned distribution of ICT-centric endeavours, agendas, objectives and projects prevents a cohesive impact on the ICT-centric innovation ecosystem.*
- *The public sector and universities have the opportunity to spread the culture of entrepreneurship and innovation across government and throughout civil society.*

The holistic Oman Vision 2040 leads the innovation ecosystem and works in harmony with the National Innovation Strategy and the Digital Economy Strategy. Underpinned by various policies, strategies, frameworks and guidelines that focus on different technology areas, the vision has given an impulse to several soft infrastructure programmes and other projects to support the ICT-centric ecosystem. Further, the country has various universities and colleges that provide technology programmes and support infrastructures such as research laboratories and incubators.

While the vision has energised the innovation ecosystem, the scattered nature of efforts has diminished the cohesiveness and impact on the ecosystem. It appears that efforts need long-term monitoring, evaluation and learning mechanisms. Moreover, the curricula in universities and colleges across the country are yet to meet the full range of labour market needs in the ever-evolving technology industry. Universities also can create active linkages with the private sector for research and create more opportunities for start-up spin-offs.

The innovation ecosystem holds a unique position in promoting digital innovation and entrepreneurship across the government and its administrative bodies, if agendas are unified and efforts consolidated across the various ministries. This will reinforce collaboration and communication among stakeholders and inspire more talents to join the innovation journey.

4.2 Entrepreneurial ecosystem

The entrepreneurial ecosystem includes entrepreneurs, their support systems and organisations that initially nurture business creation through the “valley of death” and subsequently their growth into sustainable SMEs.

- *Young Omanis are slowly joining the innovation journey, marking a willingness to take risks. A handful of them have already demonstrated early success.*
- *Innovators need substantial entrepreneurship education and soft infrastructure to build effective business models for growth.*
- *Talents have the opportunity to tap into promising domestic and regional markets by integrating technologies in non-ICT markets.*

Motivated by new opportunities for income, young talents are slowly experimenting with digital entrepreneurship. Armed with passion, willingness and good faith in creating social impact, they show more tolerance to risk. While some innovators have shown early success, the entrepreneurship ecosystem does not yet have all the means to satisfy its ambitions.

Entrepreneurs navigate an early-stage innovation ecosystem with educational, financial and infrastructural challenges. They overlook essential aspects of business building, such as problem-solving, market analysis, customer empathy, and competition research that are key to building strong and effective business models.

Innovators have the opportunity to solve local problems in domestic markets, specifically in industry verticals such as agriculture, fisheries, renewable energies and transportation, where technology integration has great potential.

4.3 Technology ecosystem

The technology ecosystem includes high-growth technology companies, their equipment manufacturers, systems integrators, companies in the ICT sectors and B2B technology platforms supporting SMEs, among others. The development of the technology ecosystem is essential to a country's ability to benefit from technological innovation and create high-growth industries and jobs.

- *The technology sector is slowly expanding, with its first examples of domestically manufactured ICT products.*
- *Gaps in some policies and regulations inhibit the creation and use of advanced high-tech.*
- *SMEs and high-tech companies have a unique opportunity to train domestic talents and partner with universities.*

Oman's technology start-up ecosystem development is essential to increase the growth of the technology and digital ecosystem and to ignite digital economic growth. As such, the country has seen some homegrown companies (e-Mushrif, Onsor and Mersal) dive into domestic manufacturing and exporting of ICT services and products including computers and phones. These companies were inspired by the Oman Vision 2040 and their desire to create local jobs and offer competitive pricing for hardware. Lately, more SMEs are seeking opportunities to digitalize their operations and products to appeal to younger consumers and expand their market across the country.

However, innovators remain cautious in using or creating advanced high-tech (big data, drones, etc.) as regulatory frameworks do not yet cover them. Besides, the use and application of various advanced technologies still require permission from the government, which can be time-consuming to acquire.

Technology companies have the opportunity to collaborate with universities on two fronts. First, SMEs and high-tech companies can uncover domestic opportunities through research and development. Second, technology companies can access a vast pool of local talent and train them to build the future workforce.

4.4 Macro challenges

At a macro level, the three ecosystems face some common challenges:

- 1 Over-regulation, the absence of regulation, and grey areas in policies, which are obstacles in the creation and operation of new and advanced innovation, specifically for SMEs.
- 2 The uneven distribution of soft and hard infrastructure in rural areas limits outreach to markets and local community inclusion in the ecosystem.
- 3 Insufficient public funding and investment opportunities across the ecosystem hinder the survival of many SMEs and start-up communities.
- 4 Access to mature and experienced human capital is not without obstacles as innovators need to spend considerable time and resources to train their workforce.

5 Stakeholders

Understanding the stakeholders

Collaboration between key actors in the innovation ecosystem is the foundation of the assessment process and drives the actions taken to build the ecosystem.

As such, being able to identify and engage with these stakeholders is an important part of the country review.

The six actors, described in section 6, are as follows: entrepreneurs, public sector actors, financial actors, academics, private sector actors, and entrepreneurial support networks.

Table 2 lists the many stakeholders who contributed to this analysis and grouped into entrepreneurs, the finance sector, entrepreneurial support networks, the private sector, academia, and the public sector. Stakeholders who were interviewed and participated in co-creation workshops are marked as “[Interviewed]”.

Table 2: Key actors and stakeholders

	Stakeholders (in alphabetical order)
Entrepreneurs	<ul style="list-style-type: none"> • Atoms Lab • Databoat • Elhabta App • eMushrif [Interviewed] • Esbaar [Interviewed] • iLab Marine • Innotech [Interviewed] • iTrans • Mamun AI • Monak e-services • Oman Adventure • Otaxi [Interviewed] • Rihal - Data Migration and Services [Interviewed] • Thawani App • Wakan Tech

Table 2: Key actors and stakeholders (continued)

	Stakeholders (in alphabetical order)
Entrepreneurial support networks	<ul style="list-style-type: none"> • Al Rud'ha Coworking Space • Carbon6 • Eco-Innovate Oman Accelerator by Be'ah • Innovation Factory Centre [Interviewed] • Innovation Hub by the Oman Arab Bank • Masar77 • Oman Information Technology Society [Interviewed] • Oman Vision 2040 [Interviewed] • OmanTel Innovation Labs [Interviewed] • SAS Centre for Entrepreneurship [Interviewed] • Sharakah • Tawasul • UK Oman Digital Hub • Venture Valley • Zubair Small Enterprises Centre (Zubair SEC)
Finance	<ul style="list-style-type: none"> • Ahlibank • Aljabr MENA [Interviewed] • Angel Investments LLC • BidayaTech • Capital Market Authority [Interviewed] • Falha Investment LLC • IDO Investments • Jabreen Capital • MCT Capital • Oman Development Bank • Oman ICT Holding Group (ITHCA) [Interviewed] • Oman Investment Authority [Interviewed] • Oman Technology Fund [Interviewed] • Phaze Ventures • SME Development Fund Inma • Sustainable Investments

Table 2: Key actors and stakeholders (continued)

	Stakeholders (in alphabetical order)
Private sector	<ul style="list-style-type: none"> • Asyad Group [Interviewed] • Awasr Broadband [Interviewed] • Codevative • FreeBalance • Huawei • Informatics for Technology LLC • Mideast Data Systems Oman • Nasma Telecommunications • National Security Services Group • Oman Broadband [Interviewed] • Oman Data Park [Interviewed] • Oman One • Omansat Space Communication Technologies [Interviewed] • Ooredoo Oman [Interviewed] • Petroleum Development Oman [Interviewed] • Ultra Electronics
Academia	<ul style="list-style-type: none"> • Artificial Intelligence Academy [Interviewed] • Colleges of Technologies (across cities) • College of Banking Financial Studies • Data Academy [Interviewed] • German University of Technology in Oman • Global College of Engineering and Technologies • Huawei ICT Academy [Interviewed] • National University of Science and Technology [Interviewed] • Oman College of Management and Technology • Sultan Qaboos University [Interviewed] • University of Technology and Applied Sciences [Interviewed]
Public sector	<ul style="list-style-type: none"> • Central Bank of Oman [Interviewed] • Ministry of Agriculture, Fisheries, and Water Resources • Ministry of Commerce, Industry and Investment Promotion [Interviewed] • Ministry of Culture, Sports, and Youth • Ministry of Education [Interviewed] • Ministry of Health • Ministry of Heritage and Tourism • Ministry of Higher Education, Research, and Innovation [Interviewed] • Ministry of Labour • Ministry of Social Development • Ministry of Transportation, Communications, and Information Technology [Interviewed] • National Centre for Statistics and Information [Interviewed] • Oman Chamber of Commerce and Industry • Public Authority for Small and Medium Enterprise Development, Riyada [Interviewed] • Telecommunications Regulatory Authority • Tender Board

6 Ecosystem maturity map

Understanding the ecosystem maturity map

The ecosystem maturity map, also referred to as the innovation journey map, highlights the work that needs to be done within the ecosystem to harness innovation on a transformative journey from pre-ideation to high growth. It describes stakeholder roles and actions in support of entrepreneurs and innovators at each stage of the start-up lifecycle. The colour coding identifies areas that are well-supported (green), inadequate (yellow) and missing or weak (red).

The heatmap of stakeholders in the ecosystem and the current status of their jobs-to-be-done has been arrived at through interviews and group discussions during the co-creation workshops with local stakeholders; and validated with the help of secondary research and review of relevant sources.

It must be understood that the innovation lifecycle or the entrepreneurial journey is not linear. Instead, it is made up of a series of jobs-to-be-done across different stages of the cycles. In the pre-ideation stage, key actors plant the seeds of support in the innovation ecosystem. In the ideation stage, innovations are developed but have not yet been incorporated as businesses. In the start-up stage, innovations evolve from concepts into businesses. The valley of death is a challenging stage of development where entrepreneurs need strong support to survive. In the SME stage, the velocity of start-up growth increases as they expand rapidly into established businesses, reach steady-state, or exit through buy-outs or initial public offerings (IPOs).

There is a need for a comprehensive understanding of how ecosystem actors can work together to implement national development priorities within the maturity ecosystem of digital innovation. Initiatives that are constructed in silos might lead to duplication of efforts and wasted resources.

The Oman ecosystem maturity map shows an early-stage ecosystem. Profiling key stakeholder actions are necessary to accelerate digital transformation.

Table 3: Actors and cycle stages

Actors	Cycle stage				
	PRE-IDEA	IDEATION	START-UP	THE "VALLEY OF DEATH"	SME
Entrepreneurs	Entrepreneurial Interest	Engage with Problems	Develop Business Models	Build Collaboration	Expand
Finance	Research Funding	Seed Funding	Angel Investment	Venture Capital	Business Finance and Loans
Entrepreneurial support networks	Entrepreneurial Events	Hackathons and competitions	Co-Working and Support	Incubators and Accelerators	Business Association
Private sector	Success Stories	Research Programmes	Lab Programmes	B2B and Support Services	Skill Training Programmes
Academia	Community of Entrepreneurs	Basic Research	Spin-Offs	Soft Skill Trainings	Human Capital
Public sector	Vision and Strategy	IP and R&D Support	Tax Support	Public Procurement	Trade Policy

6.1 Entrepreneurs

- The new younger generation of Omanis shows more entrepreneurial interest, demonstrably while still at university to escape potential unemployment after graduation.
- The hastiness to start a business, coupled with little market research skills, makes Oman innovators overlook challenges in domestic markets.
- Few innovators have developed strong business models that could turn their ideas into start-ups.
- In the absence of a mapping of private and public stakeholders for collaborations and partnerships, many start-ups barely survive the valley of death.
- Very few start-ups expand into high-growth SMEs; however, some of them do succeed in turning into traditional business ventures.

6.2 Finance

- Except for the "Block Programme" and a few research funds provided by the oil and gas companies, very little research funding is available for other sectors.
- Seed funding is available through government funds and competition prizes but very few of the awardees have been able to turn early-stage ideas into start-ups.
- There is only one known angel investment fund, and it has shown a low level of investment activity.
- Venture capitals do not see much incentive in funding domestic start-ups and have limited perspectives on local success stories.
- Riyada has deployed many support subsidies for SMEs, but the SMEs avoid taking loans and have not been able to receive traditional investment from commercial banks.

6.3 Entrepreneurial support networks

- *The public sector, the private sector, academia, and finance are involved in hosting a few events, training opportunities and other conferences in the ICT innovation ecosystem, but very few of these events truly discuss and resolve the challenges.*
- *While hackathons and competitions remain open to all and have incentivised a desire for innovation and entrepreneurship, there is little evidence that they have supported innovators to develop and test their ideas.*
- *Due to the recent economic crisis, private co-working spaces have begun to close and public spaces have seen their budgets reduced, thus affecting the innovators.*
- *A few incubators and accelerators have popped up over the last few years, but very few of them have been able to demonstrate success stories or champions at scale.*
- *There are a few active business associations, but they are yet to demonstrate their involvement in or influence the ICT-centric ecosystem.*

6.4 Private sector

- *Corporations are attempting to create success stories that can resonate in the ecosystem through start-up programmes and seed funding.*
- *Except for the oil and gas industry, there is little evidence of research funding by the private sector in other key ICT and non-ICT sectors.*
- *No private sector actor has been able to demonstrate the success of lab programmes, other than co-working spaces and incubators, to support and foster innovators.*
- *The private sector has not demonstrated any other support service or involvement with local start-ups and SMEs.*
- *There are hardly any private sector actors that are willing to host young graduates and invest their time and resources in training the future workforce.*

6.5 Academia

- *Some universities, such as the Sultan Qaboos University, have innovation centres that create digital innovation communities and, in some cases, provide prizes or co-working spaces.*
- *While many academicians engage in fundamental research, most papers end up on university shelves with no notable examples of the transfer of technologies.*
- *While universities are starting to create a community of potential entrepreneurs, many of these remain at the idea stage with no notable examples of spin-offs.*
- *While universities offer some introductory entrepreneurship courses as electives, most academic programmes do not provide practical soft skills as part of the core curriculum. Most innovators learn the required soft skills from programmes offered by the investment community and the private and public sectors.*
- *University graduates are not necessarily ready for the job market and have to be trained by the companies that hire them.*

6.6 Public sector

- *The public sector has shown awareness and engagement to support the development of an innovation ecosystem through its vision, policy and strategy developments.*
- *Government ministries have allocated funds for research and development and made efforts to revise intellectual property policies.*
- *While SMEs and start-ups received tax support during the COVID-19 pandemic, these benefits need to extend beyond just the exceptional conditions.*

Digital innovation profile: Oman

- *Most public procurement contracts are awarded to mature and experienced companies, however, the Jarada Programme aims to change this approach.*
- *While there are strong connections with the other Gulf countries, the United Kingdom and the Africa region, trade policies are yet to show a tangible impact in the ICT sector.*

7 Relevant practices

During the assessment process, the following practices were identified as noteworthy and potentially positive for the digital innovation ecosystem. As the next step in this process, an in-depth collaborative analysis could lead to the recognition of champions and good practices throughout the ecosystem.

[COMEX Technology Show](#)

Supported by the MTCIT, the COMEX Technology Show is an annual event that gathers the general public, academia, innovators, the technology community, and private and government-owned companies across all sectors to highlight ICT innovations in Oman, including the digital economy and transformation journey. Besides a physical exhibition, the event hosts subject-led conferences, workshops, seminars, pitch battles, hackathons and even an ICT Excellence Award. The show allows visitors to experiment live with robotics, coding, high-tech printing, and smart homes.

[Oman Summer of Code](#)

Initiated by the MTCIT in 2013, the "Summer of Code" is an annual three-month programme that aims to train Omani technical talent in different work environments and real-world projects, using an array of open-source applications. Participants can choose to train as developers on e-government services or civil society e-services. Since the initiative inception, more than 60 projects have been completed, 5 SMEs created, and over 350 young people trained, of which more than half have received employment opportunities.

[Oman Technology Fund](#)

Initiated by the Oman Investment Authority in 2016, the woman-led Oman Technology Fund (OTF) is a one-of-a-kind investment company that aims to brand Oman as a technology leader in the Gulf and the Arab States region. It offers funding at different stages of the start-up journey. OTF Techween is a unique three-month pre-seed investment programme that offers mentorship, co-working space and funding for up to USD 50 000. OFT Wadi Accelerator offers seed investment of up to USD 100 000, in addition to mentorship with experienced entrepreneurs and a co-working space. OTF Jasoor Ventures invests up to USD 3 million in well-established companies for growth purposes – to support access to global markets. So far, the fund has led more than 34 rounds of investments.

[Oman StartUp Hub \(OSH\)](#)

Founded in 2019, the Oman Start-up Hub is an online networking platform for start-ups, investors, advisors, mentors and entrepreneurs. The platform offers exclusive networking opportunities, relevant news about the ecosystem, and information about upcoming events. It connects innovators to valuable programmes, platforms and resources, such as a basic mapping of the ecosystem. Members also have access to a suite of services across incubators, accelerators, co-working spaces, business training, and talent, legal or technical support.

[OmanTel Innovation Labs](#)

Founded and managed by the first telecommunication operator in the country, the OmanTel Innovation Labs is a platform to leverage its expertise, network and access to a community of innovators and entrepreneurs. It provides access to community events, workshops and an

accelerator programme for in-kind services and investment opportunities. Most interestingly, the focus is on critical areas such as IoT, 5G, cybersecurity, customer experience technology, and big data for the technology ecosystem.

[Oman Information Technology Society](#)

Founded in 2012, the Oman Information and Technology Society is one of the few membership-based associations in Oman. It aspires to coordinate and unify the efforts of all ICT stakeholders and to nurture a culture of collaboration. Moreover, it aims to support the spread of ICTs throughout civil society through events, training, private consultations and awareness campaigns.

[Hadatha Cybersecurity Programme](#)

The Hadatha Cybersecurity Programme is a multi-disciplinary ecosystem of government, private, industry and academia that focuses on collaboration, information sharing, research and implementation of cybersecurity innovation technologies. It aims to create an integrated cybersecurity ecosystem enabled for economic diversification, innovation, and well-being. Its mission is to facilitate, foster and enable cybersecurity innovation to enhance capabilities in the market by identifying needs and priorities in cybersecurity innovation.

[The FinTech Regulatory Sandbox Framework](#)

Launched in December 2020, the Central Bank of Oman issued and launched the Fintech Regulatory Sandbox Framework to enable applicants from both licensed and non-licensed institutions to test their proposed fintech solutions live with CBO oversight, by providing a temporary regulatory exemption for fintech-ready products. The sandbox received an overwhelming response, with several local and international participants coming forward to present their payment solutions in the first version.

[SAS Centre](#)

Launched by the MTCIT in 2013, the centre had one of the first technology-focused incubator programmes that managed to incubate 94 technology SMEs and start-ups. These companies had the impact of creating an estimated 836 jobs and revenue of OMR 8.4 million. The centre has conducted four accelerators through partnerships with Google for Startups and the UK Oman Digital Hub. The Centre is now positioned as a technology hub with oversight of the technology start-up ecosystem.

8 Perspectives on national priorities

Understanding the national vision and key strategies

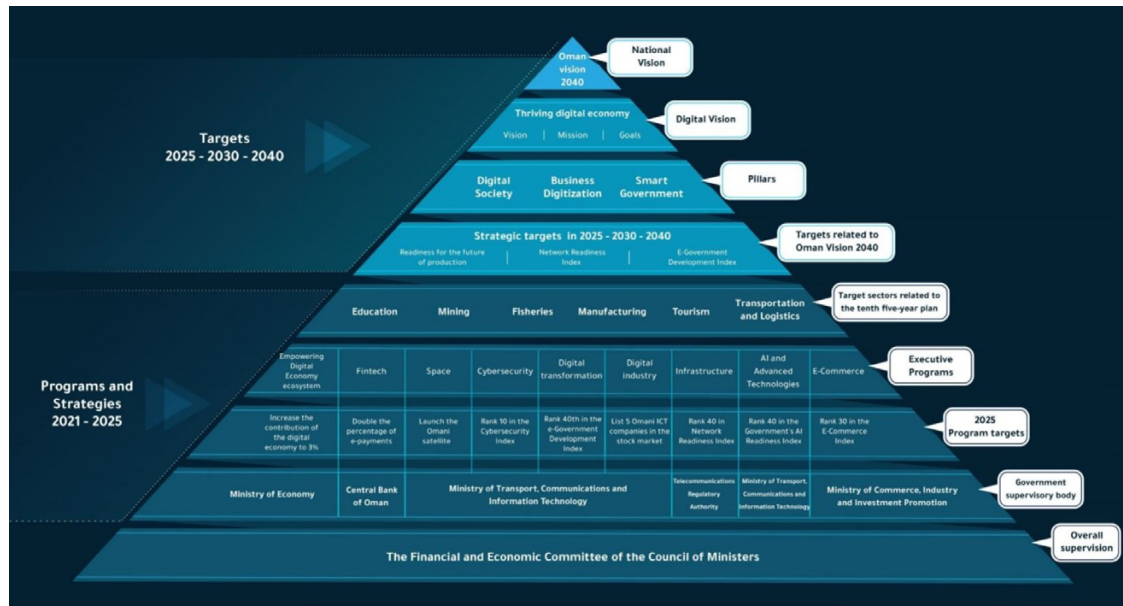
A clear vision for digital transformation, shared at a community or national level, results in synergising the resources and efforts towards one shared objective. It is important to understand that the digital economy is a product or outcome of digital transformation in a country. Towards this goal, all stakeholder visions and strategies can be aligned, including those of previously siloed stakeholders, thus enabling a collective understanding of gaps and opportunities. This alignment will lead to the creation of a cohesive common agenda.

Most countries have established their national vision for their digital economy, based on national or international narratives such as the Sustainable Development Goals (SDGs), smart cities, smart societies, and the creative economy. The national vision is essential to have a common language among stakeholders to avoid miscommunication or misleading information. Most countries are also enacting various strategies, including digital economy strategies, to achieve their national vision. However, very often, the enablers needed are missing or are insufficient, especially with regard to how ICT can drive this acceleration.

Oman has already embarked on a long-term development strategy, Oman Vision 2040. To achieve this vision, the government has put in place executive programmes, action plans, key milestones and targets. This vision has been set out to increase economic growth of key sectors in the short- to medium-term that will achieve the best long-term version of this vision. Looking at Oman Vision 2040, it is clear that Oman has put the strategies in place to reach the vision.

The MTCIT has developed a digital economy strategy to contribute to the economic diversification priority by enhancing the contribution of the ICT sector to the national economy. However, it is crucial for the country to successfully put the right enablers of the digital innovation ecosystem into all its existing and upcoming strategies to propel the vision for a digital economy in Oman.

Figure 4: National digital economy programme 2021



Section 9 presents recommendations to support Oman Vision 2040. These recommendations are targeted towards strengthening Oman’s executive programmes and related strategies to achieve the digital economy vision and mission. These recommendations include specific new measures, policies and initiatives that can propel Oman towards its national ambition.

9 Recommendations

Understanding the strategic priority matrix

Identifying the most critical needs and solving them within resources in an ecosystem is an important consideration. Without prioritisation and proper planning, success can be limited. Developing the capabilities of an ecosystem requires an agreement from stakeholders on key recommendations and key performance indicators to monitor them.

The strategic priority matrix identifies actions, programmes, policies and initiatives that must be in place to unlock the key enablers necessary for digital transformation.

The strategic priority matrix helps to develop a high-priority roadmap that amplifies the ecosystem good practices and fills in the gaps identified. This tool allows stakeholders to identify actions that need to be taken to support the ecosystem and propose missing elements as new complementary actions for the organic development of the ecosystem. The actions proposed need to be aligned with Oman’s national strategies and should facilitate ICT policies and programmes to be upgraded. All stakeholders should agree on the priorities.

Figure 5: Strategic priority matrix

<p>INNOVATION DYNAMICS</p> <p>Policies and programmes to help guide innovation dynamics</p>	<p>INNOVATION CAPACITY</p> <p>Actions that equip innovators with the right tools, skills, space and know-how to succeed</p>	<p>INNOVATION OF KEY SECTORS</p> <p>Actions that seek to integrate digital innovation in non-ICT sectors and boost competitiveness</p>
<p>ECOSYSTEM RESEARCH</p> <p>Actions and platforms providing research insight about the ecosystem, including stakeholders and existing resource mapping</p>	<p>ECOSYSTEM KNOWLEDGE SHARING</p> <p>Knowledge sharing actions and platforms to accelerate commitment and collaboration of stakeholders</p>	<p>ECOSYSTEM PARTNERSHIP & GOVERNANCE</p> <p>Actions and platforms for enabling access to resources and networks for the ecosystem projects</p>

The opportunities presented for the ecosystem in this chapter have been arrived at through group discussions with local stakeholders during the co-creation workshops; and supported with complimentary and relevant information in the detailed annexure.

There are three main strategies for developing the ecosystem. These focus on actions that enhance the nurturing environment and concentrate the ecosystem on key sectors:

- innovation dynamics
- innovation capacity
- innovation of key sectors

Three additional cross-cutting strategies help mature the ecosystem through actions that strengthen the knowledge and linkages within the ecosystem:

- ecosystem research
- ecosystem knowledge sharing
- ecosystem partnership

The following table lays out key recommendations, using the six strategic priorities, which will help to develop and strengthen the ecosystem to achieve the national ambition of digital transformation. The table has been organised into short-term, medium-term, and long-term recommendations based on the efforts and resources required to achieve them.

Ecosystem strategies and recommendations			
Strategic priorities	Timeframes		
	Short-term (Year I)	Medium-term (Year II)	Long-term (Year III onwards)
Innovation dynamics	ID1: Develop an awareness programme for finance policies that de-risk investments for shareholders and investors.	ID6: Revise ICT policies and regulations to foster digital innovation entrepreneurship in non-ICT key sectors.	ID11: Establish a guarantee fund that allows traditional financial structures such as commercial banks to bring financial support to the digital sector.
	ID2: Establish a framework allowing the development of new financial tools and modern investment instruments.	ID7: Develop an awareness programme for the data policy that enhances data storage, protection, and use for open innovation.	ID12: Strengthen support for intellectual property for the digital sector.
	ID3: Strengthen strategies to improve access to existing investment funds (angel investors, family offices) for the ICT innovation sector (start-ups, SMEs, R&D).	ID8: Revise education strategies, policies, and regulations to align the education curriculum to industry and future needs across primary, secondary, and tertiary education.	ID13: Revise trade policies and strategies to support ICT products and services on the global stage.
	ID4: Establish new ICT laws to cover emerging technologies and market competitiveness to prepare Oman for a non-energy-reliant future.	ID9: Develop collaboration frameworks and programmes with resources and incentives to target problems in key sectors for research and development.	
	ID5: Develop a policy and strategies that support start-ups and SMEs to gain access to domestic markets.	ID10: Revise research and development policies to incentivise academics in research in the domestic non-ICT and ICT sectors for social impact.	
Innovation capacity	IC1: Upgrade colleges of technology into entrepreneurial universities to include research, entrepreneurship, and academics.	IC2: Develop a mentorship and coaching programme to support talents to address market opportunities across governorates.	IC4: Develop a global exchange programme to expose talent to international practices and expertise across governorates.
		IC3: Develop a sustainable funding mechanism and framework for ecosystem programmes promoting digital entrepreneurship and innovation.	IC5: Roll out the Makeen Initiative to leverage and upgrade existing infrastructure to create value, affordability, and access for ecosystem players.

(continued)

Ecosystem strategies and recommendations			
Strategic priorities	Timeframes		
	Short-term (Year I)	Medium-term (Year II)	Long-term (Year III onwards)
Innovation of key sectors	IS1: Develop a programme to support Business to Business platforms for digital innovation and entrepreneurship in key sectors.	IS3: Develop support programmes to strengthen existing ICT innovation networks and associations in support of local authorities.	IS5: Develop agile procurement programmes for the early success of start-ups/SMEs.
	IS2: Develop a programme for digital innovators to unlock opportunities in rural communities.	IS4: Develop a support programme for the development of digital communities, specialised in key sectors such as fintech, agriculture, health, etc.	IS6: Develop a programme to enable global market access to scale-up domestic innovations to regional and international markets.
Ecosystem research	ER1: Enhance existing platforms to map inclusively the ecosystem and the products and services for digital communities.		
Ecosystem knowledge sharing	EK1: Establish a globally-accepted Innovation Forum to support events, conferences, and seminars for innovators, start-ups, and SMEs throughout the country and to attract global stakeholders.		EK2: Develop a programme to democratise access to public data for greater social impact and fuel the creation of innovative services by entrepreneurs.
Ecosystem partnership and governance	EP1: Develop a regional innovation centre to strengthen the governance and the capacity to develop, monitor and implement flagship projects with strategic partnerships to make Oman a centre of innovation in the region.	EP2: Develop flagship projects in key sectors such as oil and gas, agriculture and fisheries, health, renewable energies and tourism.	

10 Next steps

Decisive and active interventions can help transform an ICT ecosystem, making it more innovative and a true driver of accelerated digital expansion in all aspects of society – with real gains in public, professional and personal lives.

Stakeholders, based on co-creation and ecosystem priorities, shared recommendations that have helped conceptualise the following priority projects.

The value of this assessment – which identifies the main obstacles and catalysts that already exist in the ecosystem – is to provide the ideal platform for the launch and development of high-impact flagship projects. Each of these projects, designed to be of unique relevance to the country, would help accelerate digital transformation.

This digital innovation profile provides a valuable first glimpse of both the ecosystem and the existing practices. The profile is designed to raise awareness about the local challenges and opportunities and engage all stakeholders in implementing flagship projects – which can foster an enabling environment for the ICT-centric innovation ecosystem – to unleash the full potential of Oman, and ultimately help bridge the innovation gap.

A roadmap has been co-created with a wide pool of stakeholders in the country, and the recommendations offered in this DIP are based on country-level evidence. The recommendations offered will assist Oman in integrating the stakeholders and their actions into a collaborative and knowledge-driven ecosystem that is working together towards the common goals to catalyse digital transformation in the country. An extracted view of the top six priorities further offers an overview of the immediate tasks at hand for Oman, which can be viewed as the minimum job to be done to steer change in the ecosystem.

As a next step, further engagement is needed to design, implement, monitor and evaluate each item in the roadmap. Towards this, ITU can also support the country in building institutional capacity and reviewing governance systems to take the roadmap forward and guide its execution in a continued effort to improve and accelerate the digital innovation ecosystem in Oman.

Appendices

APPENDIX 1: Detailed Recommendations Roadmap

These recommendations are inspired by the co-creation workshops in which all stakeholders participated. Each recommendation can be converted into concrete projects with clear strategies and KPIs to accelerate the ecosystem.

Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunity	Opportunity Brief	Product or service	Ecosystem outcomes	National outcomes	Champions	Good Practice
	Opportunities to address a particular ecosystem challenge	Challenge explanation, analysis of the opportunity, as well as benefits users gain from using product or service.	Proposed solutions to the ecosystem challenges that meet the needs of users	How will one know the ecosystem challenge is solved; what will be measured	The Key Performance Indicators as established by the country	Core stakeholders with high power and interest to be involved in this opportunity	Good practices nationally and internationally to inform the course of action.
Innovation Dynamics 1	Develop awareness programmes for finance policies that de-risk investments for shareholders and investors.	There are few local investors willing to take risks in investing in ICT start-ups. Finance policies that de-risk investments for shareholders and investors are available. Permits have been granted and policies revised by the Committee of the Central Bank of Oman and the Minister's Cabinet). Therefore, there is a need to develop awareness programmes for those policies to bring more financial support to the digital sector.	A programme to develop awareness regarding policies that de-risk investments for shareholders and investors.	Number of awareness campaigns regarding the finance policies that de-risk investments for investors and shareholders. Number of risk investments made in local start-ups and SMEs by investors and shareholders.	Economic Diversification and Fiscal Sustainability Labour Market and Employment	Central Bank of Oman Capital Market Authority Ministry of Commerce, Industry and Investment Promotion Ministry of Transportation, Communications, and Information Technology	The Venture Capital Guarantee programme of OSEO (France)

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Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunities to address a particular ecosystem challenge	Opportunity Brief Challenge explanation, analysis of the risk of the opportunity, as well as benefits users gain from using product or service.	Product or service to develop Proposed solutions to the ecosystem challenges that meet the needs of users	Ecosystem outcomes How will one know the ecosystem challenge is solved; what will be measured	National outcomes The Key Performance Indicators as established by the country	Champions Core stakeholders with high power and interest to be involved in this opportunity	Good Practice Good practices nationally and internationally to inform the course of action.
Innovation Dynamics 2	Establish a framework allowing the development of new financial tools and modern investment instruments.	Currently, investors are unable to use innovative financial instruments for investments. Regulations are needed to allow diversified funding instruments such as convertible notes, etc.	A framework allowing the development of new financial tools and modern investment instruments.	Number of financial tools and innovative investment instruments. Number of new investments made using innovative investment instruments.	Economic Leadership and Management Economic Diversification and Fiscal Sustainability	Central Bank of Oman Capital Market Authority Ministry of Transportation, Communications, and Information Technology Ministry of Commerce, Industry and Investment Promotion	QBO Innovation Lab (The Philippines)

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Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunities to address a particular ecosystem challenge	Opportunity Brief Challenge explanation, analysis of the opportunity, as well as benefits users gain from using product or service.	Product or service to develop Proposed solutions to the ecosystem challenges that meet the needs of users	Ecosystem outcomes How will one know the ecosystem challenge is solved; what will be measured	National outcomes The Key Performance Indicators as established by the country	Champions Core stakeholders with high power and interest to be involved in this opportunity	Good Practices Good practices nationally and internationally to inform the course of action.
Innovation Dynamics 3	Strengthen strategies to improve access to existing investment funds (angel investors, family offices) for the ICT innovation sector (start-ups, SMEs, R&D).	Many local family offices and angel investment groups exist. Investment funds are also available through ITHCA, ICT Fund, MTCIT. However, strategies need to be strengthened to improve access by local ICT innovators.	A set of strategies to enhance existing investment funds (angel investors, family offices) to be relevant to the ICT innovation sector (start-ups, SMEs, R&D).	Number of strategies to enhance existing investment funds (angel investors, family offices) for the ICT innovation sector (start-ups, SMEs, R&D). Number of investments made by angel investment groups and family offices in the ICT innovation sector.	Economic Leadership and Management Economic Diversification and Fiscal Sustainability Labour Market and Employment	Aljabr MENA Capital Market Authority Oman ICT Holding Group (ITHCA) Oman Investment Authority Central Bank of Oman Capital Market Authority Ministry of Transportation, Communications, and Information Technology Ministry of Commerce, Industry and Investment Promotion SMEs Development Authority Oman Technology Fund (OTF)	The Venture Capital Guarantee programme of OSEO (France)

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Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunities to address a particular ecosystem challenge	Opportunity Brief Challenge explanation, analysis of the risk of the opportunity, as well as benefits users gain from using product or service.	Product or service to develop Proposed solutions to the ecosystem challenges that meet the needs of users	Ecosystem outcomes How will one know the ecosystem challenge is solved; what will be measured	National outcomes The Key Performance Indicators as established by the country	Champions Core stakeholders with high power and interest to be involved in this opportunity	Good Practice Good practices nationally and internationally to inform the course of action.
<p>Innovation Dynamics 4 (This item has been marked as a priority recommendation)</p>	<p>Establish new ICT laws to cover emerging technologies and market competitiveness to prepare Oman for a non-energy-reliant future.</p>	<p>Many policies are still missing to cover many disruptive and advanced technologies (Internet of Things, Machine-to-Machine). All these are promising markets. Specific independent laws may be established for emerging technologies to prepare Oman for a non-energy-reliant future.</p>	<p>A set of ICT laws covering disruptive emerging technologies for market competitiveness to prepare Oman for a non-energy-reliant future.</p>	<p>Number of new ICT laws. Number of advanced technologies covered by ICT laws.</p>	<p>Economic Diversification and Fiscal Sustainability</p>	<p>Ministry of Transportation, Communications, and Information Technology Telecommunications Regulatory Authority Central Bank of Oman</p>	

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Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunities to address a particular ecosystem challenge	Opportunity Brief Challenge explanation, analysis of the opportunity, as well as benefits users gain from using product or service.	Product or service to develop Proposed solutions to the ecosystem challenges that meet the needs of users	Ecosystem outcomes How will one know the ecosystem challenge is solved; what will be measured	National outcomes The Key Performance Indicators as established by the country	Champions Core stakeholders with high power and interest to be involved in this opportunity	Good Practice Good practices nationally and internationally to inform the course of action.
Innovation Dynamics 5	Develop a policy and strategies that support start-ups and SMEs to gain access to domestic markets.	Start-ups and SMEs need to become more aware of the policies and strategies in place to support their access to domestic markets and sectors. As per the policy, 10 per cent (minimum) of tender contracts are awarded to SMEs. A higher minimum share of procurement contracts for SMEs and start-ups is recommended.	A set of policies and strategies that provides support to start-ups and SMEs to gain access to domestic markets.	Number of policies and strategies to support start-ups and SMEs to gain access to domestic markets. Number of public procurement contracts awarded to SMEs and start-ups annually. Number of new sectorial markets accessed by SMEs and start-ups.	Economic Diversification and Fiscal Sustainability Governance of State's Administrative Bodies; Resources and Projects	Ministry of Commerce, Industry and Investment Promotion Oman Chamber of Commerce and Industry Tender Board Public Authority for Small and Medium Enterprise Development SMEs Development Authority Ministry of Transportation, Communication, and Information Technology	GovTech Poland/ GovTech Centre (Poland)

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Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunities to address a particular ecosystem challenge	Opportunity Brief Challenge explanation, analysis of the risk of the opportunity, as well as benefits users gain from using product or service.	Product or service to develop Proposed solutions to the ecosystem challenges that meet the needs of users	Ecosystem outcomes How will one know the ecosystem challenge is solved; what will be measured	National outcomes The Key Performance Indicators as established by the country	Champions Core stakeholders with high power and interest to be involved in this opportunity	Good Practice Good practices nationally and internationally to inform the course of action.
Innovation Dynamics 6	Revise ICT policies and regulations to foster digital innovation entrepreneurship in non-ICT key sectors.	ICT policies need to be informed correctly with a holistic assessment of current realities and wishes of entrepreneurs to foster digital innovation entrepreneurship in non-ICT key sectors.	A set of revised ICT policies and regulations to foster digital innovation entrepreneurship in non-ICT key sectors.	Number of revised ICT and regulations policies.	Economic Diversification and Fiscal Sustainability	Ministry of Transportation, Communications, and Information Technology Ministry of Commerce, Industry and Investment Promotion Telecommunications Regulatory Authority SMEs Development Authority	Innovation for Policy (i4Policy) Startup Act Co-creation Process (Senegal)
Innovation Dynamics 7	Develop an awareness programme for the data policy that enhances data storage, protection, and use for open innovation.	There is a need to develop an awareness programme for the customer data protection law (i.e GDPR); and rules regarding data governance.	An awareness programme for all data policies that enhance data storage, protection, and use for open innovation.	Number of awareness campaigns for data policies that enhance data storage, protection, and use for open innovation.	Governance of State's Administrative Bodies, Resources and Projects	Ministry of Transportation, Communications, and Information Technology Telecommunications Regulatory Authority	

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Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunities to address a particular ecosystem challenge	Opportunity Brief Challenge explanation, analysis of the opportunity, as well as benefits users gain from using product or service.	Product or service to develop Proposed solutions to the ecosystem challenges that meet the needs of users	Ecosystem outcomes How will one know the ecosystem challenge is solved; what will be measured	National outcomes The Key Performance Indicators as established by the country	Champions Core stakeholders with high power and interest to be involved in this opportunity	Good Practices Good practices nationally and internationally to inform the course of action.
Innovation Dynamics 8	Revise education strategies, policies, and regulations to align the education curriculum to industry and future needs across primary, secondary, and tertiary education.	There is a need to ingrain the culture of digital innovation within the education system. Universities need to continuously align with technical skills development for specific industries; and primary and secondary school programmes need to heavily embed ICT learning and teaching practices. Policies and Strategies have already been revised for primary education Grades 1 and 2.	A set of revised education strategies, policies, and regulations to align the education curriculum to industry and future needs.	Number of revised education strategies, policies, and regulations to align the education curriculum to industry and future needs.	Labour Market and Employment Education, Learning, Scientific Research and National Capabilities	Ministry of Transportation, Communications, and Information Technology Ministry of Higher Education, Research, and Innovation	Unified Strategy for Education and Science (2017-2020) (Georgia)

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Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunities to address a particular ecosystem challenge	Opportunity Brief Challenge explanation, analysis of the opportunity, as well as benefits users gain from using product or service.	Product or service to develop Proposed solutions to the ecosystem challenges that meet the needs of users	Ecosystem outcomes How will one know the ecosystem challenge is solved; what will be measured	National outcomes The Key Performance Indicators as established by the country	Champions Core stakeholders with high power and interest in being involved in this opportunity	Good Practice Good practices nationally and internationally to inform the course of action.
Innovation Dynamics 9	Develop a collaboration framework and programme with resources and incentives to target problems in key sectors for research and development.	There is a need to revise research and development policies to incentivise academic research in domestic non-ICT and ICT sectors for social impact and foster trust around research outcomes.	A collaboration framework and programme with resources and incentives to target problems in key sectors for research and development.	Number of incentives to target problems in key sectors for research and development. Number of transfers of technologies. Number of public academic research papers in international journals pertaining to ICT Innovation.	Education, Learning, Scientific Research and National Capabilities Economic Diversification and Fiscal Sustainability	Ministry of Higher Education, Research, and Innovation Ministry of Transportation, Communications, and Information Technology	Vinnova Voucher Programme (Sweden)
Innovation Dynamics 10	Revise research and development policies to encourage academic research in domestic non-ICT and ICT sectors for social impact.	There is a need to focus on research for key problems of communities to create social impact areas for the country.	A set of research and development policies to encourage academic research in domestic non-ICT and ICT sectors for social impact.	Number of social impact solutions created out of research and development. Number of public academic research papers in international journals pertaining to ICT Innovation.	Education, Learning, Scientific Research and National Capabilities Economic Diversification and Fiscal Sustainability Well-being and Social Protection	Ministry of Higher Education, Research, and Innovation	Digital Hub Initiative (De-Hub) (Germany)

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Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunities to address a particular ecosystem challenge	Opportunity Brief Challenge explanation, analysis of the opportunity, as well as benefits users gain from using product or service.	Product or service to develop Proposed solutions to the ecosystem challenges that meet the needs of users	Ecosystem outcomes How will one know the ecosystem challenge is solved; what will be measured	National outcomes The Key Performance Indicators as established by the country	Champions Core stakeholders with high power and interest to be involved in this opportunity	Good Practice Good practices nationally and internationally to inform the course of action.
Innovation Dynamics 11	Establish a guarantee fund that allows traditional financial structures such as commercial banks to bring financial support to the digital sector.	Banks have high barriers to entry to loans and performance bonds. There is a need to attract these banks to support working capital, whilst protecting the innovator. Such guarantee fund exists for SMEs through a specific policy.	A guarantee fund that allows traditional financial structures such as commercial banks to bring financial support to the digital sector.	Number of traditional financial structures bringing financial support to the digital sector. Number of innovators benefiting from the guarantee fund.	Economic Leadership and Management Economic Diversification and Fiscal Sustainability	Central Bank of Oman Aljabr MENA Capital Market Authority	The Venture Capital Guarantee programme of OSEO (France)
Innovation Dynamics 12	Strengthen support for intellectual property for the digital sector.	There are missing areas in the development of the framework for intellectual property in terms of possibilities for commercialisation and in terms of incentives for ownership on the researchers' end.	A support programme for intellectual property for the digital sector.	Number of IP laws. Number of strategies to cover commercialisations. Number of ownership incentives for researchers. Number of IP registered.	Education, Learning, Scientific Research and National Capabilities	Ministry of Higher Education, Research and Innovation Oman ICT Group (ITHCA) Ministry of Transportation, Communications, and Information Technology Ministry of Commerce, Industry and Investment Promotion	

(continued)

Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunity	Opportunity Brief	Product or service to develop	Ecosystem outcomes	National outcomes	Champions	Good Practice
	Opportunities to address a particular ecosystem challenge	Challenge explanation, analysis of the risk of the opportunity, as well as benefits users gain from using product or service.	Proposed solutions to the ecosystem challenges that meet the needs of users	How will one know the ecosystem challenge is solved; what will be measured	The Key Performance Indicators as established by the country	Core stakeholders with high power and interest to be involved in this opportunity	Good practices nationally and internationally to inform the course of action.
Innovation Dynamics 13	Revise trade policies and strategies to support ICT products and services on the global stage.	There is a need to update the corporate commercial laws to review fees imposed on Oman companies for trade as well as support trade for the ICT sector.	A trade framework to support ICT products and services on the global stage.	Number of strategies to support ICT products and services on the global stage. Number of updated corporate commercial laws.	Economic Diversification and Fiscal Sustainability	Ministry of Commerce, Industry and Investment Promotion Ministry of Transportation, Communications, and Information Technology	Digital Export Development Strategy (Hungary)
Innovation Capacity 1 <i>(This item has been marked as a priority recommendation)</i>	Upgrade colleges of technology into entrepreneurial universities to include research, entrepreneurship, and academics.	There is a need to integrate technical colleges into entrepreneurial universities with practical labs, creative entrepreneurship programmes, active industry partnerships, and international mentors.	Entrepreneurial colleges of technology include research, entrepreneurship, and academics.	Number of colleges integrating entrepreneurship. Number of talent turning to entrepreneurship after graduating from technical colleges.	Education, Learning, Scientific Research and National Capabilities	Ministry of Higher Education, Research, and Innovation Ministry of Transportation, Communications, and Information Technology	

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Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunities to address a particular ecosystem challenge	Opportunity Brief Challenge explanation, analysis of the opportunity, as well as benefits users gain from using product or service.	Product or service to develop Proposed solutions to the ecosystem challenges that meet the needs of users	Ecosystem outcomes How will one know the ecosystem challenge is solved; what will be measured	National outcomes The Key Performance Indicators as established by the country	Champions Core stakeholders with high power and interest to be involved in this opportunity	Good Practices Good practices nationally and internationally to inform the course of action.
Innovation Capacity 2	Develop a mentorship and coaching programme to support talents to address market opportunities across governorates.	Talents need the domain expertise and advice of mentors to develop professional opportunities and address market opportunities.	A mentorship and coaching programme to support talents to address market opportunities across governorates.	Number of mentorship and coaching programmes to support talents to address market opportunities across governorates. Number of mentored and coached talents across governorates.	Education, Learning, Scientific Research and National Capabilities. Development of Governorates and Sustainable Cities	Ministry of Transportation, Communications, and Information Technology Ministry of Higher Education, Research, and Innovation SMEs Development Authority	
Innovation Capacity 3	Develop a sustainable funding mechanism and framework for ecosystem programmes promoting digital entrepreneurship and innovation.	The ecosystem lacks long-term financial planning and specialised funding resources at all stages of the innovation journey.	A sustainable funding mechanism and framework for ecosystem programmes promoting digital entrepreneurship and innovation.	Number of pre-seed, seed, angel investment, series A/B, venture capital, and equity funding opportunities. Number of sectoral funding opportunities. Number of funding resources distributed.	Economic Leadership and Management Economic Diversification and Fiscal Sustainability	Aljabr MENA Capital Market Authority Oman ICT Holding Group (ITHCA) Oman Investment Authority	Innovation Fund (Serbia)

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Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunities to address a particular ecosystem challenge	Opportunity Brief Challenge explanation, analysis of the risk of the opportunity, as well as benefits users gain from using product or service.	Product or service to develop Proposed solutions to the ecosystem challenges that meet the needs of users	Ecosystem outcomes How will one know the ecosystem challenge is solved; what will be measured	National outcomes The Key Performance Indicators as established by the country	Champions Core stakeholders with high power and interest to be involved in this opportunity	Good Practice Good practices nationally and internationally to inform the course of action.
Innovation Capacity 4	Develop a global exchange programme to expose talent to international practices and expertise across governorates.	Local innovators need exposure to international practices and knowledge through global exchange programmes	A global exchange programme to expose talent to international practices and expertise across governorates.	Number of global exchange programmes. Number of exposed talents to international opportunities.	Education, Learning, Scientific Research and National Capabilities.	Ministry of Transportation, Communications, and Information Technology Ministry of Higher Education, Research, and Innovation	Health Tech Lab (Serbia)
Innovation Capacity 5	Roll out the Makeen Initiative to leverage existing infrastructure to create value, affordability, and access for ecosystem players.	There are still gaps in the ecosystem infrastructure that could easily be filled by leveraging existing infrastructure to deliver value, affordability, and access (servers, etc). The Makeen Initiative is heads-on addressing those gaps.	A rollout of the Makeen Initiative to leverage and upgrade existing infrastructure to create value, affordability, and access for ecosystem players.	Number of upgraded infrastructures. Number of accessed infrastructures.	Economic Diversification and Fiscal Sustainability	Ministry of Transportation, Communications, and Information Technology Oman Data Park Telecommunication Regulatory Authority	

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Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunities to address a particular ecosystem challenge	Opportunity Brief Challenge explanation, analysis of the opportunity, as well as benefits users gain from using product or service.	Product or service to develop Proposed solutions to the ecosystem challenges that meet the needs of users	Ecosystem outcomes How will one know the ecosystem challenge is solved; what will be measured	National outcomes The Key Performance Indicators as established by the country	Champions Core stakeholders with high power and interest to be involved in this opportunity	Good Practices Good practices nationally and internationally to inform the course of action.
Innovation of Key Sectors 1	Develop a programme to support Business to Business platforms for digital innovation and entrepreneurship in key sectors.	There is a need to integrate and unify all public sector programmes, bringing connectivity in health, education, transportation.	A programme to support Business to Business platforms for digital innovation and entrepreneurship in key sectors.	Number of integrated public sector programmes. Number of national challenges organised.	Economic Diversification and Fiscal Sustainability Governance of State's Administrative Bodies; Resources and Projects	All ministries across the government of the Sultanate of Oman. Ministry of Commerce, Industry and Investment Promotion Ministry of Transportation, Communications, and Information Technology	The Challenge Driven Innovation Programme by VINNOVA (Sweden)
Innovation of Key Sectors 2	Develop a programme for digital innovators to unlock opportunities in rural communities.	There is a need to include and provide proper guidance for rural communities to unlock ICT opportunities around them.	A programme for digital innovators to unlock opportunities in rural communities.	Number of innovators from rural areas. Number of unlocked markets in rural areas.	Economic Diversification and Fiscal Sustainability Development of Governorates and Sustainable Cities	Ministry of Transportation, Communications, and Information Technology Ministry of Commerce, Industry and Investment Promotion Innovation Hub by the Oman Arab Bank	Digital Hub Initiative (De-Hub) (Germany)

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Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunity to address a particular ecosystem challenge	Opportunity Brief Challenge explanation, analysis of the opportunity, as well as benefits users gain from using product or service.	Product or service to develop Proposed solutions to the ecosystem challenges that meet the needs of users	Ecosystem outcomes How will one know the ecosystem challenge is solved; what will be measured	National outcomes The Key Performance Indicators as established by the country	Champions Core stakeholders with high power and interest in being involved in this opportunity	Good Practice Good practices nationally and internationally to inform the course of action.
Innovation of Key Sectors 3	Develop support programmes to strengthen existing ICT innovation networks and associations in support of local authorities.	There is a need to create government-funded formal associations across all industries, with more flexibility in action. Besides, existing networks and associations need to be formalised to coordinate with the public sector.	Support programmes to strengthen existing ICT innovation networks and associations in support of local authorities.	Number of associations and networks active in the ICT sector. Number of partnerships between associations and the public sector for ICT advocacy. Number of associations and networks funded by the public sector.	Governance of State's Administrative Bodies, Resources and Projects	Ministry of Transportation, Communications, and Information Technology Oman Information Technology Society Oman Startup Hub	Palestinian Information Technology Association (State of Palestine)
Innovation of Key Sectors 4	Develop a support programme for the development of digital communities, specialised in key sectors.	There is a need to develop formal communities in sub-technologies and provide them in key sectors with financial support.	A support programme for the development of digital communities, specialised in key sectors.	Number of digital communities in sub-technologies	Governance of State's Administrative Bodies, Resources and Projects Economic Leadership and Management	Ministry of Transportation, Communications, and Information Technology	

(continued)

Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunities to address a particular ecosystem challenge	Opportunity Brief Challenge explanation, analysis of the opportunity, as well as benefits users gain from using product or service.	Product or service to develop Proposed solutions to the ecosystem challenges that meet the needs of users	Ecosystem outcomes How will one know the ecosystem challenge is solved; what will be measured	National outcomes The Key Performance Indicators as established by the country	Champions Core stakeholders with high power and interest to be involved in this opportunity	Good Practices Good Practices nationally and internationally to inform the course of action.
Innovation of Key Sectors 5	Develop agile procurement programmes for the early success of start-ups/SMEs.	There is a need to revisit the scope of public procurement projects to include SMEs and start-ups, and the ICT sector. Besides, there is a need to build trust and agility to allow for experimentation.	Agile procurement programmes for the early success of start-ups/SMEs.	Number of public procurement contracts awarded to start-ups and SMEs.	Governance of State's Administrative Bodies, Resources and Projects Economic Leadership and Management Economic Diversification and Fiscal Sustainability	All ministries across the government of the Sultanate of Oman. Public Authority for Small and Medium Enterprise Development, Riyada Tender Board	GovTech Poland/ GovTech Centre (Poland)
Innovation of Key Sectors 6 <i>(This item has been marked as a priority recommendation)</i>	Develop a programme to enable global market access to scale-up domestic innovations to regional and international markets.	Many domestic markets are too small for innovators to prosper and compete with global companies locally. Tech-driven talents need access to opportunities in other markets to scale such as in the Gulf, Asia, and Africa.	A programme to enable global market access to scale-up domestic innovations to regional and international markets.	Number of regional and international countries in which Oman innovators are operating.	Economic Leadership and Management Economic Diversification and Fiscal Sustainability	Ministry of Commerce, Industry and Investment Promotion Ministry of Transportation, Communications, and Information Technology	The Digital New Deal (Republic of Korea)

(continued)

Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunity to address a particular ecosystem challenge	Opportunity Brief Challenge explanation, analysis of the risk of the opportunity, as well as benefits users gain from using product or service.	Product or service to develop Proposed solutions to the ecosystem challenges that meet the needs of users	Ecosystem outcomes How will one know the ecosystem challenge is solved; what will be measured	National outcomes The Key Performance Indicators as established by the country	Champions Core stakeholders with high power and interest to be involved in this opportunity	Good Practice Good practices nationally and internationally to inform the course of action.
Ecosystem Research 1 <i>(This item has been marked as a priority recommendation)</i>	Enhance existing platforms to map inclusively the ecosystem and the product and services for digital communities.	There are some existing mapping platforms for the ecosystem's stakeholders. However, they are not holistic enough and no one-stop-shop exists.	Existing platforms to map inclusively the ecosystem and the product and services for digital communities.	Number of information published on those platforms. Number of stakeholders in the communities existing on these platforms.	Economic Leadership and Management	Ministry of Transportation, Communications, and Information Technology	
Ecosystem Knowledge Sharing 1 <i>(This item has been marked as a priority recommendation)</i>	Establish a globally-accepted Innovation Forum to support events, conferences, and seminars for innovators, start-ups, and SMEs throughout the country and to attract global stakeholders.	The ecosystem is punctuated with a few events, but very few of them recognize high achievers or trigger partnership opportunities.	A globally-accepted Innovation Forum	Number of stakeholders and visitors to the Innovation Forum annually.	Economic Diversification and Fiscal Sustainability	Ministry of Transportation, Communications, and Information Technology Public Authority for Small and Medium Enterprise Development, Riyada	

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Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunities to address a particular ecosystem challenge	Opportunity Brief Challenge explanation, analysis of the opportunity, as well as benefits users gain from using product or service.	Product or service to develop Proposed solutions to the ecosystem challenges that meet the needs of users	Ecosystem outcomes How will one know the ecosystem challenge is solved; what will be measured	National outcomes The Key Performance Indicators as established by the country	Champions Core stakeholders with high power and interest to be involved in this opportunity	Good Practices Good Practices nationally and internationally to inform the course of action.
Ecosystem Knowledge Sharing 2	Develop a programme to democratise access to public data for greater social impact and fuel the creation of innovative services by entrepreneurs.	There is a need to democratise access to ICT data and other public data available to develop products/services for local markets and collaborations.	A programme to democratise access to public data for greater social impact and fuel the creation of innovative services by entrepreneurs.	Number of democratisation instruments used.	Education, Learning, Scientific Research and National Capabilities.	National Centre for Statistics and Information Ministry of Transportation, Communications, and Information Technology Ministry of Higher Education, Research, and Innovation	e-Albania Initiative (Albania)
Ecosystem Partnership and Governance 1 <i>(This item has been marked as a priority recommendation)</i>	Develop a Regional Innovation Centre to strengthen the governance and the capacity to develop, monitor and implement flagship projects with strategic partnerships to make Oman a centre of innovation in the region.	There is a need for cohesiveness, prioritisation, strong governance and leadership, collaboration, coordination, execution, and monitoring and evaluation of all projects, policies, programmes and initiatives pertaining to ICT innovation.	A Regional Innovation Centre to strengthen the governance and the capacity to develop, monitor and implement flagship projects with strategic partnerships.	Number of coordination mechanisms and collaborations in place. Number of policies and regulations executed. Number of programmes, projects, policies, and initiatives monitored and evaluated.	Governance of State's Administrative Bodies, Resources and Projects	Ministry of Transportation, Communications, and Information Technology The International Telecommunications Union.	

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Ecosystem Strategies and Recommendations Roadmap							
Strategic Priorities	Opportunities to address a particular ecosystem challenge	Opportunity Brief Challenge explanation, analysis of the opportunity, as well as benefits users gain from using product or service.	Product or service to develop Proposed solutions to the ecosystem challenges that meet the needs of users	Ecosystem outcomes How will one know the ecosystem challenge is solved; what will be measured	National outcomes The Key Performance Indicators as established by the country	Champions Core stakeholders with high power and interest to be involved in this opportunity	Good Practice Good practices nationally and internationally to inform the course of action.
Ecosystem Partnership and Governance 2	Develop flagship projects in key sectors such as oil and gas, agriculture and fisheries, health, renewable energies and tourism.	There is a strong need to integrate high technologies in the successful oil and gas market, developing tourism market, and the high-potential markets of renewable energy, health, agriculture and fisheries.	Flagship projects in key sectors such as oil and gas. Flagship projects in key sectors such as agriculture and fisheries. Flagship projects in key sectors such as health. Flagship projects in key sectors such as renewable energies. Flagship projects in key sectors such as tourism.	Number of ICT projects in oil and gas. Number of ICT projects in agriculture and fisheries. Number of ICT projects in health. Number of ICT projects in renewable energies. Number of ICT projects in tourism.	Governance of State's Administrative Bodies, Resources and Projects Economic Diversification and Fiscal Sustainability Well-being and Social Protection Bodies, Resources and Projects	Ministry of Transportation, Communications, and Information Technology Ministry of Commerce, Industry and Investment Promotion Ministry of Heritage and Tourism Ministry of Health Ministry of Agriculture, Fisheries, and Water Resources The Ministry of Energy and Minerals Ministry of Energy and Minerals	

APPENDIX 2: Good practice

Good practice

To develop the recommendations, it is necessary to draw inspiration from good practices used in other ecosystems without necessarily copying them.

Good practice has been tested to produce an impact, based on evidence and positive results and which can be scaled up and replicated. Good practice is needed to help develop flagship projects, to benchmark the strengths and weaknesses of a practice, and to initiate evidence-based policy or programme development. Good practice allows actors to effortlessly add value to initiatives in their ecosystems. However, good practice should not be reproduced "as is", because every ecosystem and every project is different.

ITU has developed a database of good practices, a framework to better develop these recommendations in a country's ecosystem. For more information, please see: innovation.itu.int or contact: innovation@itu.int.

1. [The Venture Capital Guarantee programme of OSEO \(France\)](#): The OSEO mission is to support growth and innovation for enterprises through assistance and financial support to SMEs in France in various phases of their life cycle: start-up, innovation, development, business transfer/buy-out.
2. [The Digital Export Development Strategy \(Hungary\)](#): The overall objective of the Digital Export Development Strategy is to intensify the growth of digital product exports to develop strong digitalisation knowledge in Hungary.
3. [Vinnova Voucher Programme \(Sweden\)](#): The Baltic Transnational Research Access in the Macroregion (TRAM) project offers companies free access to state-of-the-art analytical research facilities across the Baltic Sea Region, providing technical and scientific expertise to help solve challenges associated with developing new products or services.
4. [The Digital New Deal \(Republic of Korea\)](#): The Digital New Deal is a national innovation project to overcome the economic crisis caused by COVID-19 and accelerate digital transformation to boost national and industrial competitiveness.
5. [Digital Hub Initiative \(Germany\)](#): The Digital Hub Initiative (De-Hub), launched by the Federal Ministry for Economic Affairs and Energy, seeks to support the establishment of digital hubs in Germany.
6. [Innovation Fund \(Serbia\)](#): The vision of the fund, as a pivotal state actor, is to contribute to Serbia's economic growth through various financial instruments by supporting innovation, strengthening the link between science and economy, and establishing new and strengthening existing companies with innovative potential.
7. [Innovation for Policy \(i4Policy\) Startup Act Co-creation Process \(Senegal\)](#): The process of co-creating the Senegal Start-up Act, which was led by the government of Senegal and facilitated by the Innovation for Policy Foundation, illustrates the practice of co-creating policies through deliberations and consultations. The Innovation for Policy Foundation grew out of the #i4Policy movement, which brings together innovation communities across 48 countries shaping in the Africa region inclusive innovation policies with their governments.
8. [Palestinian Information Technology Association \(State of Palestine\)](#): The Palestinian Information Technology Association of Companies (PITA) represents over 150 ICT companies in Palestine. PITA enhances the ICT business environment to better enable an industry that will grow Palestinian economic and intellectual capital.

9. [e-Albania Initiative \(Albania\)](#): The e-Albania initiative is designed as a portal through which citizens can access information and receive e-services from state institutions.
10. [The Challenge Driven Innovation Programme by VINNOVA \(Sweden\)](#): the Vinnova vision is to position the Challenge Driven Innovation programme as a powerful tool for developing new sustainable solutions with an international luminosity that meets important challenges identified in the framework of Agenda 2030.
11. [GovTech Poland/GovTech Centre \(Poland\)](#): GovTech Poland is a cross-ministerial task force that has been operating in the Chancellery of the Prime Minister of Poland since 2018. The initiative started as a pilot project in the Ministry of Finance in 2017 and became the chief governmental digitalization programme with a wide mandate to facilitate the adoption of innovative policies and technical solutions across the public sector in 2018. Its mission is to build bridges between government and the private sector and civil society organizations, enabling them to provide solutions suitable for the needs of the public administration and stimulating entrepreneurship and job creation by facilitating access for SMES to government public procurement.
12. [Health Tech Lab \(Serbia\)](#): Created in 2018, Health Tech Lab (HTL) Serbia is an active health-tech ecosystem of Serbia, guided by the vision of health innovation without borders. HTL Serbia is connecting the Serbia health-tech ecosystem with ecosystems of developed countries (the United States and the United Kingdom) and regions (the EU) for mentoring, learning exchanges and funding, thereby enabling knowledge transfer and co-creation. Initially operating from Serbia, Health Tech Lab plans to expand to the health-tech ecosystems of other developing countries in Africa, South America and Asia.
13. [QBO Innovation Hub \(Philippines\)](#): QBO is a modern space for Philippine start-ups and other players in the national ecosystem to come together and flourish. QBO was formed in 2016 when the public and private sectors came together and united their vision of Philippine start-ups changing the world. Since then, its role has been to help start-ups succeed, developing the ecosystem, and forwarding technology and innovation with a suite of support services for start-ups and partners.

APPENDIX 3: Methodology

This study was carried out using a global comparative framework developed by ITU for the diagnosis and development of ecosystems centred on ICTs. The analysis of a country consists of five steps, which aim to reduce the disparities in digital innovation using a practical kit to strengthen ICT-centric ecosystems that allow defining of common objectives, diagnosing the ecosystem, formulating recommendations, setting up an implementation framework and proposing a monitoring and evaluation method.

The toolkit for strengthening ICT-centric ecosystems is available here: bit.ly/DIPpolicykit

Building on ITU's innovation toolkit series, another toolkit shares more insights on how stakeholders can undertake rapid ecosystem diagnosis, establish key recommendations, and develop flagship projects that effectively nurture ICT-centric innovation within their digital ecosystems.

The toolkit for developing sustainable ICT-centric projects is available here: bit.ly/DIPtoolkit

APPENDIX 4: Key Words and Definitions

Key Word	Definition
Vision	The vision defines an ideal to be achieved after a given time. Its objective is to mobilise the stakeholders for its realisation while giving the necessary direction to obtain the desired situation.
Strategies	A strategy defines the main axes to be developed in order to obtain the objectives and results towards the vision. The transformation of value chains for each sector with the contribution of digital technology is one of the major research objectives. The strategies should also define the roles and responsibilities of non-digital actors and how their contributions reinforce the defined objectives or sub-objectives. Four pillars of strategies are proposed for sustainable development: political, social, economic, and environmental. For each strategy to be developed, it is recommended to develop a theory of change that unites and measures the actors' contributions.
Dynamics of innovation (ID) with digital technology	Measures that allow innovation to exist. They support the general environment for innovation. A dynamic innovation environment needs a coherent regulatory and organisational framework that guides, encourages and fosters a culture of innovation, mindset, projects and programmes.
Capacity for innovation (IC) with digital	Measures that make it possible to have sufficiently developed infrastructures and talents within the ecosystem, which will be conducive to digital transformation. They give innovators the tools, skills, spaces and know-how they need to be successful.
Innovation in key sectors (IS) with the contribution of digital	Measures that integrate innovation in key sectors, so that start-ups and SMEs can unleash their full potential and expand beyond their niche, making transformation in other sectors possible.
Research in the digital ecosystem (ER)	Measures and mechanisms to search for information on the ecosystem, in particular the mapping of actors and existing resources.
Knowledge sharing in the digital ecosystem (EK)	Mechanisms and measures to share knowledge to accelerate the mobilisation and collaboration of stakeholders.
Partnership and Governance in the digital ecosystem (EP)	Measures and mechanisms allowing access to resources and networks, to develop a public-private partnership model, to focus actors on ecosystem projects.
Digital Economy	Digital economy refers to a broad range of economic activities that use digitalized information and knowledge as key factors of production.
Digital Transformation	Digital transformation is the integration of digital technology into all areas of operations, fundamentally changing how you deliver services and value to citizens and customers.
Theory of change and indicator development	Measures and mechanisms allowing access to resources and networks, to develop a public-private partnership model, to focus actors on ecosystem projects.
Unicorn	A unicorn is a privately held start-up company whose valuation is over \$1 billion.
Valley of Death	A post-ideation period when innovators need significant investments and a lot of support, and the risk of business failure is high.

APPENDIX 5: Acronyms and Abbreviations

Acronyms/ Abbreviations	Full Nomenclature
DSL	Direct Subscriber Line internet
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
ICT	Information and Communication Technologies
MCIIP	Ministry of Commerce, Industry, and Investment Promotion
MHESRI	Ministry of Higher Education, Scientific Research, and Innovation
MTCIT	Ministry of Transportation and Communications Information Technology
OSH	Oman Start-up Hub
SME	Small and Medium Enterprises
SQU	Sultan Qaboos University
UK	United Kingdom
TRA	Telecommunications Regulatory Authority
VOIP	Voice over IP
WIPO	World Intellectual Property Organisation

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