

ADVANCING ARTIFICIAL INTELLIGENCE IMPACT IN DUBAI

FUTURE DIRECTIONS TOWARD STRENGTHENING THE
DIGITAL ECONOMY

In partnership with



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The views expressed in this report are those of the author(s) and do not necessarily reflect those of the trustees, officers and other staff of the Mohammed Bin Rashid School of Government (MBRSG) and its associated entities and initiatives.

Acknowledgements

The author(s) wish to express personal appreciation to the following individuals and entities for their input to the different stages of producing this report and for providing essential input and assistance into the report and its related materials:

HE Younus Al Nasser (Digital Dubai)
Akmaral Orazaly (Digital Dubai)
Andrew Collinge (Digital Dubai)
Ahmed El Essawi (Microsoft)
Hazar Alzaki (Microsoft)
Nadim Hasbani (Microsoft)
Ahmed Al Dabbagh (MBZUAI)
Dubai Statistics Center

The authors would also like to acknowledge the time and effort that was generously provided us by public and private sector entities across Dubai and the UAE more broadly. Due to anonymity requirements, we are unable to thank organizations by name, but wish to express our appreciation for entities who responded to our survey and participated in our focus groups and without whom this work would not have been possible.

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Toward this goal, the Mohammed Bin Rashid School of Government also collaborates with regional and global institutions in delivering its research and training programs. In addition, the School organizes policy forums and international conferences to facilitate the exchange of ideas and promote critical debate on public policy in the Arab world. The School is committed to the creation of knowledge, the dissemination of best practice and the training of policy makers in the Arab world. To achieve this mission, the School is developing strong capabilities to support research and teaching programs, including:

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1. Future Government and Innovation
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Future Government and Innovation

The emerging domains of research within this theme includes digital-era societal transformations, technology policy, innovation policies, big data and governance, artificial intelligence in government, open government data, "smart cities" and future of urban development, cybersecurity policies, inclusion and citizen-government interactions in the digital age, the ramifications of the "Fourth Industrial Revolution", among others.

CONTENTS

EXECUTIVE SUMMARY	vi
THE DIGITAL ECONOMY AND AI ADOPTION	1
<i>Introduction</i>	2
<i>Digital economy enablers</i>	6
<i>AI Chatbots</i>	9
THE STUDY	21
DUBAI GOVERNMENT SURVEY RESULTS	23
<i>Profile of public sector respondents</i>	24
<i>Use and governance of data</i>	25
<i>AI technology adoption</i>	33
<i>Blockchain technology adoption</i>	45
<i>Trends in remote work</i>	50
DUBAI PRIVATE SECTOR SURVEY RESULTS	56
<i>Profile of private sector respondents</i>	57
<i>Digitization</i>	64

<i>Use and governance of data</i>	70
<i>AI technology adoption</i>	78
<i>Blockchain technology adoption</i>	90
<i>Trends in remote work</i>	95
<i>Regulatory barriers to growth</i>	102
ANALYSIS AND POLICY DIRECTIONS	111
REFERENCES	119

EXECUTIVE SUMMARY

Introduction

Innovative Artificial Intelligence (AI) and data-heavy applications have become a driving force in advancing the digital economy globally. The scope and scale of their use cases have reached sophisticated levels of maturity around the world, with feasibility and impact increasing rapidly. These transformations have triggered diverse new business models, as well as influential societal innovations and impactful use cases in government operations and policymaking cycles. A widely present example today is the continuously evolving applications of AI-driven chatbots over the past decade. Today, their applications have reached sophisticated levels of maturity driven by advancements in Generative AI and Large Language Models. The rapidly expanding digital readiness of societies, coupled with the digitization of private and public sector organizations, suggest that the impact of these transformations will only expand on disrupting business models, labor markets and service delivery approaches across the economy. In such cases of transitions through rapid digital transformations, the policy, regulatory and ethical implications for societies and economies tend to go through turbulent phases. What are the gaps, challenges and future policy directions to grow the digital economy and drive AI impact towards public value creation, while governing the transition responsibly?

Dubai has been at the forefront of digitization globally, with data and AI adoption playing a pivotal role in Dubai's future vision for digital development. Sustained advancements in digital development coupled with a thriving digital economy do not only have implications for Dubai and the UAE's GDP and their future competitiveness, but also for virtually all social, educational, healthcare-related and societal wellbeing initiatives and priorities. Today, digital transformation and AI adoption are embedded as central pillars

within Dubai's strategic and developmental plans, impacting every sector of the economy. The quality and degree of digital adoption are therefore viewed as determinants of the future of economic and societal development.

As Dubai continues to diversify its economy and aims to be a locus for innovation regionally and globally, it is of utmost importance to understand the spectrum of challenges and opportunities facing diverse stakeholders in the age of data and AI. Primarily, this includes economic and market players who rely on a sustained flow of data and solid digital infrastructures for their day-to-day functions, as well as those who are developing digital and AI products and services across a fast-changing economic landscape.

Given the UAE's vision of further establishing its position as a digital and AI leader, and Dubai's ongoing efforts at building and sustaining a flourishing digital economy ecosystem, the Mohammed bin Rashid School of Government (MBRSG), in partnership with Dubai Digital Authority and with the support of Microsoft conducted a comprehensive study to identify opportunities and challenges to AI adoption in Dubai and the future of the its digital economy. The ultimate aim of the study is to distil policy directions and recommendations both informed by international best practice but rooted in localized policy, socioeconomic, legal and cultural contexts.

Strengthening core enablers...

The core enablers of the digital economy continue to be a. digital infrastructures, b. digital data, c. AI adoption d. digital platforms, e. digital and AI capacity, and importantly, f. a supportive and agile regulatory environment.

The digital economy is driven primarily by the ability to collect, use and analyze large amounts

of digital data. This data is produced by the online presences and activities of people who are using the internet. For that reason, access to the internet for a wide percentage of the population is crucial for a functioning digital economy. So too is the infrastructure that makes access to the internet, servers and the cloud possible and facilitates data collection, use and analysis.

In the UAE, internet penetration in the is nearly 100%. With one of the best internet infrastructures in the region, the capacity for data generation is high. However, the country faces challenges in the capacity to engage in and benefit from a data-driven world.

The digital economy...

In a nutshell, the digital economy refers to any economic activity that results from the capacity to engage in and benefit from digital data (i.e. machine readable data), and digital technology. Its foundations are ICT technologies and digital infrastructures.

This report relies on the OECD's definition of the digital economy:

“The Digital Economy incorporates all economic activity reliant on, or significantly enhanced by the use of digital inputs, including digital technologies, digital infrastructure, digital services and data. It refers to all producers and consumers, including government, that are utilising these digital inputs in their economic activities”
(OECD, 2021).

Given this conceptualization of what constitutes the digital economy, any efforts to drive the digital economy must focus on the following:

1. Ability to generate machine readable data (digital infrastructures and population internet/mobile penetration)
2. Ability to harness data for a variety of activities which requires:
 - Digital/data and AI capacities and skills
 - Capitalization of digital platforms and

digital products (through the support of digital economy companies and SMEs)

- Investment in all parts of the data value chain (data collection and storage, data analysis, processing and use)
3. Favourable digital regulatory environments:
 - Appropriate and robust data and AI governance structures and legal systems
 - Capable regulatory institutions
 - Regulators and policy makers with expertise in data/AI and digitization

This report...

The aim of this study is to inform future policies that pave the way for innovative and ethical adoption of AI applications and lead to a thriving digital economy

This study consisted of:

1. A map of the current policy environment of the UAE and Dubai, with an analysis of current regulations that govern the digital economy, including those that affect start-ups and SMEs .
2. A survey of Federal and Dubai government organizations and Dubai private sector entities concerning their digital transformation efforts, data collection and use, AI adoption, blockchain adoption and remote work policies.
3. Focus groups and policy workshops aimed at supplementing the quantitative data collection
4. A secondary survey amongst Dubai Government entities which was conducted in March of 2023 around topics related to AI adoption.

The report presented here contains the results of the private and public sector surveys conducted in Dubai. Special emphasis has been placed on the analyses of the Dubai private sector data which comprises the bulk of our survey results.

Current state of digital economy enablers...

1. Governance: Over the past decade, the UAE has developed a series of strategies building towards the development of a robust digital economy, ranging from early strategies such as the ICT 2021 Strategy to the more recent 4IR strategy, Emirates Blockchain Strategy, UAE Artificial Intelligence Strategy, the 2025 UAE Digital Government Strategy and the newly announced UAE Digital Economy Strategy.

Currently, the digital economy is governed by the Minister of State for Artificial Intelligence, Digital Economy and Remote Work Applications Office, the Telecommunications and Digital Government Regulatory Authority (TDRA), local digital authorities (such as Abu Dhabi Digital Authority, Dubai Digital Authority, Sharjah Digital Office, Department of Digital Ajman, e-Government Department of Fujairah), Free Zone regulatory authorities, and sectoral regulatory authorities such as the Ministry of Health and Central Bank of the UAE. Issues related to cybersecurity are governed by the National Electronic Security Authority.

As it stands, the UAE's governance environment is hard to navigate given the variety of governing bodies and their respective mandates. To counter some of the issues that arise from this multifaceted governance structure, concerned bodies at the federal and local levels have created councils that bring together varying regulators and stakeholders to collaborate on policy making efforts.

Examples of this include the UAE Council for Artificial Intelligence and Blockchain which was formed in 2018 and the Digital Wellbeing Council which was formed in 2020.

2. Regulatory environment: This multifaceted governance structure impacts the regulatory environment in Dubai. Different aspects of the regulatory environment are mandated to different entities, and some of the same aspects, such as data collection and use, are governed by different entities depending on the nature of the data being collected and by whom.

This renders the regulatory environment fragmented and difficult to navigate which often contributes to the overly conservative and cautious behavior on the parts of private sector entities and investors.

Our research shows that despite the great strides that the UAE has made in terms of its forward-looking vision for the digital economy, and for Dubai as a hub of digital activity, confidence in the regulatory environment is not as high as it should be. Dubai private sector entities report challenges navigating and understanding the current regulatory space.

3. ICT infrastructure: Dubai has one of the most advanced digital infrastructures in the region. It is a Global leader in 5G adoption and has one of the highest internet penetration rates in the region, with 100% of the population having internet access. Despite having an extremely high internet penetration rate, Dubai has a high threshold to internet. The high cost of broadband, for example, has resulted in low broadband adoption in the UAE, below even some of the UAE's less digitally advanced neighbors in the MENA region. According to the 2019 World Economic Forum Global Competitiveness Report, while the UAE ranked 2nd globally in mobile internet subscriptions, it ranks 27th in broadband subscriptions.

The cost of telecommunication is an important barrier for many small businesses in the UAE. In addition to adding to the cost of running a business, the hosting costs in the UAE far exceed those in other countries

in the region; moreover, while digital infrastructures in the UAE are some of the best in the region, arbitrary restrictions to necessary technologies like VoIP and VPN introduce inefficiencies and unnecessary barriers to businesses and individuals benefiting from the digital ecosystem.

Taken together, these barriers impact the UAE's competitiveness as a digital economy Hub.

4. *AI Adoption:* AI adoption has been embraced enthusiastically within Dubai's government entities. Despite this enthusiasm, some challenges remain, these relate primarily to AI skills that are still lacking within the labor market and availability and exploitability of data. Private sector entities face the similar challenges with the added concern of an ambiguous regulatory environment when it comes to artificial intelligence. These challenges are not unique to Dubai and are faced by every city and country aiming to incentivize AI adoption within its economy.

5. *Data quality and access:* Over the last decade the UAE has launched several successful open data initiatives that have consolidated the access to open government data. The most recent iteration, Bayanat, is a one stop shop for all open government data. While these efforts have improved the data ecosystem in the UAE tremendously, data access and data quality remain important challenges for government sector and private sector organizations. Data access in Dubai is challenging for reasons that have to do with database maintenance and data quality assurance measures. In many cases, open data, while helpful, is not of a quality that facilitates its most effective use. Moreover, published data is often out of date or contradicts other available data.

Current data residency requirements and unclear data sharing regulations, make data

flows across the digital economy ecosystem difficult and inefficient. These inefficiencies are critical for the health of the digital ecosystem. Data, being the bloodline of any digital economy, needs to be abundant and flowing in order to be of the most use to digital economy organizations and companies. The new personal data protection law is an important step in the right direction. However, the multiple jurisdictions and regulatory entities that govern the collection and use of personal data in the UAE remains a challenge that exacerbates the uncertainty of the regulatory environment.

6. *Digital/AI skills:* Similarly to many global cities, Dubai faces challenges related to developing, attracting and retaining people with expertise in areas related to data collection, optimization and processing, artificial intelligence, blockchain and others.

This challenge is by no means one that is faced by the UAE alone. However, it remains a challenge requiring urgent solutions that mix between attracting and retaining talent and developing the skills of current and future generations.

UAE and Dubai governments have implemented several initiatives to upskill the current population in areas related to data science, coding and others. By their own account, private sector entities in Dubai also invest in upskilling efforts.

Current efforts at attraction and retention include offering opportunities for long term residency (10-year golden visa) to people with digital and AI skills. While this is an important and necessary step, attracting digital and AI talent requires a holistic approach that begins with providing an attractive start-up environment where those with digital skills can use them to create and grow digital businesses with transregional impact. Importantly as well, it requires providing a high quality of life and lower

cost of living, making Dubai an attractive place to live for digital nomads with a variety of compelling options for where to reside.

This universal challenge acts as a kind of catch-22. A thriving digital economy attracts digital talent, and digital talent is important for a thriving digital economy. Given this dilemma, it is important to keep in mind the interconnections and interdependencies of the digital economy. Strengthening other enablers in the digital economy will necessarily have a positive impact on talent attraction, retention, and development.

7. *Accessing Financial Resources for SMEs:*

Accessing financial resource is an important part of growing local start-ups. This remains a challenge for SMEs in Dubai. Start-ups and small businesses continue to face difficulties accessing seed money, loans and Venture Capital.

The availability of funding has been primarily challenging for companies who are starting up (seed money) and for companies in an expansion or scaling phase. Put simply, while the development of accelerators and the expansion of venture capital markets has improved the start-up ecosystem in the Dubai tremendously, it has done so primarily for companies in early or growth stages.

Globally, crowdfunding has been a solution to the “Capital Gap” for the start-up sector. In the USA and Europe both donation and equity crowdfunding is legal. Crowdfunding in the UAE is extremely limited and includes government sponsored and developed platforms. While this is a step forward, these platforms limit funding opportunities due to the limited audience that these platforms allow.

Funding challenges are exacerbated by the de-facto exclusion of small businesses from government tenders. While, technically, small businesses can compete for government contracts, in practice, tender requirements

are too restrictive and effectively exclude small businesses. Moreover, the unreliability of timely payments from government clients makes building a sustainable business difficult for companies with a government clientele, no matter the quality of the service or product being offered.

Key findings...

1. Dubai Government Results

a. Data Collection and Use

- Survey results on data use and governance amongst Dubai government entities indicates that a large majority of entities collect data (93%) with the most commonly collected kind of data being customer/personal data followed by engagement data and attitudinal data. Most entities (96%) reported storing their data in central databases, and half of them indicated that they stored their data in central databases with attached metadata.
- By and large, Dubai government entities reported using the data they collect to improve internal processes and make strategic decisions as well as develop products and services. A smaller percentage were using their data to personalize products or services or for targeted marketing.
- Use of big data was limited. Awareness and usage of government big data sources was low. When big data was being used, its uses were varied and inconsistent among entities. Only a minority of entities reported using big data for decision making about internal matters – whether strategic or financial.
- Data governance practices were sophisticated in some areas and not others. A majority of Dubai government entities reported having data privacy policies (86%) in place but not data use ethics policies (38%), therefore policies are in place to ensure the security of personal data but not necessarily to regulate the processes of its collection and use.
- Despite nearly 100% of entities reporting that they collected data, only 62% had

specialized data teams or units and 52% had data governance strategies in place.

b. AI Adoption

- Survey results on AI adoption indicate that AI adoption amongst Dubai Government entities is already very high and will continue to grow. Overall, the perception of benefits of AI is very positive with most government entities reporting favourable views on the impact of AI on their organizations and business functions.
- Despite high AI adoption rates, only a minority of entities indicated having dedicated AI strategies (28%) or AI ethics guidelines (21%). The prevalence of these governance tools among digital economy organizations is considerably higher than among non-digital economy organizations; however, the rate of adoption of these governance tools is only marginally higher amongst digital economy entities. Only 39% reported having an AI strategy in place, and 32% reported having AI ethics guidelines or policies.
- By and large, our survey results indicate that there is room for improvement when it comes to AI governance processes and procedures.
- The business functions in which AI adoption was most common were service development operations. There is significantly less adoption of AI in internal functions like strategic planning, risk assessment, finance or HR. The most commonly adopted forms of AI technology were chat bots or virtual agents.

c. Blockchain Adoption

- Blockchain technology and blockchain-based systems are often offered as solutions providing speedier transactions, more security, cheaper costs, and smart

contracts. A variety of industries has studied the usefulness of this technology.

- 4% of responding organizations currently use blockchain technology, and another 5% expect to do so within the following year. 27% of organizations were only monitoring blockchain technology. 40% stated they had no intentions to use blockchain technology in the near future. 18% of AI businesses now use blockchain technology. Despite internal preparedness and digital capabilities, private sector blockchain adoption is modest.
- The regulatory environment is the main impediment to private sector blockchain implementation. Uncertainty regarding blockchain rules was cited as a key impediment by 32% of respondents. Talent is again cited as a hindrance, with 32% citing it as a key one. Blockchain was also cited as a significant obstacle to implementation due to misinformation about what it is and its potential.

d. Remote Work Policy Adoption

- According to our survey, in the summer of 2021, a very small minority (19%) of Dubai government entities had between 10-25% of their employees working remotely. Nearly two years after the start of the pandemic, almost none of our responding government entities had more than 10% of their staff working remotely.
- When there were staff working remotely, they were concentrated in support services.
- While Dubai government entities report significant benefits to their organizations and employee wellbeing due to the implementation of remote work policies, only a small percentage (26%) were planning on implementing remote work policies permanently.

- The most significant enablers of remote work were a strong IT infrastructure (69%), and the availability of virtual collaboration tools (52%).
- The majority of Dubai government entities reported that remote work policies had a positive impact on their organizations, particularly in terms of productivity, collaboration and employee well-being.

2. Dubai Private Sector Results

a. Digital Transformation

- 35% of organizations that responded to this survey spent less than 5% of their budgets on digital transformation activities and 21% spent more than 20% on such efforts. Companies that developed AI were on the higher end of the spectrum in terms of expending on digital transformation.
- A digital transformation team or unit was reported by 37% of responding firms, while a digital transformation plan was reported by 54%. In comparison, 18% of organizations in the non-digital sector reported having a digital transformation team or unit, while 36% reported having a digital transformation plan.
- Regarding digital transformation initiatives, 40 % of responding organizations have amended their data privacy policies and examined third-party data sharing and privacy agreements during the previous year.
- Cloud computing was the most widely adopted advanced technology by responding organizations, with 39 % saying that it has been wholly implemented inside their organization and another 27 per cent beginning to install it. Cloud computing was extensively accepted even among non-digital economy enterprises, with 59 per cent currently using it and

36% planning to use it.

- New deep technologies such as 3D printing, crypto protocols, and extended reality tech (AR/VR) were the least adopted among respondents. However, this may change in the coming years due to the increased interest and potential associated with these technologies, their rapid adoption by multiple stakeholders, and governmental strategies (such as the Dubai 3D Printing Strategy).

b. Data Collection and Use

- According to the Data Governance Institute, Data Governance refers to the system of decision rights and accountability for information-related procedures that is carried out in accordance with agreed-upon models that specify who may take what actions with what information, when, under what conditions, and using what means
- Overall, 63% of responding organizations said they had data privacy rules in place, and 44% said they had a data governance plan. Data privacy and ethical data use policy adoption were greatest among organizations that reported developing AI technology, with 77% and 64%, respectively, adopting data privacy and ethical data use policies.
- 50% of respondents reported collecting personal customer data, 33% collected engagement data, and 23% collected behavioural and attitudinal data.
- Big data use was not prevalent among the firms questioned for this research. 17 % said they used extensive data scraped from web sources, and 15 % said they used free government data sources. Firms who acknowledged developing Artificial Intelligence (AI) technology showcase greater percentage shares. Among AI developing firms, 32% reported using data scraped from web sources, open

government sources, or data obtained from public IoT sources.

- Data mainly was used for forecasts (54%) and decision making (54%) by responding organizations, as well as product/service development (51%) and marketing (51%). Only 29% of non-digital economy enterprises reported using data for service or product development, compared to 68% of AI developers. For the most part, respondents do not disclose data with anybody other than partners. Only 39% of organizations reported sharing data with partners, while fewer than 15% reported sharing data with suppliers or the general public.

c. AI Adoption

- AI adoption was strong among responding organizations, with 54% of all companies utilizing AI and 24% creating AI. Sentiments toward AI adoption were favorable, showing a conviction that AI would help businesses become more competitive, efficient, and productive. However, most respondents (82%) disagreed that AI is essential for organizational success. Only a tiny percentage of respondents saw an advantage to using AI technology in their business processes. Only around 20% of respondents cited a benefit to a single company function. Product development and marketing/sales departments gain the most from AI adoption
- AI literate employees within responding firms are just a select few. Around 41% of businesses claimed that fewer than 25% of their staff are AI literate, while 19% reported that more than 75% are AI literate.
- In terms of future plans to implement AI technology, 12% of respondents said they had solid plans to apply AI technologies within the next 12 months, 10% said

they are already experimenting with AI technology, 2% said they had developed a prototype AI application, and another 2% said they have one or more active AI applications.

- Machine learning (23%) and virtual agents (17%) were the most prevalent applications of AI in responding private sector organizations, followed by natural-language text comprehension (15%).
- When it comes to adoption hurdles, non-digital economy organizations cited internal/organizational challenges such as misalignment of policies and strategy, leadership support, organizational culture, and bureaucracy as more significant than digital economy enterprises. The most restricting hurdle to AI adoption indicated by private sector organizations was a shortage of AI-related talent and skills among workers, with 37% of companies reporting that a lack of talent was at least a substantial barrier.

d. Blockchain Adoption

- Blockchain technology and blockchain-based systems are often offered as solutions providing speedier transactions, more security, cheaper costs, and smart contracts. A variety of industries has studied the usefulness of this technology.
- 4% of responding organizations currently use blockchain technology, and another 5% expect to do so within the following year. 27% of organizations were only monitoring blockchain technology. 40% stated they had no intentions to use blockchain technology in the near future. 18% of AI businesses now use blockchain technology. Despite internal preparedness and digital capabilities, private sector blockchain adoption is modest.
- The regulatory environment is the main impediment to private sector blockchain

implementation. Uncertainty regarding blockchain rules was cited as a key impediment by 32% of respondents. Talent is again cited as a hindrance, with 32% citing it as a key one. Blockchain was also cited as a significant obstacle to implementation due to misinformation about what it is and its potential.

e. Remote Work Policy Adoption

- Remote work became a norm ever since the start of the Covid-19 pandemic, with organizations shifting to fully remote or hybrid work models.
- 13% of private sector organizations said 100% of their employees work remotely in the survey. 16% said over 75% of their personnel worked remotely. 40% of organizations said fewer than 10% of their personnel worked remotely.
- Remote employees in private sector organizations mainly were in support (46%) and marketing (46%). 30 % of organizations said their remote staff worked on product development. 45 % of responding organizations had a remote work policy in place, with 32% intending to adopt it permanently and another 32% just temporarily.
- The suitable IT infrastructure (51%) was cited as the most critical enabler by our respondents, followed by adequate virtual collaboration tools. 32% said an agile culture was critical to implementing remote work policies.
- Microsoft Teams and Zoom were the most widely utilized virtual tools among responding private sector firms (77%). Zoom was the most popular virtual tool among small and new firms (96%).
- Overall, remote work improved employee happiness (51%) and productivity (47%). Remote employment has decreased corporate costs (45%) but has had both

good and bad effects on cooperation. 31% reported a good influence on team cooperation and 36% a negative impact. The introduction of remote work policies harmed organizational culture and customer connections.



THE DIGITAL ECONOMY AND AI ADOPTION

*A review of key themes and trends
in international literature & best practice*

INTRODUCTION

The COVID-19 pandemic has demonstrated that governments and economies all over the world need to be more agile and adaptive. Measures to contain the pandemic and to mitigate its economic and social consequences have reconfigured and reinforced our dependency on digital technologies. Digital transformation is not only one of the main sources of rapid change in our modern world, but also one of the drivers of agility and adaptiveness in organizations and society at large. The pandemic has accelerated the rate of digital transformation; as societies become more dependent on a digital backbone of hyperconnectivity, the transition to online and digital delivery channels has touched all aspects of the economy, from health and education to commerce and manufacturing. As demands for internet-based, bandwidth intensive activities skyrocket, governments and businesses have to continually reformulate their approaches to the digital economy.

As a regional and global leader in digital adoption, Dubai has long recognized the importance of digital transformation on an organizational and societal level. The emirate has been focusing on the important roles that artificial intelligence, digitally mediated work, and the broader digital economy will play in the Dubai's future. Significant policy shifts are already underway and continue to evolve to enable the integration of new technologies and technological adoption into the economy and foster an innovative and digitally driven ecosystem.

“Digital transformation is not only one of the main sources of rapid change in our modern world, but also one of the drivers of agility and adaptiveness in organizations and society at large

The Digital Economy

One of the many lessons learned globally after two years of wrestling with a global pandemic is that our collective need to shift to digital platforms overnight has permanently changed the landscape of our society. Digital ways of producing and consuming goods and services continue to grow at pace, and the importance of the digital economy cannot be overestimated as policymakers and businesses determine the way forward in a post-COVID age.

From an economic perspective, the concept of viewing the digital aspects of the economy as their own dedicated cluster dates back to the 1990's, the very beginning of the internet age, when businesses and consumers adopted emerging digital computing technologies (UNCTAD, 2019). Since then, the digital aspects of the economy have continued to grow and evolve at breakneck speed, and with that growth, has come an evolution of definitions for the digital economy. In the 2000's, the focus remained very much on the internet economy, looking at the expansion of internet connectivity across the globe and the emergence of fully digital enterprises, products, and services (UNCTAD, 2019). Today, whether it is IoT, Blockchain, machine learning or AI, new digital applications are being rapidly adopted globally. This is coupled with innovative ways in which businesses, governments and individuals are applying the technology.

Policymakers and economists have sought to define the digital economy in an effort to quantify the economic impacts of digital technologies. As the pace of technological development continues to accelerate, so the definition of what the digital economy is continues to evolve. However, there is growing consensus about the key elements and concepts that make it up. Building consensus around the definition of the digital economy

allows policymakers to more effectively create targeted policy agendas for the digital economy, as well as to better identify important gaps that can be addressed by targeted policies. Such gaps may include topics related to digital inclusion, access, and use that impact the ability of companies and consumers to engage with one another in a way that both promote innovation and protect individual safety (Hatem et al., 2020).

Defining the Digital Economy

So, what is the digital economy?

The World Bank, OECD, G20, and the United Nations agree that the digital economy broadly involves any economic activity and data produced through usage of and interactions with digital technology. This economic activity is understood through a tiered approach of three or four tiers (Hatem et al., 2020). For the purposes of this report, we have adopted the conceptualization of the digital economy developed by the OECD in collaboration with the G20:

“The Digital Economy incorporates all economic activity reliant on, or significantly enhanced by the use of digital inputs, including digital technologies, digital infrastructure, digital services and data. It refers to all producers and consumers, including government, that are utilising these digital inputs in their economic activities” (OECD, 2021).

Depending on the nature of interaction of stakeholders with ICT goods and services, the OECD and G20 model categorize digital economic activities into four main tiers:

- 1- those who produce digital content and ICT goods and services,
- 2- those who are heavily reliant on digital inputs such that their economic activities cannot exist without them,
- 3- those whose economic activity is enhanced by but not reliant on digital inputs.
- 4- non-economic activities that might be related to or enhanced by digital inputs

Critical success factors for a robust digital economy include (1) wide and affordable access to the internet and digital tools, (2) an enabling ICT infrastructure, (3) digital friendly regulatory regimes, (4) an innovation ecosystem that supports start-ups and SMEs and (5) a population that has the skills and knowledge to use and leverage the power of the internet. This includes preparing populations for jobs of the future that require a high degree of IT skills and capability.

Data usage and flow between governments, businesses, and individuals is an essential element of the digital economy for unlocking innovation and economic growth. Strong data governance, management and usage enables economies to

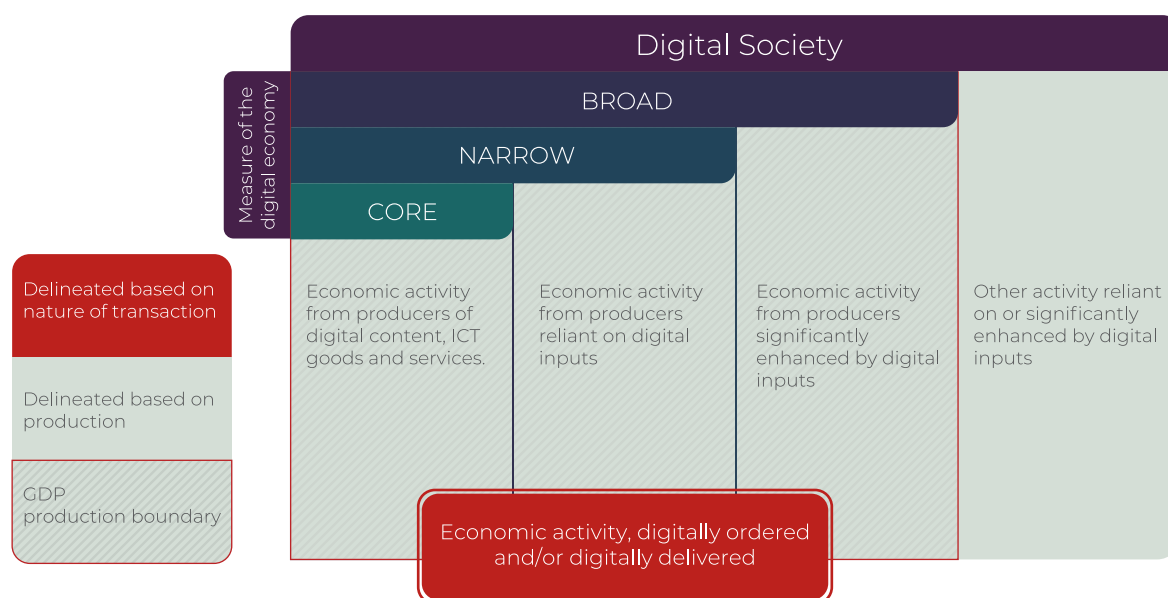


Figure 1. Tiered Definition of the Digital Economy. Source: OECD

harness emerging technologies like AI, in a safe, secure and ethical manner. The application of emerging technologies is primarily driven by a robust innovation and start-up ecosystem. An ecosystem where start-ups and SMEs can thrive requires an innovation-friendly regulatory regime, access to the right support network and funding, and the ability to tap into talent pools that possess the critical skills to run and scale digital enterprises is critical to facilitating a growth-oriented digital economy. Lastly, none of the above is possible unless the ICT backbone is in place with access to global data networks, and through which consumers, businesses and governments can engage with parameters around the safe and secure usage of data. These networks do not easily map to national boundaries. Thus, it is critical for governments to cooperate in order to manage cross-borders data flows, an area of growing importance at regional and global levels.

The emergence of the digital economy has created the need for new types of national or regional infrastructure, such as fiberoptic broadband networks, which require significant investments from governments in close collaboration with industry, as well as trans-borders international collaboration (G20, OECD 2020, 11). It has also demanded the transformation of labor markets, as old ways of doing work become obsolete, and require new skillsets become crucial for deploying emerging technologies.

Measuring the Digital Economy

Measuring activities that classify under the digital economy umbrella is a critical need for governments in the digital age and a necessity for national competitiveness, economic diversification and sustainable developmental activities. Accepting a working definition of the digital economy enables policymakers and practitioners to define indicators to measure the growth and impact of the digital economy. Measuring and monitoring against an established set of indicators year on year enables policymakers to ascertain whether their policies and initiatives

have the intended effect, and if they do not, to adjust accordingly.

So far, the European Union has developed one of the most sophisticated tools for measuring the digital economy, the Digital Economy and Society Index (DESI). Developed in 2014, the DESI is a composite index that summarizes relevant indicators on Europe's digital performance and tracks the evolution of EU Member States in digital competitiveness (European Commission, 2021). The DESI looks at digital competitiveness across five key dimensions which are broken down into sub-dimensions and indicators that are collected on a yearly basis. The DESI collects its data from a variety of sources, including Eurostat, ITU World Telecommunication/ICT, World Bank, Google Consumer Barometer, a variety of OECD indicators, UN E-government Survey, and the Global Open Data Index (European Commission, 2021). The Index has also extended internationally with the creation of the I-DESI, which utilizes 24 international data sets across 45 countries (EU-27 plus 18 non-EU countries) (European Commission, 2021). The index provides the data and framework to conduct standardized comparative analysis at a regional and international levels.

Yet, quality and availability of data is one of the critical components of measuring any aspect of development, economic activity or governance (Bayoumi et al., 2022; Jarrar et al., 2022; Prasad, Refass, Saidi, Salem, & Shepherd, 2022). It is highly critical when measuring activities involved in the digital economy, a large portion of which takes place on virtual platforms and digital systems. Even in fairly mature measurement efforts, like those undertaken by the G20, data availability is a challenge (Hatem et al., 2020). Countries seeking to measure their digital economies will not only need to establish which indicators are relevant for measurement, but also, if they are not currently, will need to begin collecting the data (Hatem et al., 2020). This challenge of data quality and availability is more disruptive in the MENA region and in countries that lack the data governance ecosystem (Salem, 2020; Salem & Shaer, 2020). The process of establishing this founda-

tion for robust measurement is time-consuming and challenging in the MENA region, which have significant data collection gaps (Bayoumi et al., 2022). However, the measurement tools and data collected only become valuable when historical data can be compared year over year, and where international comparability is possible. Ideally, a country is able to compare itself against other countries which are collecting data across the same set of interrelated indicators.

Enabling the Digital Economy

The success of a country or city's digital economy depends on the presence of critical enablers - the backbone that allows the digital ecosystem to thrive. Entrepreneurs are more likely to enter a market or start a business in economies where these enablers are in place. Establishing and stewarding these enablers is a key focus for policymakers and economists looking to nurture the growth of the digital economy. Ensuring that these enablers are in place can create stability and resilience, not only in the highly digitized aspects of the economy, but the economy as a whole (OECD, 2020). The lack of these enablers often leads to stunted growth in areas of the economy, or even complete gaps, which create a broken link in the overall development of a digital ecosystem (OECD, 2020).

When we view the digital economy as an ecosystem, it becomes apparent that each of the main enablers, or pillars, that ensure success are interlinked and build upon each other. We can see this interconnectedness at work in the economy already. For example, with the right telecommunications infrastructure in place, established corporations, SMEs, and start-ups have the digital enablers to allow them to do business and to foster innovation. Education and job preparedness training allows the economy to become more resilient against job loss as a result of digitization and automation and prepares the workforce for the new jobs that emerge from the digital economy. Together, these key enablers network to drive the digital economy forward.

As this report is concerned with assessing the enablers of the digital economy of Dubai, for the purposes of this discussion on enablers, we have focused on introducing some of the most critical, cross-cutting, and Dubai-relevant enablers emerging from the literature on the digital economy.

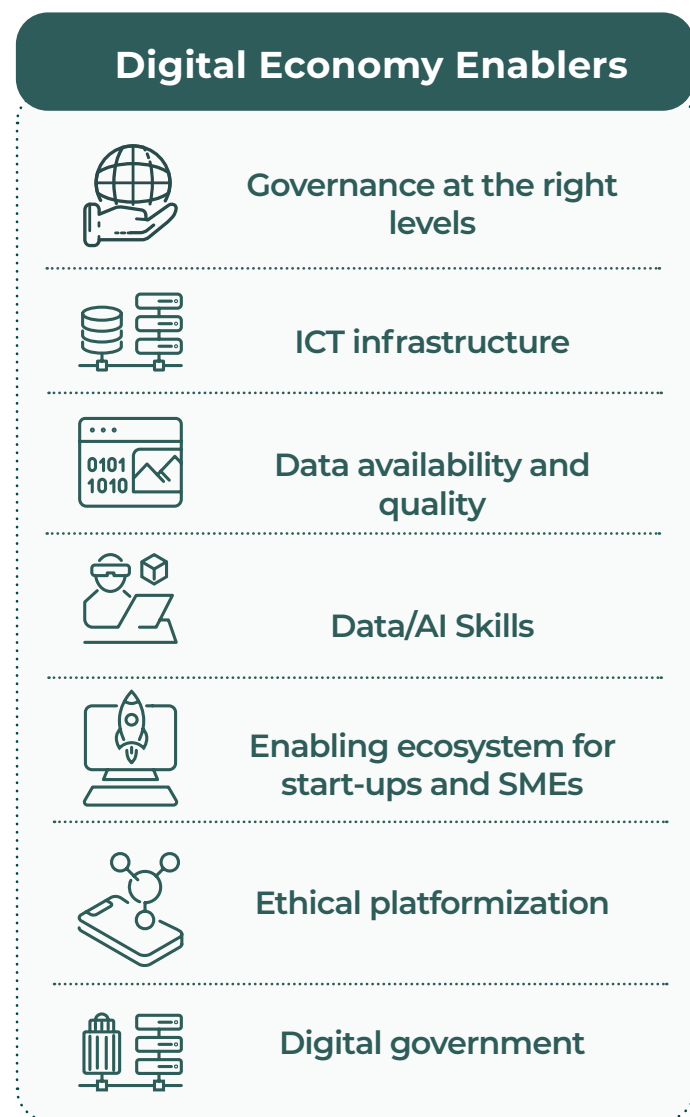


Figure 2. Digital economy enablers

DIGITAL ECONOMY ENABLERS

A. Governance at the right level

The right governance structures for managing the digital economy ensure that policy decisions are endorsed at a high enough level of government to enable implementation and enforcement, and that policies are created in partnership with the stakeholders to ensure they are fit-for-purpose. Digital policies must also have the agility and flexibility to respond to the rapidly evolving nature of the digital economy.

There are two aspects of high-level digital economy governance that emerge as critical to the enablement of a strong digital economy. The first relates to the governance structure of the digital economy as a portfolio within government, and the second, to the existence of a national digital strategy. What is almost universal in economies with a strong digital component is that policy decisions on the digital economy are endorsed at a high level of government (OECD, 2020). In almost all scenarios, the governance of the digital economy takes place either at a ministerial level, or through a government-owned corporation model which reports directly to the ministerial level (OECD, 2020). Within the ministerial governance pattern, there are two main governance models most frequently adopted. In the first, the national digital strategy is managed by a ministerial coordination office, which reports directly to the Prime Minister or President. A Secretary General or Chief Digital Officer is typically responsible for the development, coordination and evaluation of the strategy, and the ministries are responsible for implementation in a whole-of-government approach (OECD, 2020).

In the second scenario, a lead ministry is responsible for stewarding the digital policy,

sometimes among a portfolio ranging a number of other policy priorities, but this method is most effective when the ministry itself is dedicated to digital affairs (OECD, 2020). In this scenario as well, the ministry is responsible for strategy development, coordination and evaluation, typically through a coordination office or unit within the entity, which coordinates the implementation and monitoring by the ministries. In both cases, most success is found when resources are dedicated at a high level of government. Research indicates that of the two, the more prevalent model is the latter, whereby a dedicated ministry for digital affairs governs digital economy strategy development and coordination (OECD, 2020). With the appointment of HE Omar Sultan Al Olama as Minister of State for Artificial Intelligence, Digital Economy and Remote Work Applications in 2017, the UAE is leading international best practice with a dedicated ministerial post responsible for these activities.

Increasingly, national strategic direction and key policy initiatives for the digital economy are captured through the development of a national digital strategy. Today, national digital strategies are becoming a cornerstone of effective governance of the digital economy, with nearly all OECD countries and many partner countries with them in place (OECD, 2020). These strategies typically plug into a larger national strategy, for example, part of an innovation strategy (OECD, 2020). The governance of the National Digital Strategy, therefore, is tied closely to other sector focuses of national strategic importance, and requires a cross-sectoral and increasingly trans-boundary approach.

B. A digital approach to government

Digital government has increasingly become a prerequisite for a digitized economy. Initially, the digitization of government was focused on the digitization of government service delivery, and transference of government data and processes to digital platforms. However, in more recent years, the next evolution in the government digital maturity model has been the emergence of “digital government” or “smart government”, which focuses greater emphasis on a holistic approach to digital integration into the very core of what government is, and how it engages with citizens and industry. The OECD Recommendation of the Council on Digital Government Strategies defines digital government as “the use of digital technologies, as an integrated part of governments’ modernisation strategies, to create public value (OECD, 2016). It relies on a digital government ecosystem comprised of government actors, non-governmental organisations, businesses, citizens’ associations and individuals which supports the production of and access to data, services and content through interactions with the government” (OECD, 2016).

In the MENA region, while facing numerous challenges, digital government implementation continues to be a key driver for the digital economy (Jarrar et al., 2022; Salem, 2006; Salem & Jarrar, 2012; Salem & Shaer, 2020). A major focus of digital government transformation has been on open government data initiatives, which enables the free and open use, reuse and distribution of government data, typically provided as raw data sets (Idlebi, 2019; UNDESA, 2020; World Wide Web Foundation, 2017). Open data is an important driver of innovation, transparency and accountability. An “open by default” approach to government data, whereby the standard practice is to make data open and available publicly. Open data is viewed as important not only from a transparency and accountability perspective, but as a key enabler of innovation in the economy (OECD, 2019).

C. The rise of Artificial Intelligence

Artificial intelligence has emerged as a technological driving force behind the digital transformation, applied across sectors and industries to increase economic output and productivity. Over the last ten years there has been a skyrocketing growth in capability of computing infrastructure which has allowed us to obtain, process and store more data faster and cheaper (World Bank, 2021). This data revolution has enabled software to move beyond machine programming into machine learning. Artificial intelligence and machine learning have had a truly disruptive effect on the economy, enabling rapid technological advancement and economic growth. They have created disruption that has caused both excitement and reservations about the risks AI poses, whether that be the collapse of existing labor markets or the potential for ethical abuse of the technology. One of the central roles policymakers play in the conversation on AI, therefore, is creating the regulatory and policy frameworks to enable the development and adoption of AI, while managing trust, through the privacy and ethical standards surrounding its use (Fuentes et al., 2022; Salem, 2020; Yu-Che Chen, Fadi Salem, & Anneke Zuiderwijk, 2019; Zuiderwijk, Chen, & Salem, 2021). Increased investment in recent years has spurred on the development of AI technologies, their application in new ways across new sectors, and AI’s linkage to other aspects of digitization within the economy.

Because of the data load required to harness AI, the conversation around safe and secure data and data privacy is heavily tied to the dialogue on AI ethics and its role in the digital economy. The OECD and G20 have developed closely aligned values-based AI Principles which, similar to definitions proposed for the digital economy, seek to strike a balance between being specific enough to provide useful and implementable direction, but wide enough to not become quickly irrelevant (G20 Japan, 2020). Key themes include things like ensuring human-centered sustainable

growth, transparency, accountability, and the right safeguards to keep data secure. Countries are increasingly establishing national artificial intelligence strategies, aimed at addressing the need for the AI ecosystem development through a proactive government led approach that is actively co-designed with the multitude of stakeholders that participate in the AI and broader digital ecosystem (Jacobides et al., 2019). By 2020, over 60 countries had developed national AI strategies, including the UAE, which is at the global leading edge, with the appointment of a dedicated Minister for AI in the national cabinet (OECD, 2020). Priority areas globally in national AI strategies include creating an ecosystem and adequate funding for AI research and development, and supporting AI adoption across industries (World Bank, 2021). The emphasis of addressing AI at a national level echoes governance recommendations for the digital economy as a whole, and the development of national strategies for AI are becoming increasingly important. Underlying the need for an AI strategy is the required shift that governments need to take from creating policy and regulation that respond to technological innovation, to instead guiding the growth of that innovation.

Enablers for AI growth include many of the same enablers for the digital economy as a whole. These include clearer regulatory frameworks for data collection, usage, and ownership, creating an entrepreneurial ecosystem where new innovative companies can thrive, developing a talent pool with AI skills, and cooperating across borders on AI technologies as well as sharing data and insights produced by AI. Another strong enabler for AI growth is in facilitating investment, both public and private, in research and development. AI and other technology-based research fields differ from many traditional R&D spaces in that industry and academic research hold parity in terms of research potential (Jacobides et al., 2019). A domestic ecosystem for industry-academia R&D requires buy-in from government in providing government sector investment in R&D, and in creating an environment that attracts the best talent (Jacobides et al., 2019).

It is necessary to view AI within the broader landscape of the digital economy foundation, as well as within the context of building critical infrastructure and ensuring that the enablers are in place for the creation of a digital economy ecosystem at a national level. AI is one piece of the complex ecosystem that makes up the digital economy, and many of the enablers for AI integrate into broader objectives. These broader objectives include: ensuring a robust start-up and SME regulatory environment and innovation ecosystem; building a close relationship between government and industry; creating harmonization across data policies, and ensuring that the scaffolding that surrounds the digital economy, whether that be real estate, intellectual property law, or talent pool and immigration policies, facilitate an environment where disruptive innovators can come and build and scale their ideas. As the adoption of AI continues to grow, it is expected that these policy frameworks will continue to evolve and perhaps move towards a unified framework for policymakers in facilitating AI adoption. While the practice of developing policy for AI is a new area of focus for governments, they can look to support the growth of AI by proactively directing AI adoption through policy interventions, and by facilitating or enabling AI adoption through the deployment of policy tools (World Bank, 2021).

AI CHATBOTS

Artificial intelligence chatbots, or AI chatbots, are computer programs that use natural language processing (NLP) and machine learning algorithms that are “capable of communicating with humans, usually in a simple way”. AI chatbots can interact with users via text, voice or video, using chat interfaces, messaging platforms, or voice assistants among other formats. Chatbots are used for various applications, including customer service, e-commerce, education, healthcare, and more. They can also be integrated with various systems, such as enterprise resource planning (ERP) software, to automate business processes and improve efficiency at scale.

ADVANTAGES OF AI CHATBOTS

- **Availability 24 hours a day, seven days a week:** Chatbots may respond promptly to user inquiries outside regular office hours.
- **Expense savings:** Chatbots can handle numerous requests and queries, decreasing the need for human employees.
- **Personalization:** Using data analytics and machine learning, chatbots may tailor user interactions and make more pertinent recommendations.
- **Productivity:** Chatbots can automate regular chores and processes, allowing human employees to focus on more complex and creative work.

DISADVANTAGES OF AI CHATBOTS

- **Absence of empathy:** Chatbots can appear impersonal or cold due to their lack of emotional intelligence.
- **Poor comprehension:** Chatbots may have difficulty comprehending complex or nuanced queries, resulting in inaccurate or irrelevant responses.
- **Data dependency:** Chatbots rely on data to make judgments and generate responses, which might result in bias and errors if the data is missing or wrong.
- **Security and privacy matters:** Chatbots may capture and store user information, which raises privacy and security concerns.
- **Bias and discrimination:** Chatbots can promote bias and discrimination if not designed and tested with diverse user populations. This can be especially difficult for civil society organizations and governments tasked with providing equal service to all individuals.
- **Ease of use/technicality:** Chatbots rely on complicated AI algorithms, which can be challenging to design and manage. This might be especially hard for firms that need more technological competence to develop and manage chatbots independently.
- **Acceptance by users:** Chatbots might be daunting or perplexing for specific users, especially those unfamiliar with AI technology. This might make it difficult for civil society organizations and governments to interact effectively with citizens and give the necessary support.

USE OF CHATBOTS BY GOVERNMENTS

Governments are increasingly using AI chatbots worldwide to improve services and engage citizens. Some of the primary uses of chatbots are :

- Providing instant responses to citizens' queries and requests via chatbots on governmental/ public institutions and services websites.
- Simplify and automate administrative processes such as form filling and tax payment.
- Collect citizen feedback and opinions and use this information to inform policy decisions.
- Provide citizens and residents with personalized recommendations and advice based on their needs and preferences.

USE OF CHATBOTS IN THE MENA REGION

In recent years, the Middle East and North Africa (MENA) area has witnessed a substantial increase in the use of artificial intelligence (AI) chatbots, particularly in Gulf countries such as the United Arab Emirates (UAE), Saudi Arabia, and Qatar. The region's high smartphone penetration and tech-savvy populace make it an ideal market for adopting chatbots. Several industries in the MENA area employ chatbots, including healthcare, finance, education, and government services.

Applications of AI language models and chatbots powered by artificial intelligence (e.g. ChatGPT) have the potential to bring numerous benefits to civil society and governments, including enhanced customer service, increased efficiency, and information access. It is anticipated that creative use cases will increase due to chatbots' growing popularity and AI technology's development. Nevertheless, there is a wide range of challenges , as presented above, involved with the use of chatbots and other AI systems in civil society and government contexts. Organizations from both the public and private sectors are thoroughly analyzing these challenges and developing strategies to address them to ensure that chatbots and other AI systems are used effectively and responsibly.

Previous research by the MBRSG has suggested that there are diverse views towards utilization of chatbots across societies in the region, with a spectrum of levels of readiness and concerns by internet users in the region. This is especially true regarding social media chatbots, which remained popular over the past decade

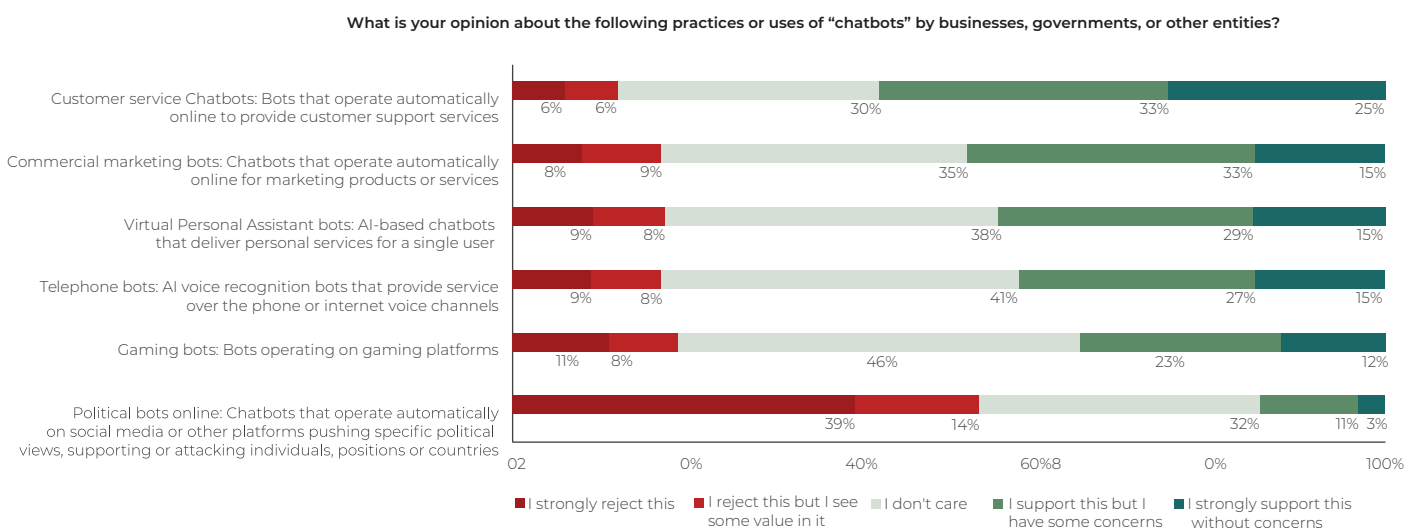


Figure 3. Source: The Arab World Online 2017, MBRSG. <http://dx.doi.org/10.2139/ssrn.3059445>

Across the region, there are growing uses of chatbots, including for commercial, governmental, political, entertainment and social needs. However, research by the MBRSG during the past 5

THE CASE OF CHAT GPT

also showed growing concerns about the practices around artificial-intelligence bots online by businesses and governments. According to MBRSG's regional public survey internet users, the use of AI-based bots for political purposes is what most people are worried about. This is unlike all other uses which were viewed largely positively (including customer service, commercial uses, virtual assistants, telephone marketing bots and gaming bots)

Among AI chatbots, the ChatGPT interactive system has raised a wave of enthusiasm recently at the start of 2023, followed by numerous questions and concerns. In a very short time, it gathered a million users and was tested on many tasks, mainly textual: requests for information, essays, computer programming, translation of texts, and writing of poems, to name a few uses.

ChatGPT is an artificial intelligence chatbot developed by OpenAI, an American non-profit corporation and research laboratory launched in 2015 by tech giants. OpenAI's objective is to create safe and beneficial artificial general intelligence (AGI) for the benefit of all humanity. On November 30, 2022, OpenAI unveiled its most recent model, "ChatGPT," which can converse with people. OpenAI released the first version of GPT in 2018, followed by GPT-2 in 2019 and GPT-3 in 2020. These models have significantly improved the ability of machines to understand and generate human-like text. ChatGPT was released in June 2020 as a demonstration of the capabilities of the GPT-3 architecture, which uses deep learning to generate human-like text. ChatGPT is trained on a massive corpus of text data consisting of millions of web pages, books, and other text sources. It can understand and generate text in multiple languages, and it can handle a wide range of tasks, including language translation, question-answering, summarization, and conversation. The development of ChatGPT builds on the advances in natural language processing and deep learning that have occurred in recent years. It quickly gained popularity due to its ability to carry out intelligent conversations and generate high-quality text. One of the reasons for this popularity is that ChatGPT has shown strong capabilities in many areas as well as emerging capabilities, for example, computer code generation and "multimodal" generation. Another reason is that its chat interface allows users to interact with a significant underlying GPT3.5 language model more effectively and efficiently than before through interactive chats. ChatGPT is also being utilized, mostly by enterprises and startups in the MENA region.

D. Investment in telecommunications and ICT infrastructure

In the age of COVID-19, digital connectivity has become more important than ever. Existing ICT networks have been strained as they buckle under the surge of capacity usage as schooling and business migrated online. Upgrading fiber-optic networks to expand broadband network coverage to rural areas and reduce overall costs to consumers have been a focus of NDS' globally, as has spectrum management tactics to increase capabilities to deploy next generation wireless networks (OECD, 2020). Investment in a digital infrastructure backbone is a critical path to growing the digital economy. It is a prerequisite for accessing digital goods and services effectively. Digital infrastructure delivers strong socio-economic benefits. Within ICT infrastructure, the evidence that strong broadband penetration leads to economic growth is fairly irrefutable. A 2010 study shows that countries with an 80% broadband penetration rate are twice as innovative as those with a 40% penetration rate; and that each 10-percentage point increase in broadband penetration raises labor productivity by 1.5% (Katz & Callorda, 2018). Further reporting shows that every 10% increase in (3G and above) broadband penetration can result in increased GDP per annum of 1.38% in developing economies. Doubling broadband speed can increase GDP by 0.3% as well as produce efficiencies in productivity that will cascade across the economy and contribute to further GDP growth (Kennedy & Cheung, 2020). In emerging economies, fixed broadband continues to trend below OECD country levels, with greater emphasis and usage of mobile broadband (OECD, 2019). In these economies, costs of fixed and mobile broadband remain high, which serves as a barrier to entry for both individuals and businesses. In the UAE, the telecommunications market mirrors many other developing economies in the region, whereby fixed broadband penetration is low, mobile broadband usage is high, and monopoly market conditions keep broadband costs high (Nicol & Reid, 2019).

A critical component of broadband adoption is the affordability of broadband, particularly for SMEs, and this becomes relevant for a country like the UAE where SMEs comprise over 94% of the economy (UAE Government, 2021). One of the World Bank's key recommendations for emerging economies is that they introduce regulatory frameworks which unbundle telecommunications monopolies and introduce new players into the telecommunications market amid fair competition. It also recommends regulators strengthen regulation for non-discriminatory access to communications networks for telecommunications operators (Katz & Callorda, 2018).

The development of national strategies to enable 5G network adoption has been a core focus of national governments in this space in recent years, and the UAE has joined global peers with the Telecommunications and Digital Government Regulatory Authority (TDRA) already working on the implementation of 5G networks (UAE 5G - TDRA, n.d.). 5G and other ultra-high-speed connectivity technologies and fiber optic infrastructure will increase speed and capacity across all technologies, as well as increase network ability to store data. 5G networks can enable countries to unlock other emerging technologies like AI and IoT which require the ability to generate and process large amounts of data.

E. Preparing the population for the digital future of work

The excitement about the transformative potential of Industry 4.0 and the digital economy is often coupled in the same breath by the fear of catastrophic job loss. There is a concern as old ways of doing work become automated and entire industries run the risk of becoming redundant at a rapid rate. Commonly cited statistics include the estimation that 14% of jobs globally are at high risk of being eliminated through automation, and another 32% of jobs will be radically altered due to the integration of digital technologies (UNCTAD, 2019). While job loss through automation is a real phenomenon, so too is job creation through the implementation of emerging technologies. This can include platforms like Uber, which has revolutionized the traditional taxi system, digital freelancing platforms like Upwork which tap into new facets of the labor market, and entirely new digitally enabled roles that did not previously exist. Thus, the need to upskill workers for the digital age becomes of critical importance, so that current workers whose jobs either no longer exist, or have been partially automated, can be redeployed into new digital jobs. Effective redeployment to different segments of these workers' respective industries or to entirely new industries requires investments by both industry and government to create resilience in the labor market and prevent significant labor market disruption. Simultaneously, policymakers must invest in school education to prepare the future generation to enter a highly digitized labor market.

Training at a massive scale becomes a necessary tool to addressing the potential labor market shocks of the digital age. While focus on revamping education curriculum for primary, secondary, and higher education is critical, the re-skilling of employees currently in the labor market is also imperative. Governments are investing in revising curriculum and national education policies, ensuring teachers have adequate ICT skills, and focusing on the technical and soft skills necessary

to excel in the rapidly changing digital economy. At the same time, governments and businesses must work (at times collaboratively), to develop training tools for the current labor market.

The scale of training required is not a small undertaking. Andrieu et al. estimate that the country-level minimum cost of moving workers in occupations at high risk of automation (on average, 14% of the labour force) to occupations where they are not at such risk ranges between 1% and 5% of a single year's GDP, on average across the countries they studied (Andrieu et al., 2019). These cost estimates include both the direct costs of training as well as the indirect costs of foregone wages, as workers undertaking full time training may be unable to work. This 1% to 5% of one-year GDP is to be considered in addition to existing training and social protection expenditures (Andrieu et al., 2019).

Public and private sources of adult training and learning are often disjointed, and both individuals and businesses are short served. Massive Open Online Courses (MOOCs) provide a useful accessible tool for upskilling, but are predominantly accessed by learners who already have a university degree; MOOCs are typically published on university platforms (WEF, 2017). MOOCs must be complemented by tailored courses delivered by businesses to meet their specific skill needs and to reach those who may not seek out online tools. OECD countries reported a broad variation in participation rates in adult learning and training programs, ranging from 27% to 82% of the total adult population, with substantial variation across segments of the adult population depending on age cohort and level of educational attainment (WEF, 2017). This means that even if the courses are available, the workers who need them most are not necessarily enrolling, despite the free or low cost options available (WEF, 2017). Creating empowered learners in the labor market is therefore an important component of

the reskilling movement.

There are two segments of the labor force which struggle in accessing adult learning essential for digital reskilling for the future workforce. The first are SMEs, which often cannot afford to enroll their employees in expensive executive programs nor develop in-house training like large corporations can, which means their employees may not have access to the same quantity of training nor the job-specificity that employees of larger companies have access to. The second and large contingency of the labor force which slip through the cracks are employees in non-standard forms of employment, such as freelance and gig workers, particularly low-skilled gig workers. Even before the pandemic, the share of gig workers in the US alone increased by 15% since the beginning of 2020 and gig work is expected to continue to grow (WEF, 2017). Non-standard employment already provides challenges in accessing the most basic employment benefits, no less the type of reskilling required to prepare gig workers for the digital economy. Digital skills training may be well placed as part of a larger labor market transformation that better provides social protections for non-standard employees, potentially by decoupling access to benefits from employment contracts.

In the UAE, in addition to education strategies for full-time students through the Ministry of Education, the government has launched the National Program for Advanced Skills that aims to deliver targeted programming to support the reskilling of current and emerging workers. The Ministry of Education's Strategic Plan incorporates digital skills and digital learning as a foundational pillar of its approach. While the UAE is one of the regional leaders in terms of high-skilled jobs in the economy, it is estimated that 47% of jobs in the UAE are vulnerable to automation (WEF, 2017). The UAE ranks top of the MENA region in the World Bank's Human Capital Index, it scored 67% in 2020 on the scale, but has room to improve to compete with OECD countries scoring between 70%-80% (World Bank, 2020).

F. Platformization

Platformization of tech giants such as Facebook and Amazon have been a critical driver of the creation of digital ecosystems (Jacobides et al., 2019). These major tech platforms can both dominate an ecosystem and create opportunities for smaller start-ups and SMEs to integrate into the larger platforms. Policymakers must work to ensure fair competition that allows new joiners to the ecosystem the opportunities to participate in the market, as well as a regulatory regime that attracts the large platforms to enter the market in sustainable ways.

Digital platforms are characterized by their ability to connect one set of users or consumers with external producers. For example, Uber, a simple digital platform, serves as a tool for connectivity, linking passengers with drivers, and does not employ the drivers themselves. Platforms like Facebook, which connect users, advertisers, companies, news, trading and micro-selling, are more complex. Platforms can be divided into transaction platforms like Uber, Amazon and Facebook, which individual consumers most commonly access, and innovation platforms, which operate at a firm level and enable companies to interact in industry with entire sectors (UNCTAD, 2019).

It should be noted though, that like anything in the digital economy, the classification criteria of platforms is considered a moving target, and it is likely these definitions will be refined further as technologies are more widespread and their impacts are better understood. The lack of Arab leading global platforms is notable, as UNCTAD identifies the presence of digital platforms and future platformization as a fundamental driver of value in the digital economy (UNCTAD, 2019).

While platforms were initially heralded as innovative solutions that promised to create more egalitarian “participatory” societies through the “sharing” and “gig” economy, criticisms of their negative social impacts have now become commonplace. By circumventing existing labor laws

and unions, platform corporations, while increasing access to certain kinds of revenue streams, also intensify the precariousness of those who use their platforms to earn money (Uber drivers emerge as an important example). Additionally, users and civic groups in Europe and elsewhere have criticized platforms for “dataifying” and commodifying social relations by collecting, processing, and selling user data without accountability to those whose data is being collected. Indeed, a new concept of the “platform society” (Van Dijck and Poell, 2016) has emerged to describe the transformational effects that platforms can have on all sectors of society, from transportation to education and housing. Over the last decade, private companies such as Uber and Airbnb have transformed the transportation, hospitality, and housing sectors worldwide in unexpected ways, some good and some bad.

While datafication holds enormous potential for better, more evidence based, governance practices, it also presents an enormous regulatory and institutional challenge. Governments all over the world are working to devise appropriate regulatory frameworks to minimize the social damage caused by platformization while maximizing the potential economic benefits of platforms.

Issues surrounding data access and privacy, unexpected social impacts, and monopolistic practices of the platform giants will continue to drive the conversation around the digital economy. There is yet to be a common approach on how these platforms should be regulated. This challenge looks to be one of the biggest facing policymakers as they look to shape their digital ecosystems moving forward.

G. Conceptualizing data within the digital economy context

The existence of data, and how to govern it, manage it and create value from it are fundamental and key pillars for governments and businesses seeking to steward and grow the digital economy.

The value of data materializes when ecosystems holistically support its production, flow and use in diverse practices that collectively lead to the creation of economic and public value (World Bank, 2021). In general, data can be categorized into three initial broad categories: data that is representative in nature, data that is implied, and data that is derived (Kitchin, 2014). Representative data includes elements such as one's age, how many cars are on a road, or what temperature it is outside. Implied data is data derived from reading into an absence, for instance, inference about an individual's voting preferences based on their online activity: the types of pages they read and posts they share. The last data category is derived data, meaning data that is produced from other data (Kitchin, 2014). It is important to note that while we often think of data as neutral, especially representative data, data is rarely truly neutral. It does not exist outside its surrounding ecosystem of the preferences and contexts that inform its collection, processing, and analysis. Which data to collect and how to collect it is a choice (Kitchin, 2014).

The importance of data continues to accelerate in the global economy, especially in the context of COVID-19 where societies are leaning more heavily than ever on digital connectivity. The number of IoT-connected devices is expected to reach 25 billion by between 2019 and 2025, and by 2024 LTE 4G networks are estimated to cover 90% of the global population and 45% connected to 5G network (Ericsson, 2019). In the Arab region, the growth of personal IoT and societal data sources is also expanding exponentially (Salem, 2017a, 2017b). Blockchain, AI, and other emerging technologies are reliant on the ability to process large amounts of data. Handling these connections requires substantial increases

in capacity to produce, store, and process large volumes in data that underpin the digital economy. The decisions of how to responsibly steward data provides a complex challenge for governments to tackle.

In the UAE, a constellation of data dissemination, privacy, intellectual property laws, and in Dubai, a data law, provides a foundation upon which to build a harmonized approach to data. However, redundancies and contradictions exist between the multiple laws governing data, including data residency restrictions, the enforcement of data privacy and IP protection, as well as the role of government in monitoring and restricting content. These inconsistencies raise questions for businesses considering operating in the UAE digital economy.

Creating a data secure ecosystem with transparent data governance requires participation from all actors: governments, manufacturers, service providers, and individuals, and requires physical, technical, and organizational solutions (UNCTAD, 2019).

H. The economic value of data

The growth of innovative data-driven applications is changing the foundational structures of the economy and posing new opportunities and challenges for policymakers in managing it. Traditional firms birthed in the industrial era were driven by supply side economics, pushing businesses to increase volume to lower prices. In contrast, the newer data-driven internet firms are driven by demand economics or network effects where users create value for other users, attracting multiplied numbers of users, who continue to generate value. Digital platforms also rely on data flowing as freely as possible. From a regulatory perspective, emerging challenges include restrictions such as localization which restricts data storage within a country's borders, as well as the ability to move and process data across borders. Policymakers are currently grappling with monopolistic market behaviors from tech platform giants like Facebook and Google, and finding that competition and anti-trust laws designed for the supply side industrial age of steel and railroads are not adequate to address the challenges of these data-based firms.

The stakes for both companies and governments in getting the right policy and regulatory framework for data are high. It is estimated that in 2018 that Facebook's data centers alone produced a cumulative \$5.8 billion to the GDP of the United States and created 60,100 jobs between 2010 and 2016 (VanLear et al., 2018). Google's data centers in 2016 alone generated \$1.3 billion, \$750 million in labor income, and 11,000 jobs (Oxford Economics, 2016). In Europe, the European Data Market Monitoring Tool estimates that the value of the data economy in the EU (direct and indirect impacts and induced effects) increased from €246.8 billion in 2013 to €335.6 billion in 2017, which represented a contribution to the EU's GDP of 2.4% (Cattaneo et al., 2020). Emerging economies are increasingly leveraging the value of their data, trading national data in exchange for technology and the capacity building support to use it (UNCTAD, 2019).

The digital economy and commercialization of data have created whole new value-chains within the economy, and over time, will impact virtually all sectors and stakeholders. A whole-of-government approach is required to harness the economic potential of data in the economy and ensure that government is forming policies that build consumer trust, protect data privacy, manage cross-border data flows, and build the right skillsets in the economy to harness data driven economic development.

1. Data trust, security and privacy

Responsible, transparent data stewardship is one of the most critical enablers of digital growth and a sustainable thriving digital ecosystem. The topics of data trust, security and privacy are highly interlinked. Consumers expect that as businesses and governments continue to collect and store unprecedented amounts of personal data, that they will simultaneously be capable of keeping personal information private and safe. When that does not happen and data privacy is violated, the trust is broken, and with it, there are often significant financial losses for the organisations whose data security is breached (Accenture, 2019). As businesses and governments collect larger and larger amounts of data, the stakes of these type of digital security incidents become increasingly catastrophic in consequence (Accenture, 2019). Recent ransomware attacks shut down half the oil supply to the United States east coast for nearly a week in June 2021 until a ransom of \$4.3m was paid, and just days later a similar attack crippled the healthcare system in Ireland (The Economist, 2021). These types of attacks shake consumer trust in both government and businesses' ability to keep their data safe. Trust is an essential enabler for the digital economy, which is so reliant upon interdependence and a degree of uncertainty as technologies and their applications continue to evolve. Companies historically kept their data systems closed by default, but the interlinked nature of the digital economy makes that way of protecting data a thing of the past. In today's ecosystems, a hyper-connected web of data and technology provide the foundation of the entire system (OECD, 2019). Closed systems are no longer possible without significant economic and social consequences.

Although data security breaches and data privacy issues are often perceived to be a large company issue, SMEs and start-ups are particularly critical to economic growth and particularly vulnerable to digital security and privacy risks. This is because they often lack the funding and

apparatus for robust cybersecurity measures, and often perceive their own risk of data breaches to be low. In reality, SMEs and start-ups can provide a weak link in the chain of the digital ecosystem, offering an easy entry point which enables hacks that impact larger companies. It is estimated that in the private sector, cyber attacks may cost an estimated US\$5.2 trillion in value creation to the digital economy. Within this \$5.2 trillion, high-tech industries face the highest vulnerability, with more than US\$753 billion in potential lost value creation due to cyberattacks (Accenture, 2019).

When it comes to personal data privacy, creating more robust data security is essential for preserving and building trust. While previous suggested as much data as possible should be collected and stored, sometimes indefinitely, governments and businesses are beginning to consider a minimum data required approach, and looking at a stronger role for safe data destruction in data security. The ethics and practicality of data collection in the face of increasingly sophisticated data breaches makes the business case for organizations sitting on large tracts of data less viable.

Policy and regulation continue to be some of the first tools policymakers look to in order to address data protection and privacy. Despite their interconnected nature, policy responses to data security and privacy are often developed independently with little coordination between the two. Many countries possess privacy laws, but those laws are not entirely fit for purpose for the unique aspects of personal data. The OECD in particular has called for whole-of-government approaches to the development of a national privacy strategy closely interlinked with a national digital security strategy (NDS). While many countries have developed national digital strategies, the robust focus on both data security and data privacy remain on the future agenda. Currently, the European GDPR represents the gold standard for data protection. Most ground-

breaking is that it applies privacy rights to all EU citizens regardless of European or international data residency, which de-facto gives the legislation global reach. Because of this, companies that serve the European market, including the giants like Microsoft, Apple, and Facebook, have aligned their global privacy practices to be GDPR compliance (UNCTAD, 2019).

The UAE falls into the category of many countries where right to privacy laws have not been updated for the digital age, and there is no current NDS that addresses data security and data privacy at a national level. Progressive steps have been made, however, to improve the UAE's data security and privacy framework. The TDRA's 2020-2025 National Cybersecurity Strategy lays out objectives for data privacy and security, and the Dubai International Finance Centre (DIFC) refreshed its data protection law in 2020 to closely align with GDPR levels of data protection stringency (TDRA, 2019). When COVID-19 required the rapid transition to working and schooling from home, the Ministry of Human Resources & Emiratization adopted Resolution N. 281 of 2020 which requires the UAE's private sector to ensure a secure technological environment, by observing regulations related to maintaining data privacy and confidentiality (Ministerial Decree No 281, 2020). The UAE is clearly working towards a comprehensive data protection law. A robust data-oriented privacy regime would provide a strong market signal that the UAE is a safe economy for tech-companies and non-tech companies that handle large amounts of data to bring their business.

J. Data ownership and intellectual property rights

The rapid expansion of the digital economy has made the question of who owns the data, and what ownership means particularly important. Data has become a resource and source of value creation in its own right. Data ownership must strike a balance between protecting private data, incentivizing innovative data collection and derivation by protecting the rights of those who mine it and commercialize it, and protecting the public's right to access, use, and reuse data that is considered public domain. However, how do we define what is private and what is public? Representative data, things like the temperature outdoors, may clearly fall into what is called public domain data that is for use and reuse by all, but data on how many cars there are on the road, raises questions of whether the data is owned by whomever took the action to collect it. If that data is what can be classified as personal data, the ownership becomes even murkier. Data derived from other data is murkier still. It is easy to see how conversations of who owns the data and what that ownership entails can quickly become complicated.

As data becomes more and more important, implications for copyright and intellectual property (IP) rights becomes increasingly relevant economically, as businesses want to ensure that their right to their data sets is protected by law. This is particularly important for SMEs and start-ups, whom for many, their ability to commercialize specific data and technologies is at the center of their business models, and whom we have noted are more vulnerable to cybersecurity threats, and if threatened, may produce ripples throughout the larger ecosystem (OECD, 2019). Data ownership is typically protected through copyright and IP laws, although some countries are starting to produce specific data protection laws (Gurry, 2019). Copyright law jurisprudence generally acknowledges that copyright law requires a human author to be valid, and that copyright does not cover facts. The line between data and

facts remains unclear from a legal perspective (Data Ownership, 2018). Further, data or other data products that are produced by robotics and AI, for instance, lack a human author and cannot be copyright protected (Data Ownership, 2018). This has raised concerns among technologists that the outputs of these technologies are not capable of copyright protection under current interpretations of copyright law.

THE STUDY

Aims of the study

Driving the growth of the digital economy is of strategic importance for the continued competitiveness of the UAE and for its social and economic development. As the UAE diversifies away from oil and aims to be a locus for innovation for the region and beyond, it is of utmost important to understand the challenges and opportunities facing companies and organizations who rely on data and digital infrastructures for their day-to-day functions and those who are developing digital and AI products.

Given the UAE's vision to becoming a digital and AI leader, the Mohammed bin Rashid School of Government (MBRSG) conducted a comprehensive study to identify opportunities and challenges of the future of the UAE's digital economy, including the role of AI as a key component and driver. This study was conducted in partnership with Dubai Digital Authority and with the support of Microsoft. The aim of the study is to distil policy recommendations rooted in both international best practice and localized context. The demand for more strategic approaches to tackle and benefit from digital transformation is the driving force of this study.

Methodology

The methodology of this study consisted of a comprehensive survey that was disseminated amongst a. Dubai government organizations, and b. private sector companies in Dubai. The respondents were asked to respond on behalf of the practices of their entire organization.

The survey was launched in July of 2021 and ran for six months. Private sector entities were targeted using of national private sector databases and the help of the Dubai Statistics Center. 469

viable company contacts were retrieved and targeted directly via email. The completion rate was 35% rendering a representative sample.

A total of 29 Dubai government entities responded to this survey, representing 67% of total Dubai government entities.

The survey consisted of 5 sections and asked questions related to a. digital transformation, b. data collection and use, c. AI adoption, d. blockchain adoption, and e. remote work policy adoption and practices.

In March of 2023, a second survey was disseminated amongst Dubai Government entities and asked further questions about AI adoption, namely about the use of ChatGPT technology and AI language models. 13 entities responded to this survey

The results of this survey are complemented by two focus groups with private sector entities including multinationals and SMEs and one policy councils with federal government and local government regulators participating.

In addition, the results of the survey were shared in their early stages with members of the private sector and public sectors for discussion.

Results

The survey results presented in this report reflect only the completed results of the survey and represent the practices of 163 organizations in the private and public sectors.

The results are presented in their respective sections a. Dubai government survey results, and b. Dubai private sector results.

THE STUDY

METHODOLOGY

POLICY MAPPING

FOCUS GROUPS

SURVEY

DUBAI GOVERNMENT
RESULTS

PRIVATE SECTOR
RESULTS

2

DUBAI GOVERNMENT SURVEY RESULTS

PROFILE OF PUBLIC SECTOR RESPONDENTS

A total of 29 Dubai Government entities responded to this survey, representing 67% of the total number of Dubai government entities¹ (43²). Of those 29 entities, 90% (26) indicated that their organization can be understood to be a digital economy organization (i.e. an organization that is reliant on or significantly enhanced by digital

1. 100% of responding organizations have between 250-299 employees, making them medium sized organizations

2. See Dubai Government departments list according to The Dubai Media Office <https://mediaoffice.ae/general-information/dubai-government-departments>

inputs). Of those 29, 93% indicated that they collect data, 55% (16) indicated that they use AI and 31% (9) indicated that they use and develop AI technology (see fig.3).

These results are indicative of the general trend amongst Dubai government entities to collect, utilize, and share data, making the public sector an integral part of the UAE and Dubai digital economy. The adoption of artificial intelligence technology is also high among government entities, with 86% of entities at least utilizing AI technology in some form.

Does your organization use or develop AI?

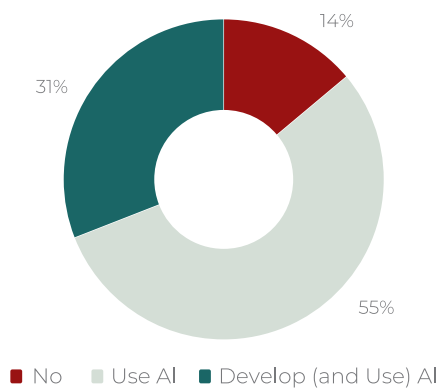


Figure 4. AI adoption in government entities

Data Collection

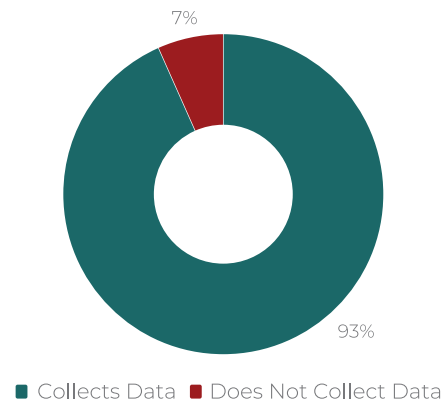


Figure 5. Data collection in government entities

DUBAI GOVERNMENT SURVEY RESULTS

Data Collection & Usage

/28

Data collection and governance

/30

Usage of collected data

/32

Big data utilization

RESULTS SUMMARY

By and large, Dubai government entities reported collecting data and using it to improve internal processes and make strategic decisions, as well as develop products and services. A smaller

percentage were using their data to personalize products or services or for targeted marketing.

Survey results on data use and governance amongst Dubai government entities indicates that a large majority of entities collect data (93%) with the most commonly collected kind of data being customer/personal data followed by engagement data and attitudinal data.

93%

Collect data

Most entities (96%) reported storing their data in central databases, and half of them indicated that they stored their data in central databases with attached metadata

96%

Store data
in central
databases

Despite nearly 100% of entities reporting that they collected data, only 62% had specialized data teams or units and 52% had data governance strategies in place.

62%

Had specialized data teams or units

Use of big data was limited. Awareness and usage of government big data sources was low. When big data was being used, its uses were varied and inconsistent among entities. Only a minority of entities reported using big data for decision making about internal matters – whether strategic or financial.

55%

Utilize open government data sources

A majority of Dubai government entities reported having data privacy policies (86%) in place but not data use ethics policies (38%), therefore policies are in place to ensure the security of personal data but not necessarily to regulate the processes of its collection and use.

86%

Have data privacy policies

90%

Of data collectors collect customer/user personal data

38%

Have data use ethics policies

USE & GOVERNANCE OF DATA

86% of responding Dubai Government entities have data privacy policies in place, while 62% have a specialized data team or unit. A relatively smaller percentage of entities indicated having a data governance strategy (52%), or ethical data use policies (38%) (see fig.3). While data privacy policies do include an ethical use component – protecting the privacy of customers or partners whose data is being collected, data ethics policies are more expansive and describe the ethical principles governing how organizations collect and

use data and all organizational processes or activities that utilize that data. In that respect, generally speaking, a majority of responding Dubai government entities have policies in place to ensure the security of personal data but not necessarily to regulate the processes of its collection and use.

A large majority (74%) of government entities indicated that their organizations have protocols in place to ensure data quality, indicating that government organizations ensure that the data they collect is fit for use.

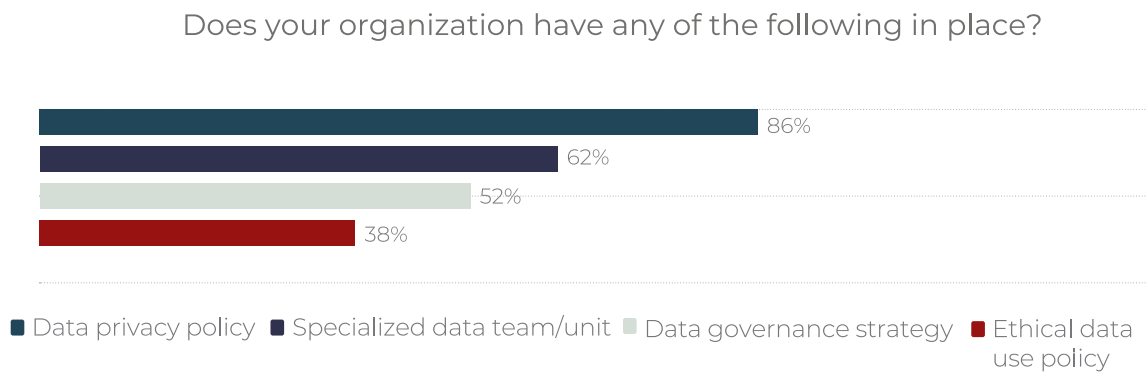


Figure 6. Data governance among Dubai government entities

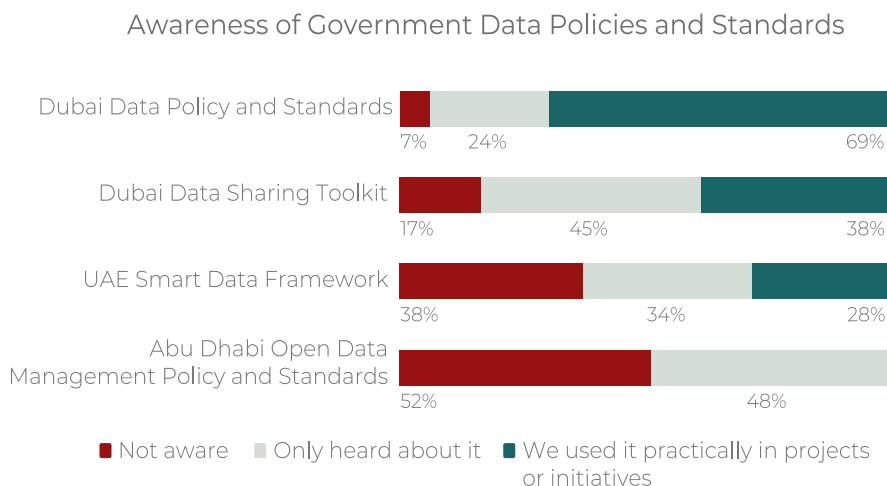


Figure 7. Awareness of government data policies and standards among Dubai government entities

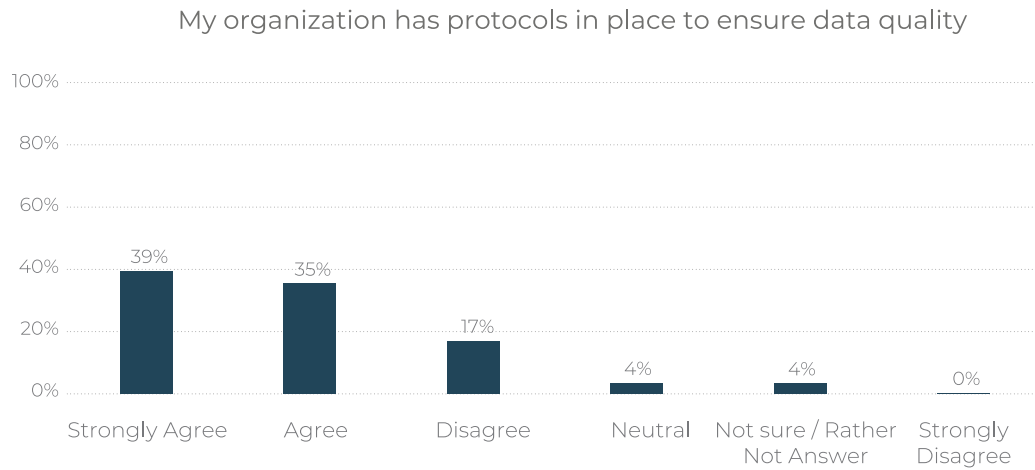


Figure 8. Percentage of Dubai government entities with data quality protocols in place

The most commonly collected data among Dubai government entities was customer data (90%), followed by engagement data (69%), attitudinal data (66%), Geospatial data (48%), and behavioural data (34%). General trends for data collection and use indicate that government entities are, by and large, collecting data. A large percent-

age are collecting data on how digital services are being used by customers and the degree of satisfaction with these tools. Overall, 46% of entities store their data in central databases, and 50% store them in central databases with metadata. This indicates a potential roadblock to making data interoperable.

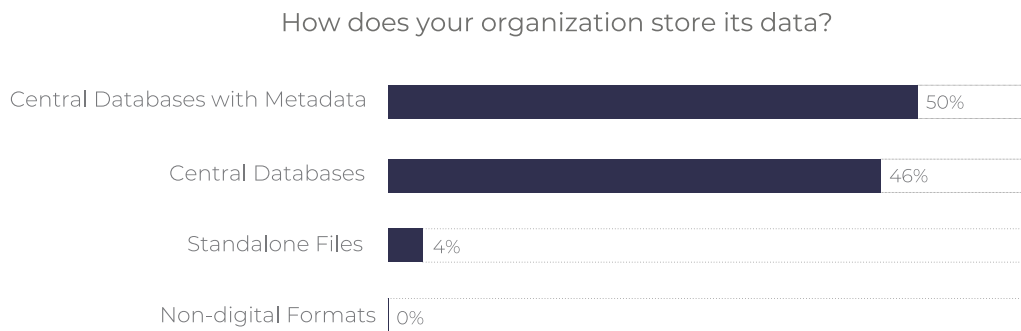


Figure 9. Data storage among Dubai government entities

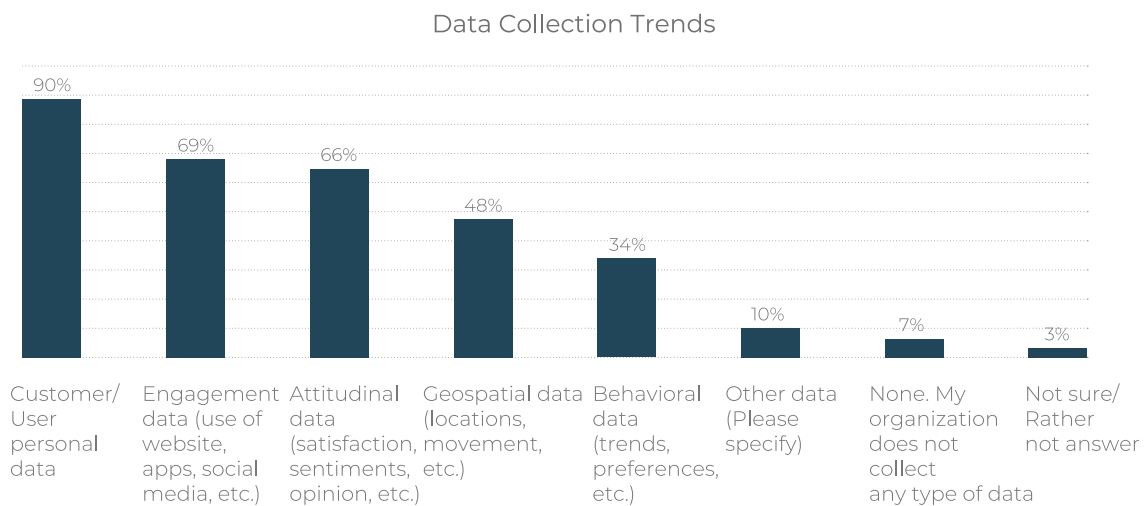


Figure 10. Data collection in Dubai government entities

In terms of how collected data is used, 90% of organizations reported using the data they collect to improve internal processes, 79% use it to improve products and services, 79% use it for strategic decision making, 76% use it for forecasting and 72% use it for performance measurement. These numbers become considerably lower when it comes to using data for marketing, personalization of products or customer targeting.

ernment entities are sharing their data primarily in the form of open data and with partners. 54% of entities strongly agreed that their organization shares consolidated data with partners and 34% strongly agreed that their organization publishes consolidated data as open data. Overall, over 70% of organizations are sharing consolidated data in these two forms. Only 39% of entities indicated sharing data with vendors and only 25% published their own organizational data online.

Trends in data sharing indicate that Dubai gov-

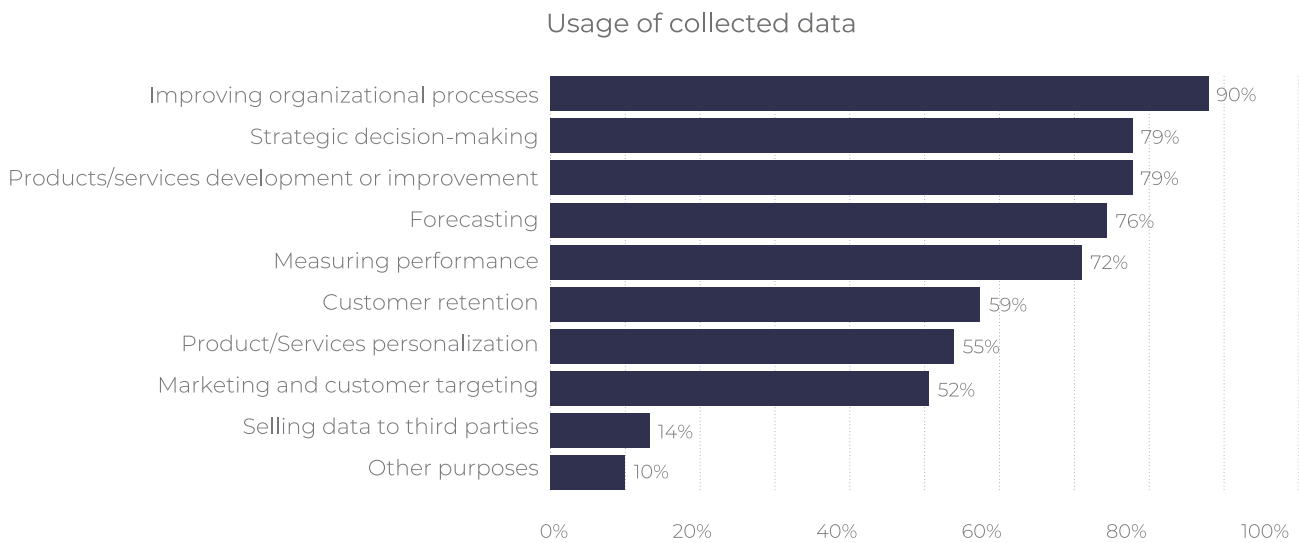


Figure 11. Data collection in Dubai government entities

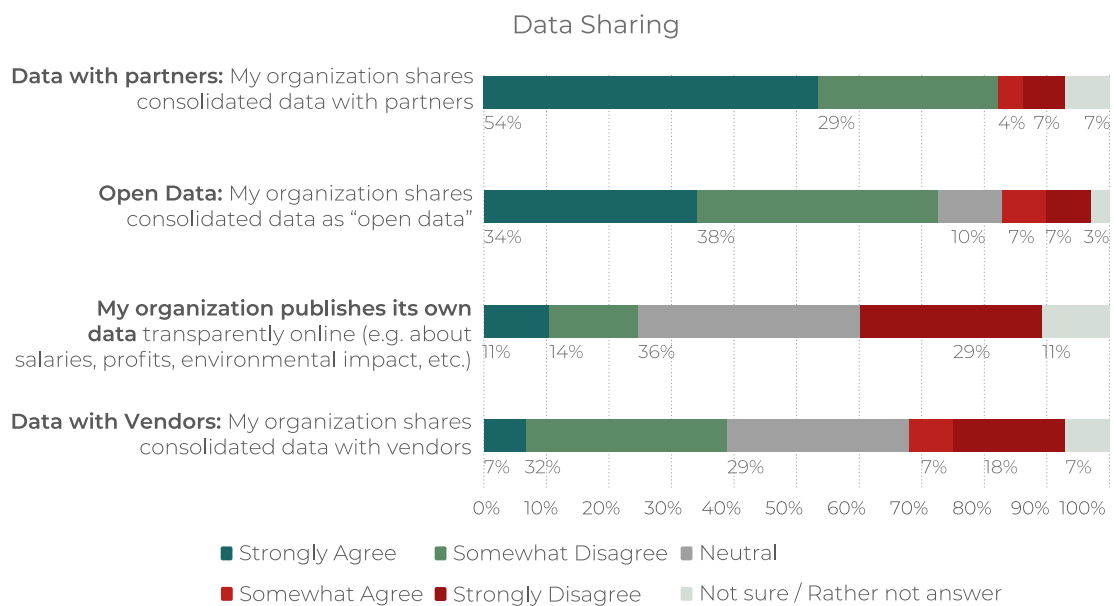


Figure 12. Data sharing among Dubai government entities

Usage of big data sources was low overall. The source most commonly used was open government data with 55% of entities responding that they used open government data sources. 34% of respondents indicated that their entities used

scraped big data, while 31% said they used data from data exchanges, 28% said they used big data published by non-government entities or individuals, and only 14% said they used big data gathered from IoT devices.

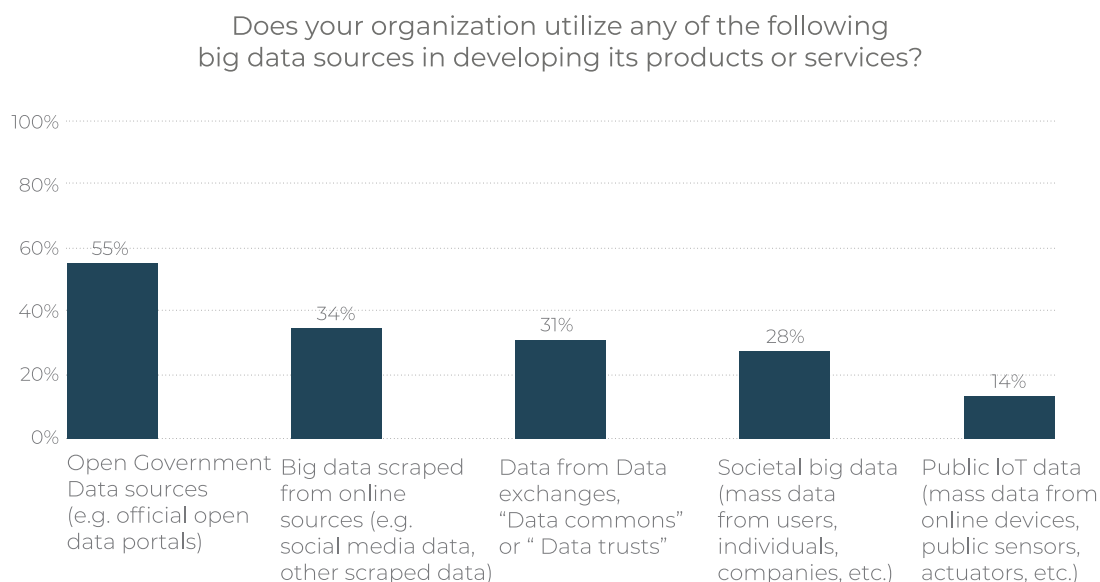


Figure 13. Big data use among Dubai government entities

The most commonly used government data source was Dubai Pulse (66%), followed by Dubai Registers (28%). The difference in utilization was very stark. 40% less respondents report using Dubai Registers than Dubai Pulse, and the uti-

lization decreases further as we go down the list. This indicates that 44% of respondents have never used Dubai Pulse, 90% have never used Bayanat, and 97% have never used Abu Dhabi Open Data Portal.

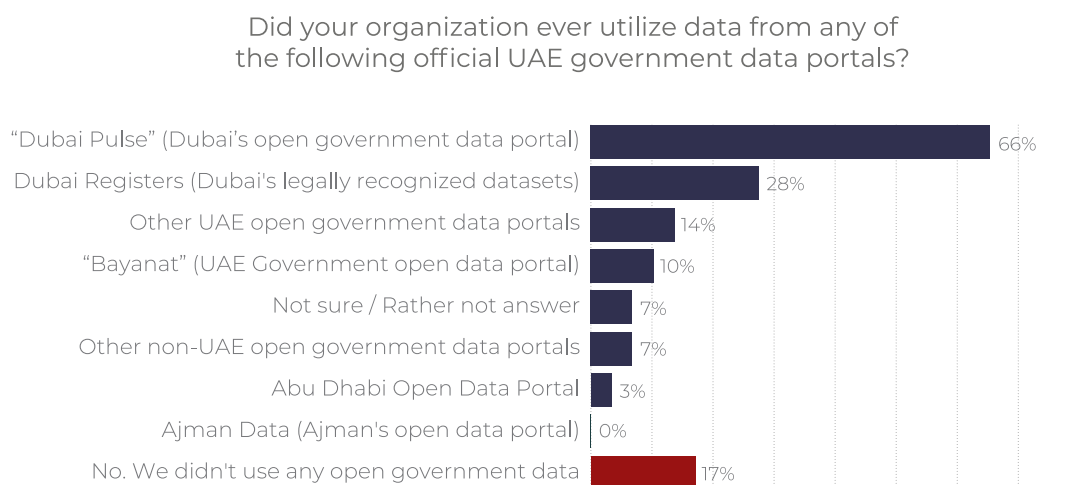


Figure 14. UAE government data portal use among Dubai government entities

In terms of the utilization of open government data, 41% of respondents indicated that they used this data for internal decision making, 41% indicated that they used it to develop services,

34% indicated using that data software/ applications development, while 24% indicated using it for product development.

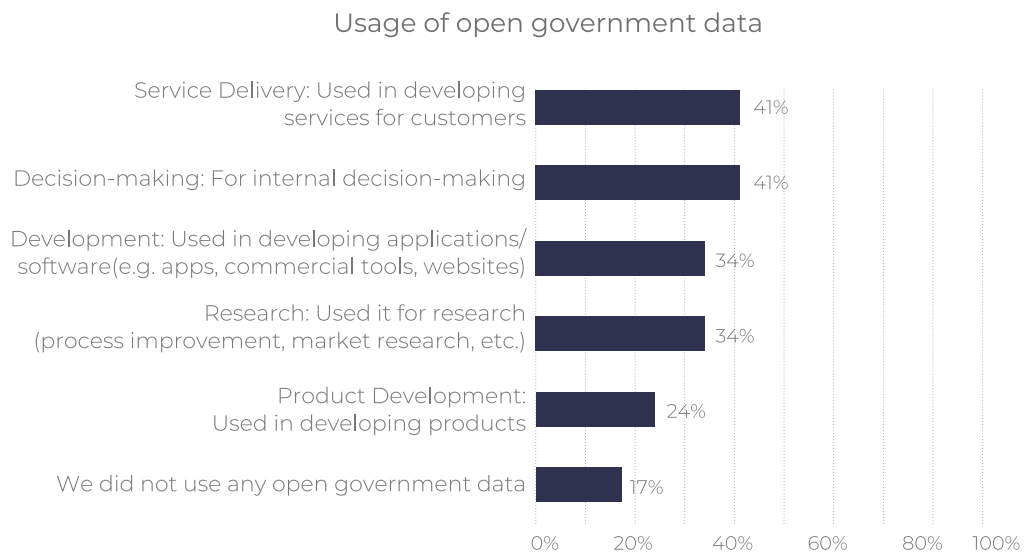


Figure 15. Usage of open government data among Dubai government entities

DUBAI GOVERNMENT SURVEY RESULTS

Artificial Intelligence Adoption

/36

Trends in AI adoption

/40

Barriers to AI adoption

/43

Adoption of generative AI



RESULTS SUMMARY

Survey results on AI adoption indicate that AI adoption amongst Dubai Government entities is already very high and will continue to grow. Overall, the perception of benefits of AI is very

positive with most government entities reporting favourable views on the impact of AI on their organizations and business functions

Despite high AI adoption rates, only a minority of entities indicated having dedicated AI strategies (28%) or AI ethics guidelines (21%).

28%

Had AI strategies

21%

Had AI ethics guidelines

56%

Of AI adopters utilized AI within the service development business function

38%

Of entities already utilizing generative AI in customer service*

Human capital capacity gaps emerged as the most important barrier to AI adoption within government organizations

55%

Use AI

64%

Of AI adopters utilized virtual agents

31%

Use & Develop AI

AI TECHNOLOGY ADOPTION

AI adoption among Dubai government entities was very high. 86% of entities reported using AI and 33% reported developing AI. Only 14% of entities said that they do not either use or develop AI.

In terms of future plans to implement AI technology, 24% of respondents said that they had

solid plans to apply AI technologies within the next 12 months, 28% said that they are already experimenting with AI technology, 21% said they have already developed a prototype AI application and 24% said that already have one or more active AI applications.

Does your organization use or develop AI?

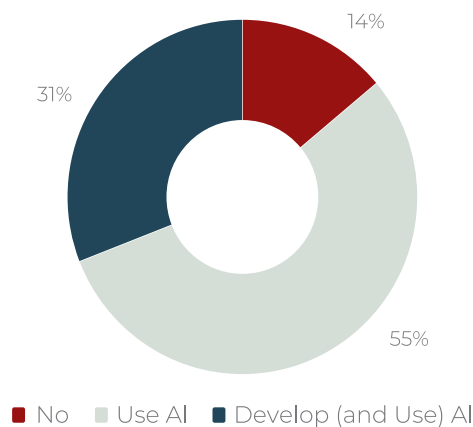


Figure 16. AI Development in Dubai government entities

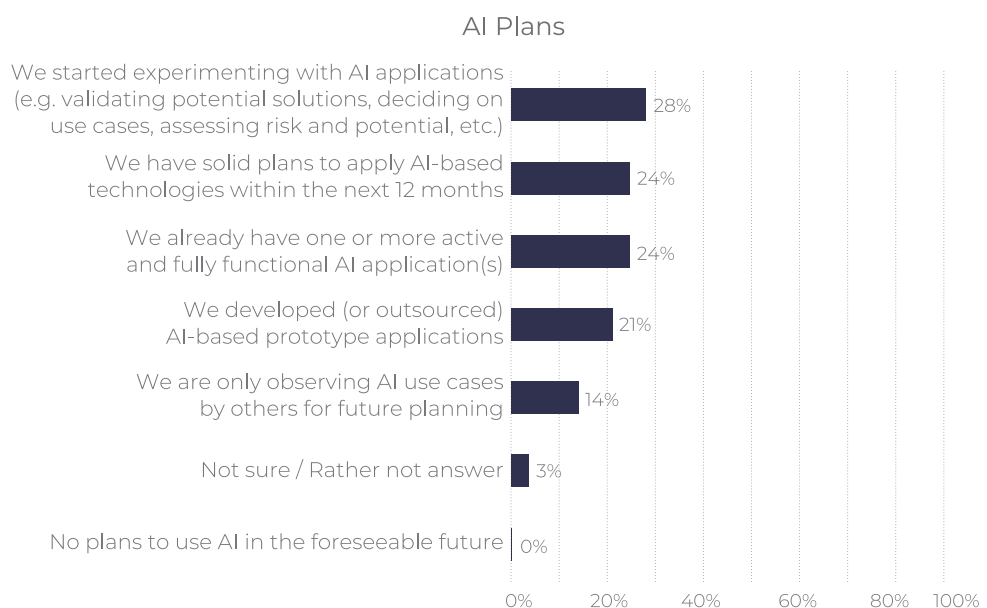


Figure 17. AI plans among Dubai government entities

Of the 86% of entities that reported either using or developing AI technology, 56% implemented it within service development operations. The percentage of implementation drops sharply to 24% within product development functions. Only 16% of respondents reported implementing AI technology in strategic planning or corporate finance, and only 12% reported doing so in risk assessment processes and functions. 48% of respondents said that AI implementation within service delivery functions had a benefit on those functions. 24%

of respondents said that the implementation of AI technology had a positive impact on product development, while 12% said it had a positive influence on strategic planning and corporate finance (see figure 15).

This shows that, by and large, the implementation of AI technology remains largely within service operations and AI technology has yet to exert a notable influence on internal organizational functions and processes.

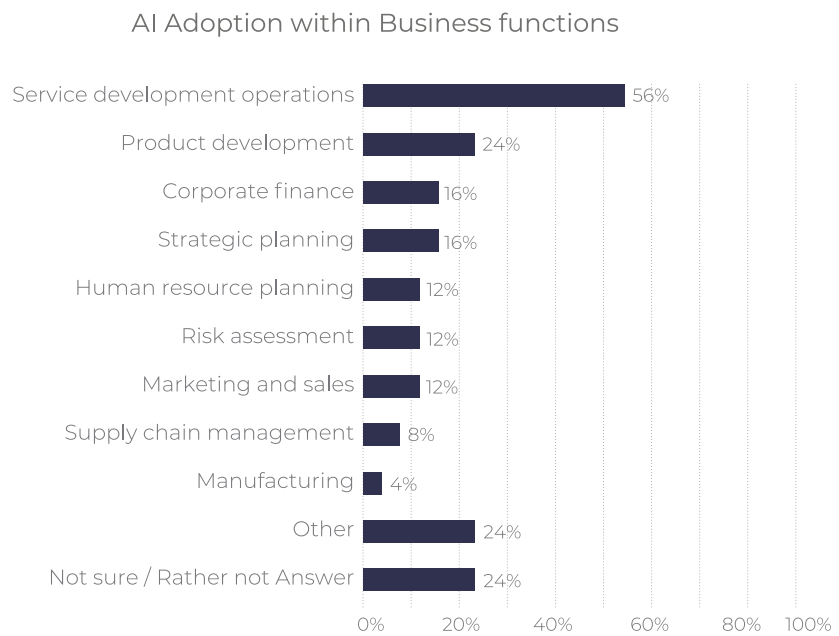


Figure 18. AI Adoption within business functions in Dubai government entities (N=25)

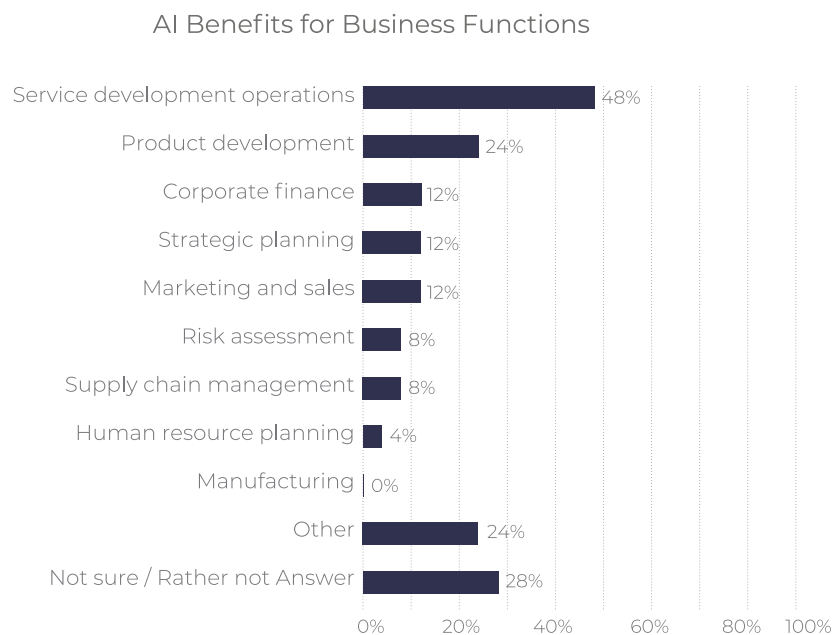


Figure 19. Benefits of AI Adoption within business functions in Dubai government entities (N=25)

The most commonly adopted applications within Dubai government entities were virtual agents, with 64% of entities reporting implementing that technology. Robotic process automation was the next most popular application with 52% of government entities reporting implementing that technology, followed by machine learning with 44% of entities reporting implementing that

technology. Beyond these three categories of AI applications, other applications are adopted at much lower rates. For example, only 12% of entities (3 entities out of 25) reported implementing natural language understanding technology and only 4% (1 entity out of 25) used natural language generation technology.

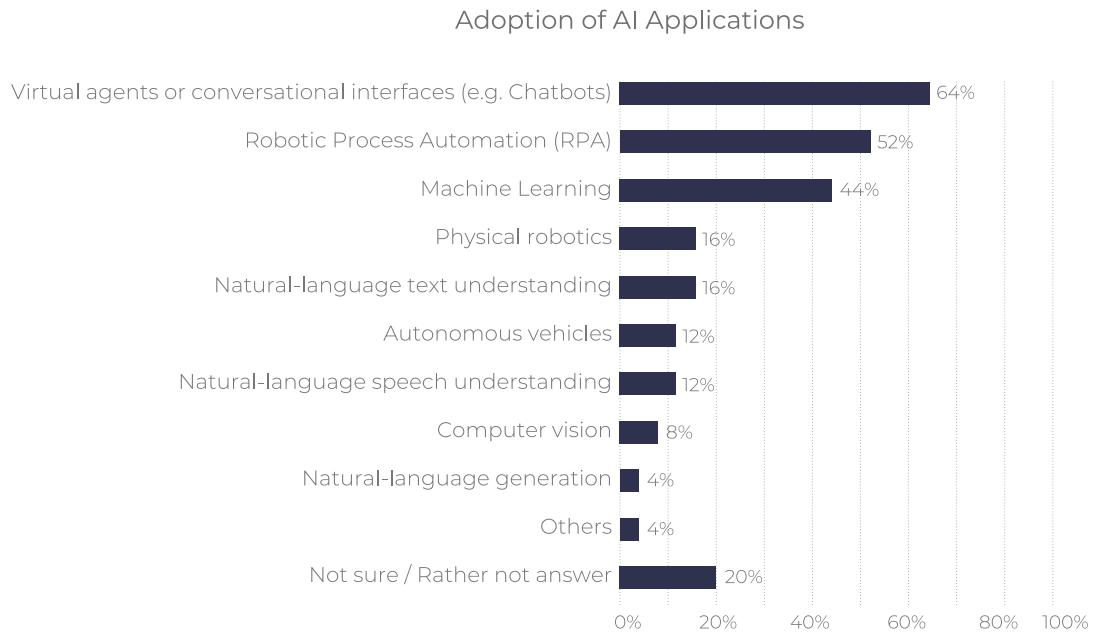


Figure 20. Adoption of AI applications among Dubai government entities (N=25)

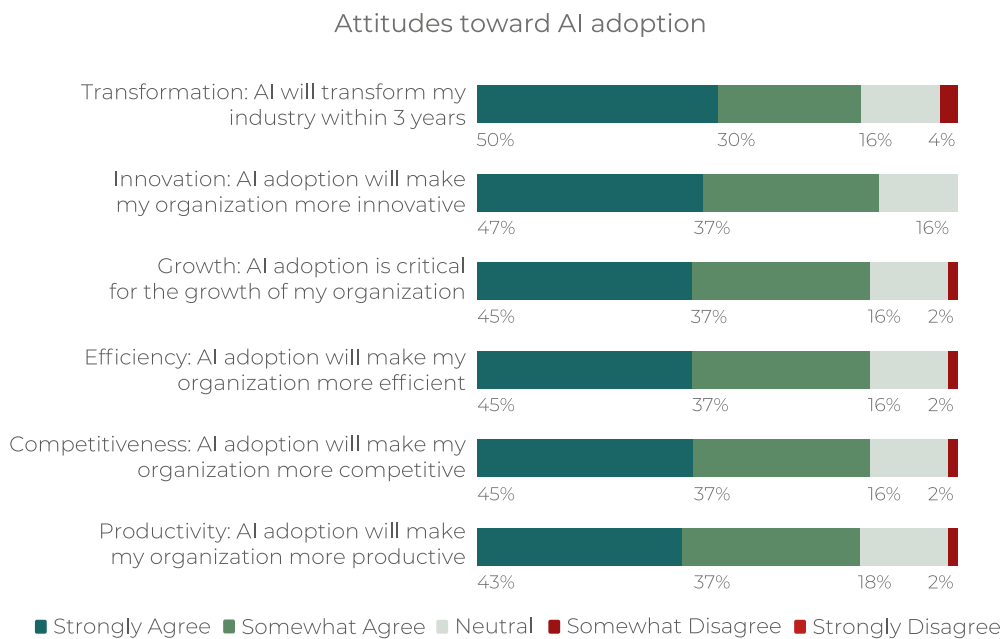


Figure 21. Attitudes toward AI adoption among Dubai government entities (N=25)

AI governance

28% of Dubai government entities reported having a dedicated AI unit or team, 21% reported having AI ethics guidelines or policies and 28% said that they had an AI strategy in place. Even among entities that used AI applications and self-reported as digital economy organizations, only 39% reported having an AI strategy in place, 32% reported having AI ethics guidelines or policies, and 31% had an AI unit or team. The prevalence of these governance tools among digital economy organizations is considerably higher than among non-digital economy organi-

zations. Only 12% of non-digital economy organizations reported having AI ethics of guidelines, none of them reported having an AI strategy.

31% of government entities reported having well defined AI governance processes in place, and 30% said that they had clear AI ethics guidelines in place regarding the use of data in AI solutions. 74% of entities reported having protocols in place to ensure data quality. Only 46% of entities reported tracking the performance of AI initiatives.

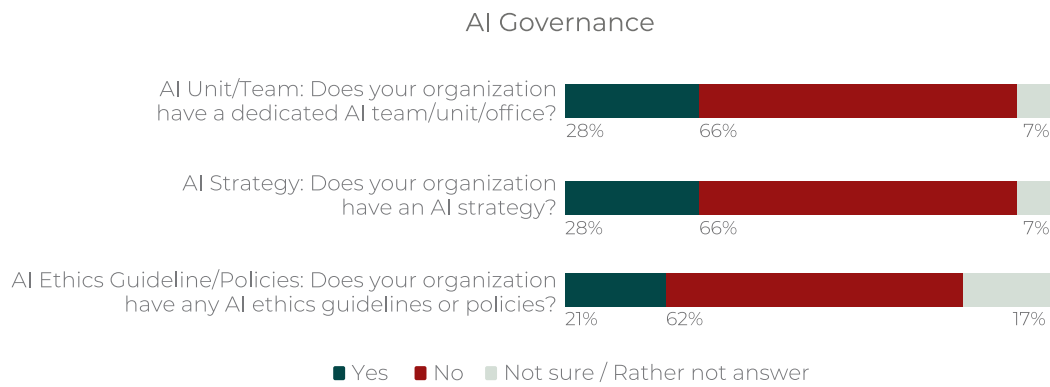


Figure 22. AI governance among Dubai government entities

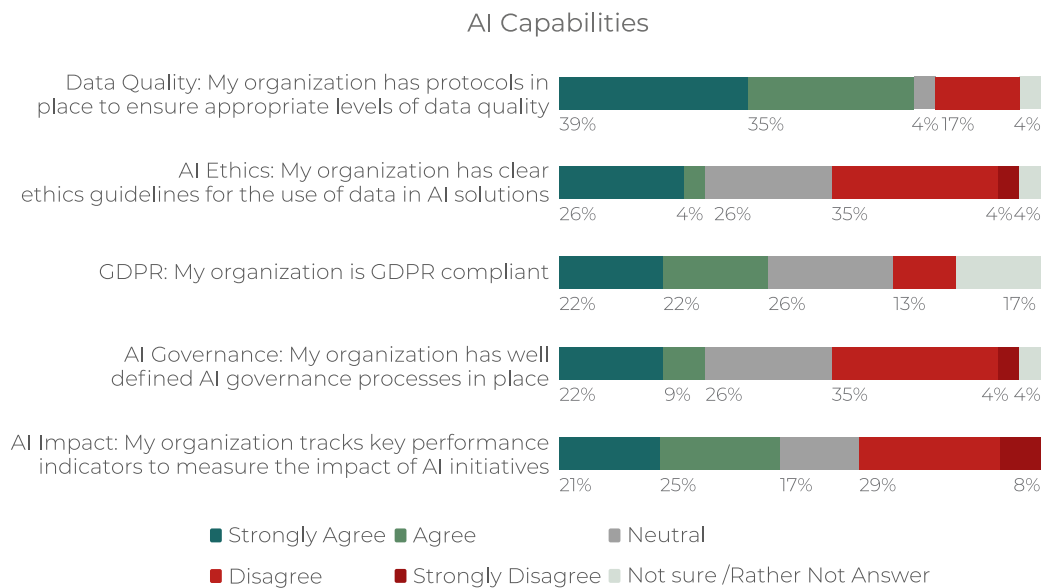


Figure 23. AI capabilities among Dubai government entities

Barriers to AI adoption

The most restrictive barrier reported by government entities, as it relates to AI adoption was the lack of AI related talent and skills amongst employees, with 59% of Dubai government respondents indicating that talent was at least a major barrier. Only 10% indicated that it was not a barrier. Talent, then, emerges as the biggest obstacle to AI adoption within government entities. Complex and cumbersome bureaucratic systems were also reported as a major barrier. 28% of respondents said that this was a major barrier, and 21% said that it was a moderate barrier. A lack of AI strategy, and privacy concerns were also important barriers to AI adoption. Leadership support for AI implementation and organization-

al cultures were the least impactful barriers to AI adoption. However, their impact was not insignificant. 41% of respondents said that support from leadership and organizational culture was not a barrier, leaving 59% of respondents reporting that both were indeed barriers. Data quality and availability also emerged as only moderate barriers with less than 20% reporting data quality or data availability as acute barriers

This number increases slightly when considering data collection activities. 38% of entities who collect engagement data, and 30% of entities who collect customer data reported that data quality was at least a major barrier to AI adoption.

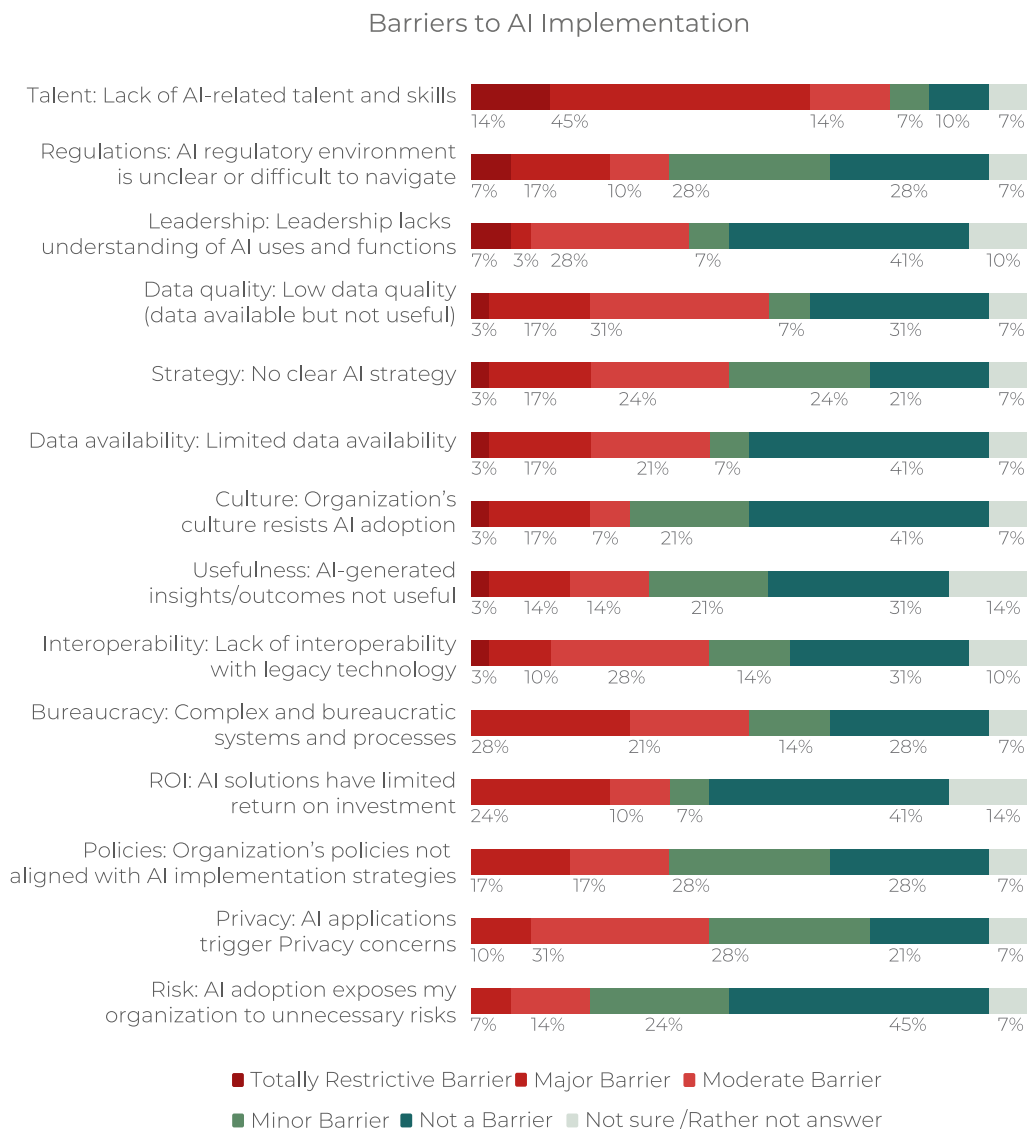


Figure 24. Barriers to AI implementation among Dubai government entities

Data Quality as a Barrier by Data Collection Type

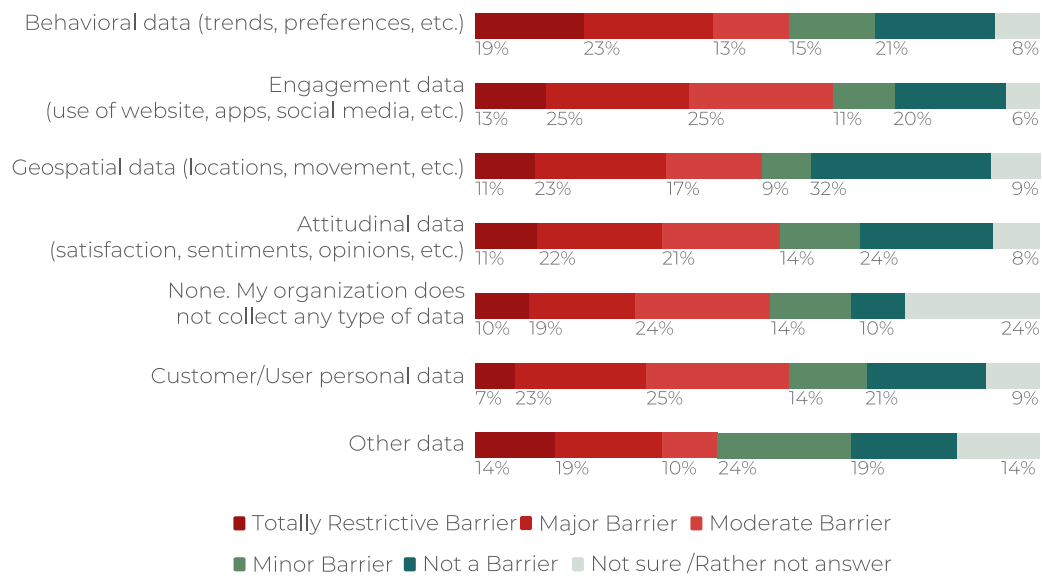


Figure 25. Data quality as a barrier to AI implementation depicted by data type collected

AI related skill gaps

In terms of AI related capacity gaps, only 21% of respondents indicated that they did not face any difficulties related to human capital capacity gaps. 79% of respondents faced difficulties in this area, with 38% reporting having many difficulties regarding AI related human capital. This emerges as the most significant capacity gap. Financial resources gaps and research gaps also emerge as important difficulties, with 69% of respon-

dents indicating that they are a difficulty for their organizations, though financial resource gaps are more acutely difficult with 38% of respondents reporting that they face many difficulties in this area. Infrastructure emerged as the capacity gap with the least difficulties, with only 14% of respondents indicating that they faced many difficulties in this area and 55% percent reporting having no difficulties with infrastructure at all.

AI Related Capacity Gaps

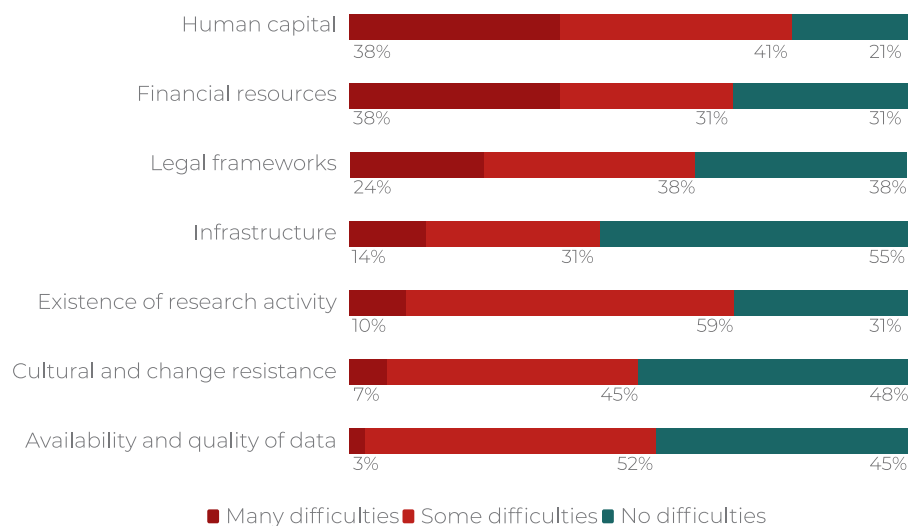


Figure 26. AI related capacity gaps among Dubai government entities

To supplement internal AI capacities, 48% of respondents reported that their organizations buy or license AI capabilities from large companies, while 34% buy or license capabilities from start-ups. While there is a gap in buying and licensing from start-ups versus large companies, 34% of

respondents reported investing in upskilling their employees and 24% partnered with training institutions to train their staff on AI skills. Only 10% reported crowdsourcing for AI capabilities. Suggesting a hesitancy in relying on crowd-based solutions.

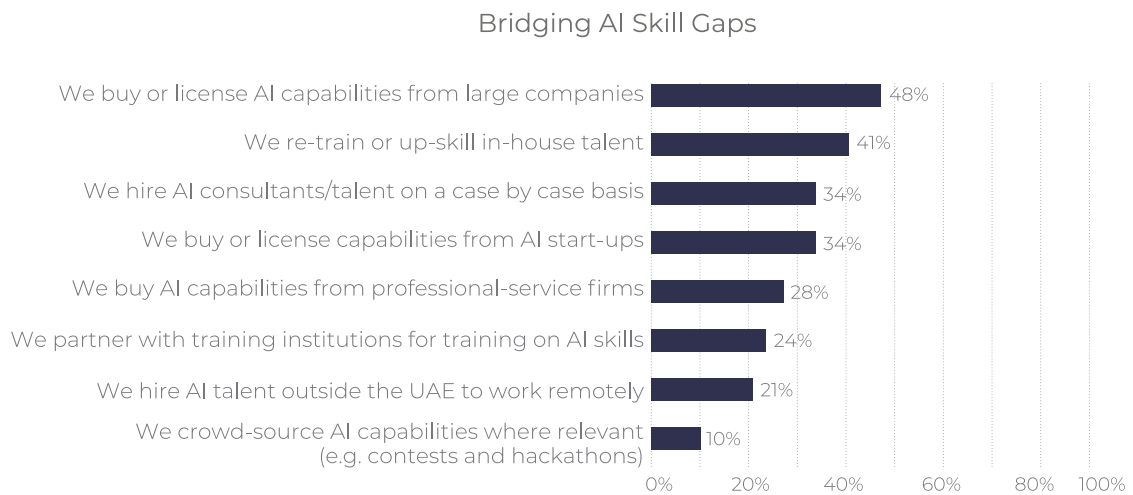


Figure 27. Initiatives to bridge AI skill gaps among Dubai government entities

Adoption of generative AI applications

Attitudes regarding the utilization of generative AI applications in Dubai government were positive, with 46% of responding entities indicating that they support their use and another 46% indicating that they strong support it.

The 46% of responding entities who indicated strong support of this technology also indicated that they are already implementing generative AI

in their organizations.

Overall, no entities reported strong disapproval of the use of generative AI technology and none indicated having any explicit policies in place that prohibit their utilization.

Views on Generative AI (Eg. ChatGPT)

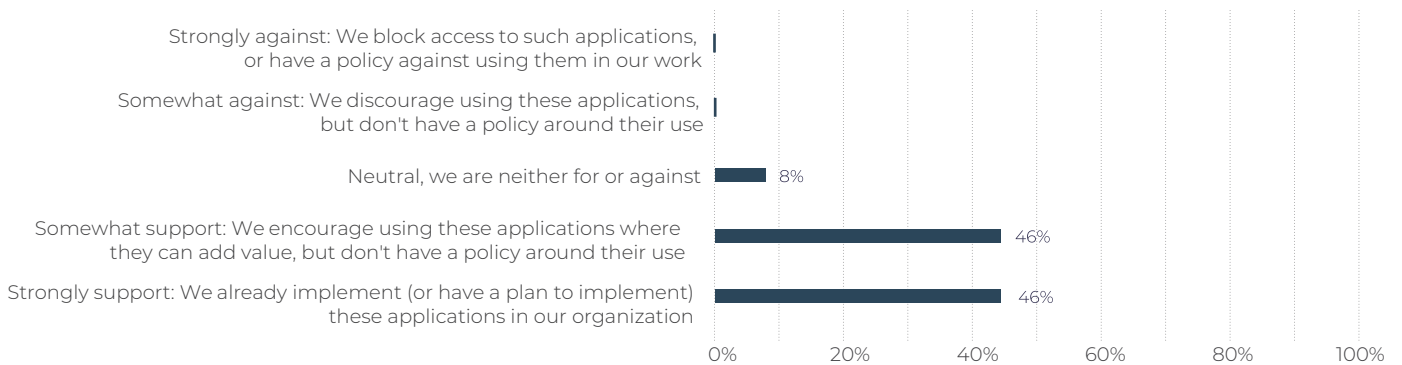


Figure 28. Views on generative AI applications among Dubai government entities n=13

In terms of future plans for implementing generative AI, the business function in which generative AI was being implemented most was customer service.

23% of responding entities indicated that they planned on implementing generative AI technology in strategic planning functions within the next year, and 23% indicated plans to implement

generative AI for internal decision making activities, while 38% indicated plans to implement generative AI for internal knowledge management within a year.

38% of responding entities were already implementing generative AI technology in customer service functions, and 8% were already implementing it for decision making.

Plans for Utilizing Generative AI Applications

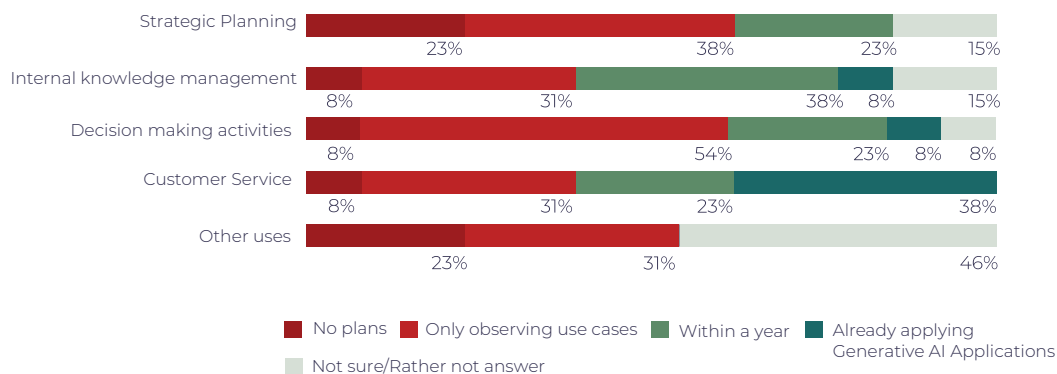


Figure 29. Plans for utilizing generative AI applications among Dubai government entities n=13

Though there was a general positive attitude toward generative AI, responding Dubai government entities reported concerns around its use.

62% of responding entities indicated that they viewed bias in the data used to train AI applications as an ethical concern.

54% indicated that they viewed the limited quality and availability as a concern when considering generative AI applications. This is similar to the concerns that entities reported regarding

the implementation of any kind of AI technology whether generative or otherwise.

Legal concerns were also widely held, with 54% of responding entities reporting that they were concerned that generative AI applications may have legal repercussions for the entity.

Concerns regarding Generative AI Applications

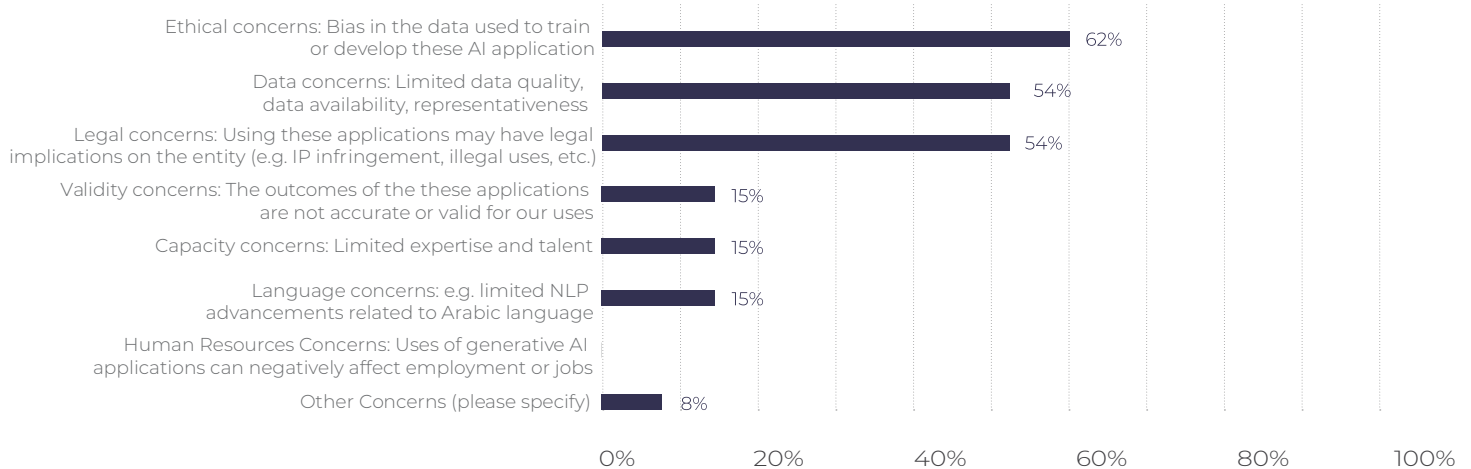


Figure 30. Concerns regarding generative AI applications among Dubai government entities n=13

When asked what percentage of their employees were already using ChatGPT at work (during work hours), 54% indicated that less than 10% of their employees currently utilized this technology

at work.

31% indicated that 10-25% of their employees were doing so.

Percentage of Employees who Use ChatGPT at Work

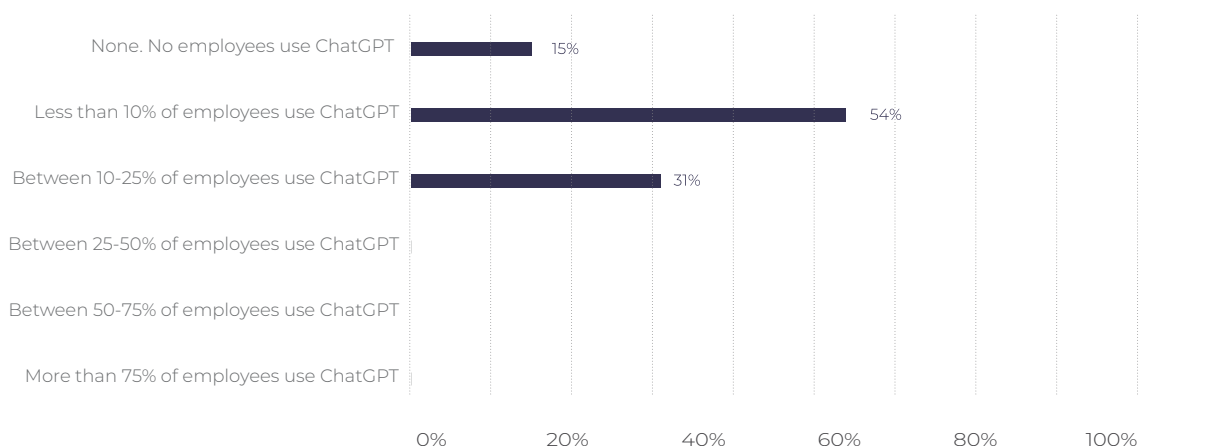


Figure 31. Percentage of employees utilizing generative AI applications at work among Dubai government entities n=13

DUBAI GOVERNMENT SURVEY RESULTS

Blockchain Adoption

/48

Trends in blockchain adoption

/49

Barriers to blockchain
adoption



RESULTS SUMMARY

Our survey results indicate that a large number of Dubai government entities are already applying blockchain technologies.

The two most significant barriers to blockchain adoption was a lack of collaboration amongst

industry actors to develop blockchain technologies and a lack of skills and talent to develop and implement such technologies.

7%

Had immediate plans to implement blockchain technology

48% of our responding entities reported already implementing blockchain in their organizations. Perceptions of the benefits of blockchain adoption were favourable.

48%

Already implementing blockchain technology

56%

Reported lack of collaboration as, at least, a major barrier to blockchain adoption

52%

Reported skill gaps as, at least, a major barrier to blockchain adoption

56%

Reported improvement in transaction speed as a benefit of blockchain adoption

75%

Reported increase in trust as a benefit of blockchain adoption

BLOCKCHAIN TECHNOLOGY ADOPTION

48% of Dubai government respondents indicated that their organizations are already applying blockchain technologies in their organization, while 34% reported that they were observing blockchain use cases with the intention of possibly adopting the technology in the future.

In terms of the benefits of blockchain adoption, the vast majority of respondents indicated that

they saw value in adopting blockchain technology whether in terms of gaining customer trust, improving transaction speed, and integrity, protecting data or reducing cost and risk and improving efficiency. Overall, respondents thought that the area that would benefit most from blockchain adoption would be data protection, followed by customer trust.

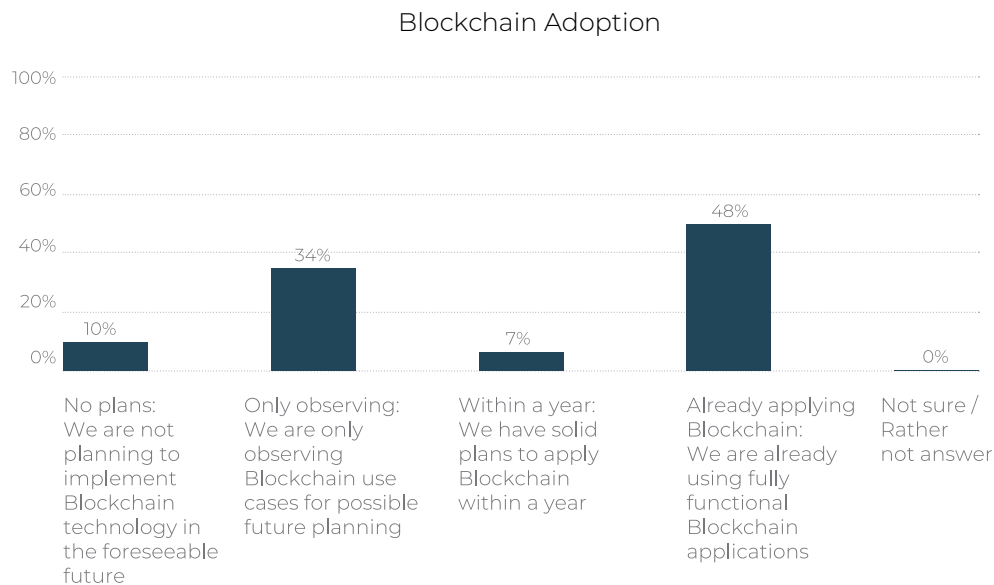


Figure 32. Plans to implement blockchain technology among Dubai government entities

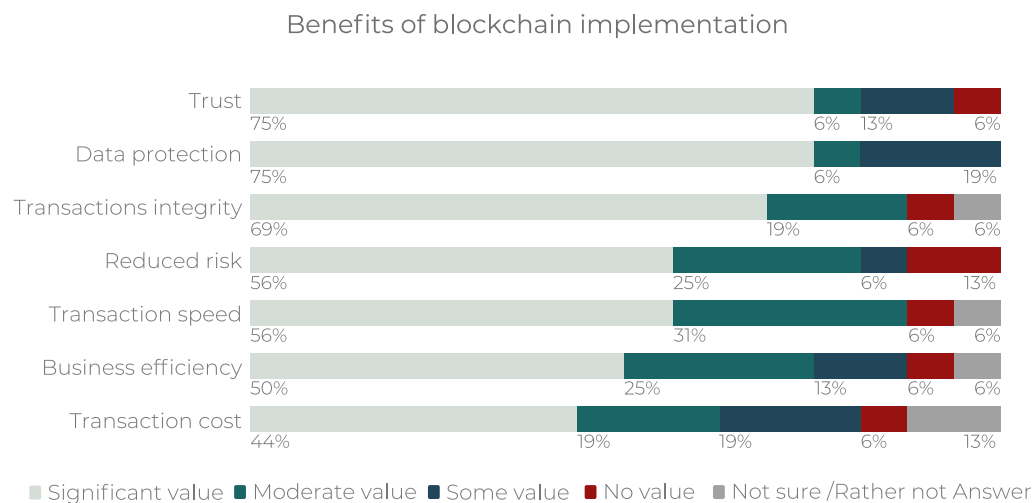


Figure 33. Benefits of blockchain implementation among Dubai government entities

The most significant barrier to blockchain adoptions amongst government respondents was lack of collaboration amongst industry partners to create blockchain solutions. 28% of respondents indicated that this was a totally restrictive barrier, another 28% said it was a major barrier and 24% said it was a minor barrier. Only 20% of respondents did not report collaboration

amongst partners as a barrier. Lack of skills for blockchain implementation was the second most acute barrier with 44% of respondents reporting that it was a major barrier. Lack of interoperability between blockchains, uncertainty regarding regulations and a lack of industry standards were also major barriers to adoption.

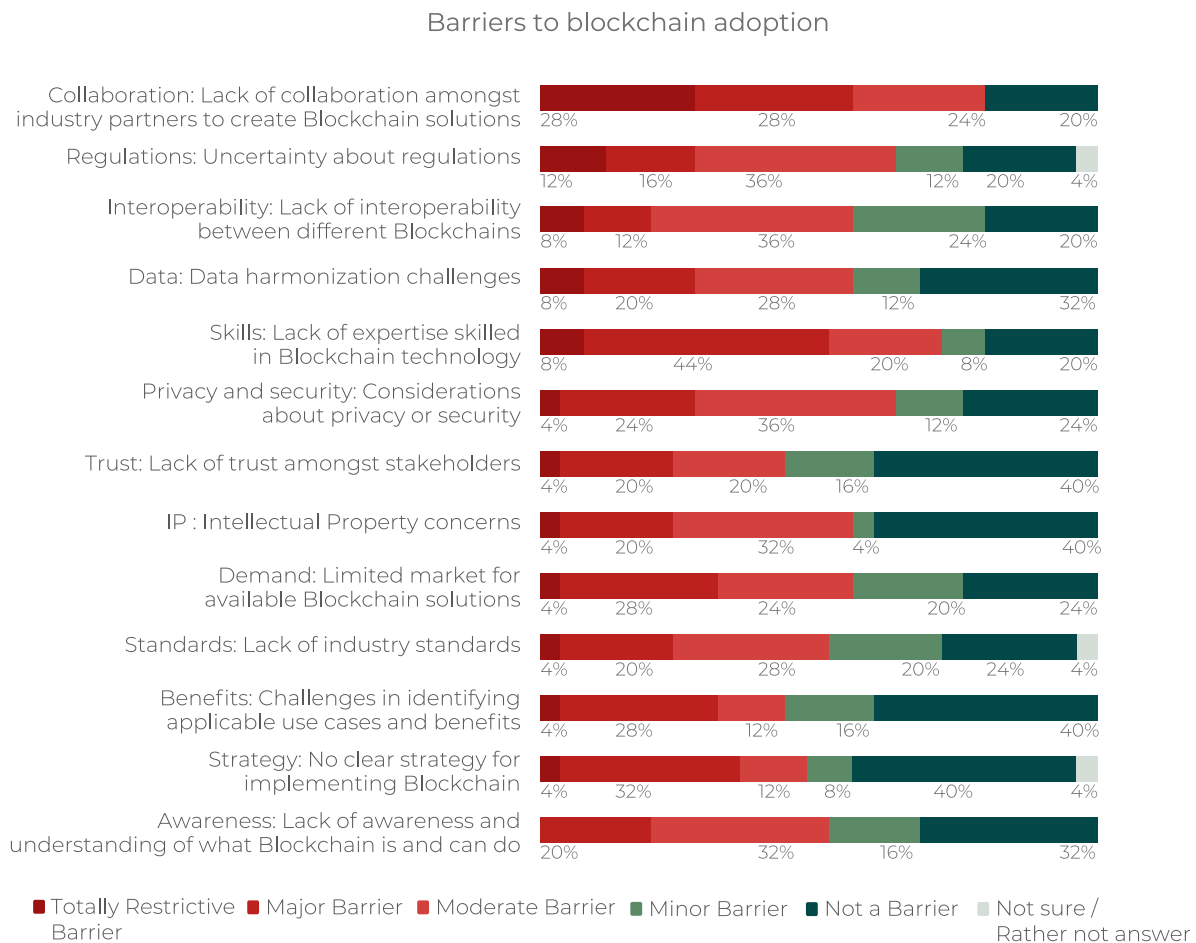


Figure 34. Barriers to blockchain adoption among Dubai government entities

DUBAI GOVERNMENT SURVEY RESULTS

Remote Work

/53

Trends in remote work

/55

Impact of of remote work



RESULTS SUMMARY

According to our survey, in the summer of 2021, a minority of Dubai government entities were implementing remote work policies in a wide spread way. staff working remotely.

While Dubai government entities report signifi-

cant benefits to their organizations and employee wellbeing due to the implementation of remote work policies, a small percentage were planning on implementing remote work policies permanently.

91%*

Had remote work policies in place

23%*

Had no employees working remotely

19%*

Had 10-25% of their employees working remotely

*These results are from the summer of 2021

41%*

Of remote workers were concentrated in support services departments

26%

Of entities were planning to implement remote work policies permanently

82% of responding entities reported that implementing remote work policies had a positive impact on employee wellbeing. 82% of respondents also reported a positive impact on productivity

82%

Reported improvements to employee wellbeing & productivity

TRENDS IN REMOTE WORK

At the time of running this survey (Summer 2021), 50% of Dubai government respondents reported that less than 10% of their staff were working remotely. 23% said that none of their staff were currently working remotely. 73% of Dubai government respondents indicated that less than 10% of their staff were working remotely. 19% of respondents reported that between 10 to 25% of their staff were working remotely.

According to our survey, most remote staff in Dubai government entities were concentrated in support services departments – HR, Finance, IT, etc. 41% of respondents indicated that the majority of their remote workers were support staff. Only 7% of respondents reported that their customer facing staff members were working remotely.

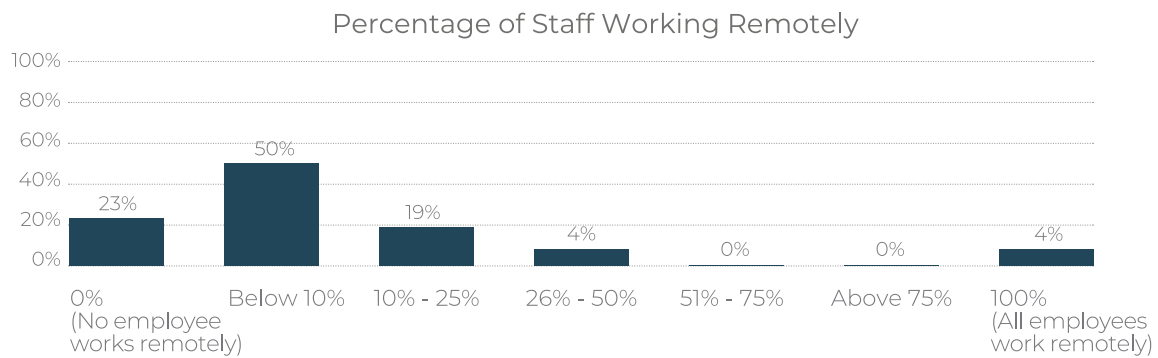


Figure 35. Percentage of staff working remotely in Dubai government entities in summer 2021

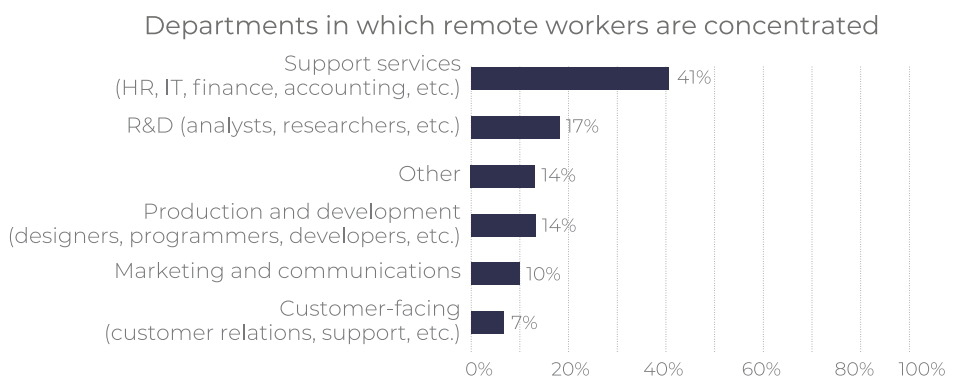


Figure 36. Concentration of remote workers by department in Dubai government entities in summer 2021

In terms of the impact of remote work, the majority of respondents indicated that remote work for staff members had had a positive impact on the organization.

91% of Dubai government respondents indicated that their entities had remote work policies. Despite the reported positive impact of

remote work, 26% of responding entities plan on applying those policies permanently, while 30% said that they plan to apply them only temporarily. 4% were not planning to keep applying them at all.

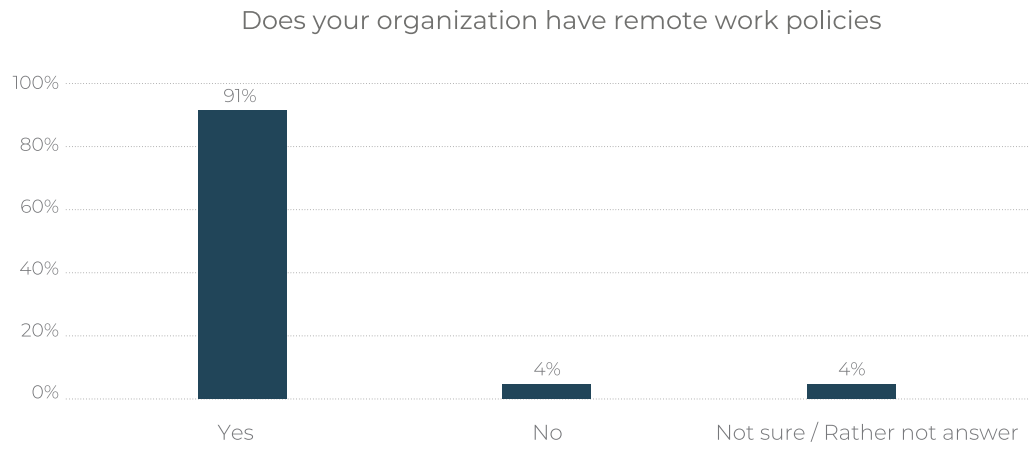


Figure 37. Application of remote work policies among Dubai Government entities

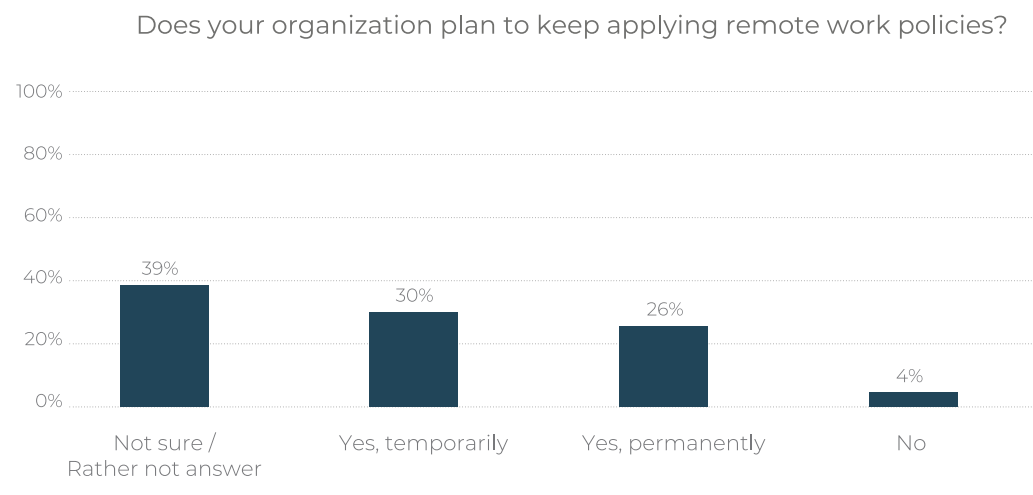


Figure 38. Plans to continue to apply remote work policies among Dubai Government entities

The most significant enabler of remote work was a strong IT infrastructure (69%), followed by virtual collaboration tools (52%). Only 31% of respondents indicated that having an agile or flexible culture was a remote work enabler for their organization.

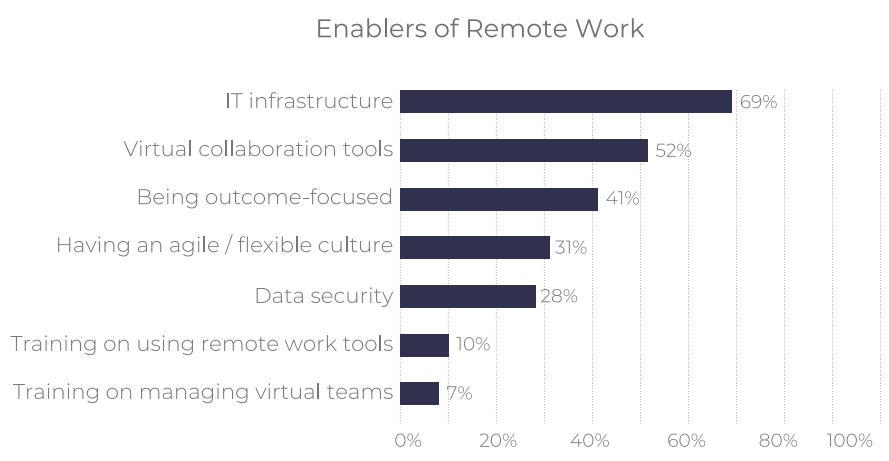


Figure 39. Enablers of remote work among Dubai Government entities

Overall, Dubai Government respondents reported that the implementation of remote work policies had a positive impact on their organizations. The most positive impact reported was on employee wellbeing and productivity. 82% of responding entities indicated that remote work had a positive impact on their employees' health

and satisfaction, another 82% reported that it had a positive impact on productivity in their organization. While the impact of remote work policy implementation was overall positive, 14% of organizations reported that it had a negative impact on customer relations and 9% said it had a negative impact on project management.

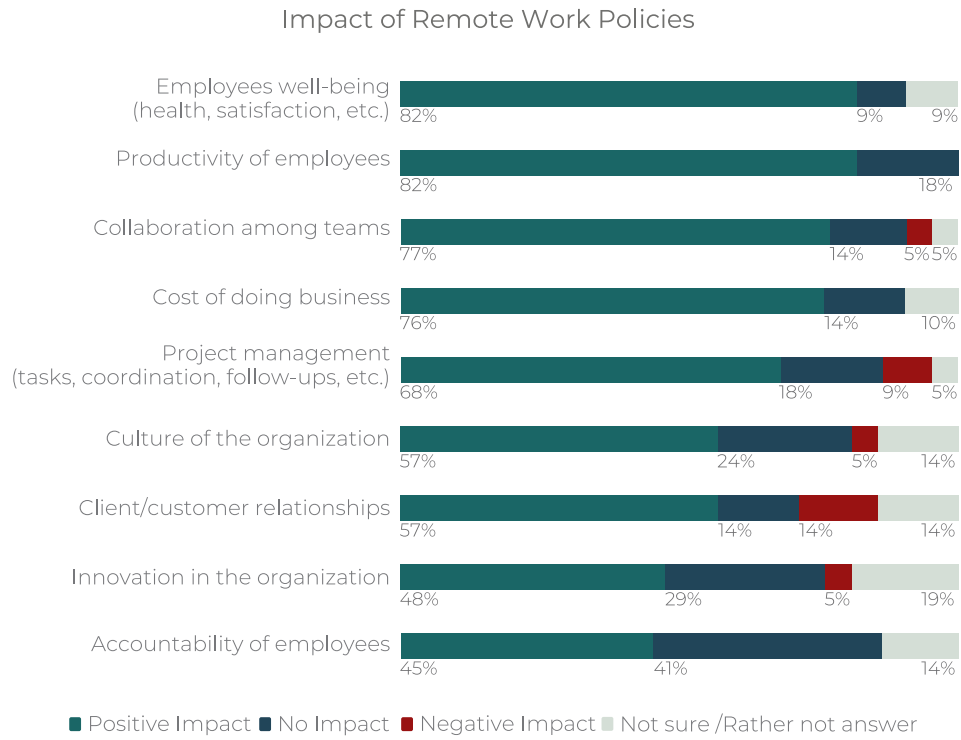


Figure 40. Impact of remote work policy implementation in Dubai Government entities

3

DUBAI PRIVATE SECTOR SURVEY RESULTS

PROFILE OF PRIVATE SECTOR RESPONDENTS

115 private sector companies responded to our survey. All of them were located in Dubai, half were registered in the mainland and half were registered in Free Zones. 88% of the responding companies either had regional or global headquarters in the UAE or the UAE was their only location. Of the 115, 30% were small business-

es and 30% were large companies. 18% were start-ups.

The majority of companies (53%) were in the service sector, while 31% were in the trade sector (including retail). 64% of the companies who responded to this survey reported being a digital economy company, and 25% were not.

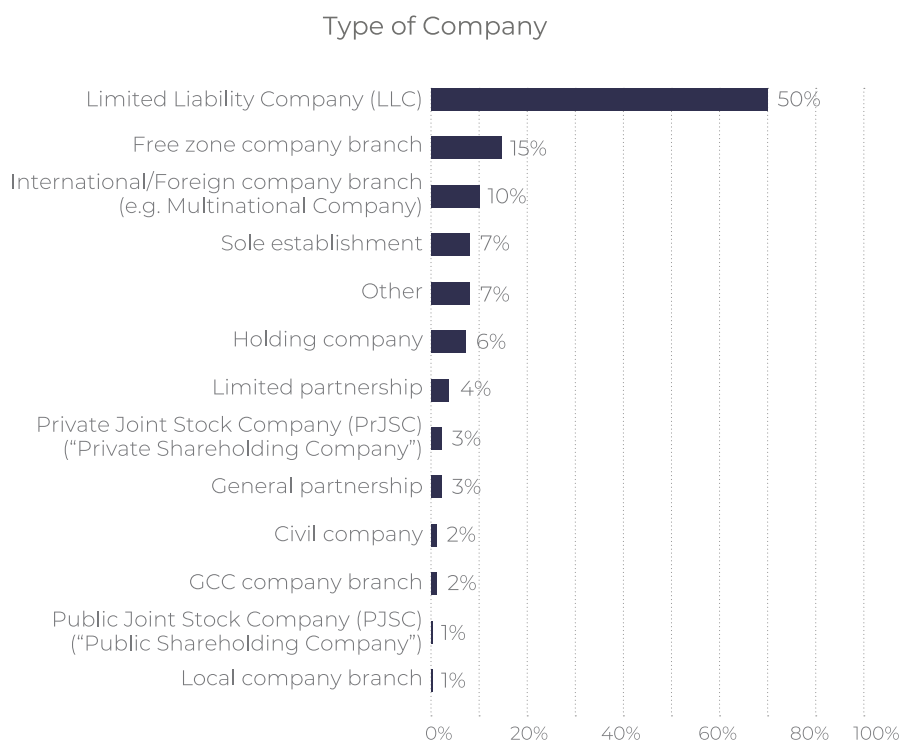


Figure 41. Types of private sector companies responding to this survey.

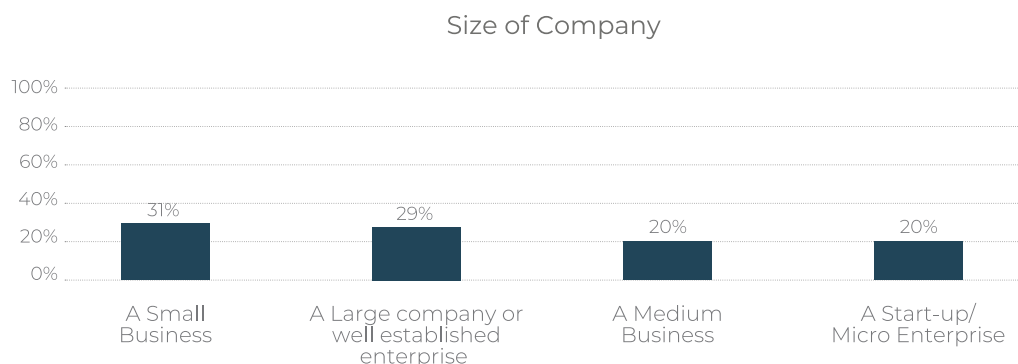


Figure 42. sizes of private sector companies responding to this survey.

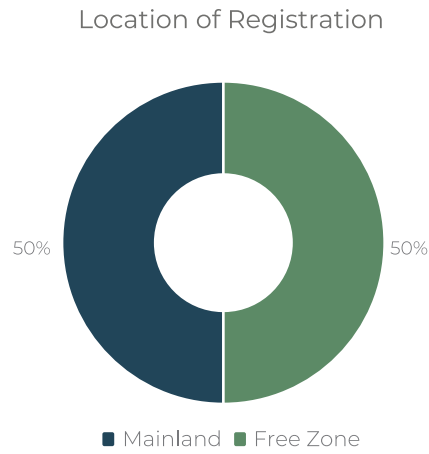


Figure 43. Location of registration among private sector companies responding to this survey.

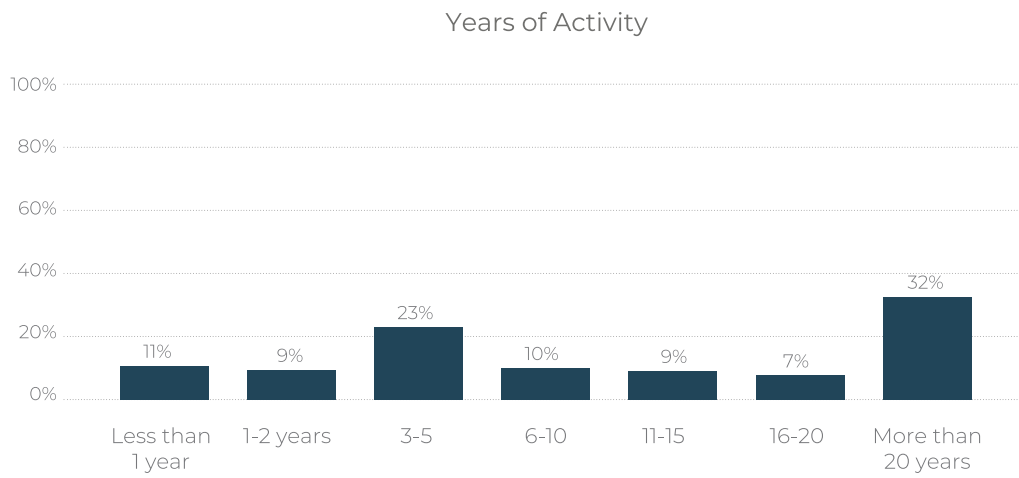


Figure 44. Years of activity among private sector companies responding to this survey.

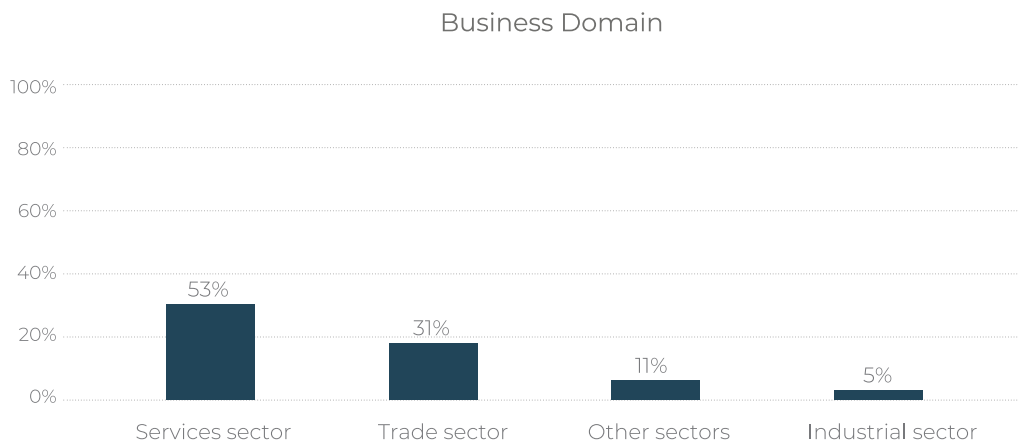


Figure 45. Sector representation among private sector companies responding to this survey.

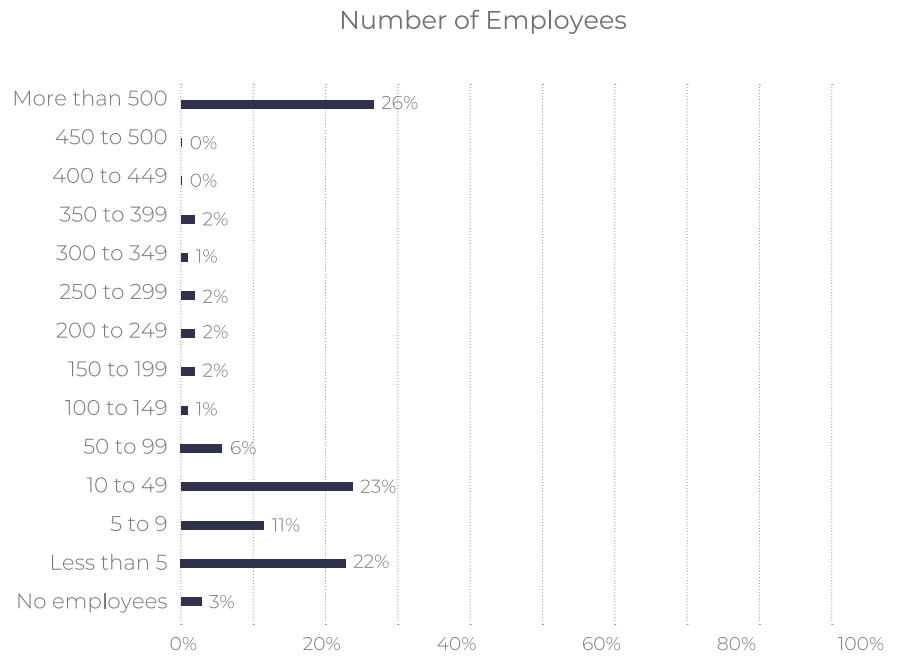


Figure 46. Size of private sector companies responding to this survey.

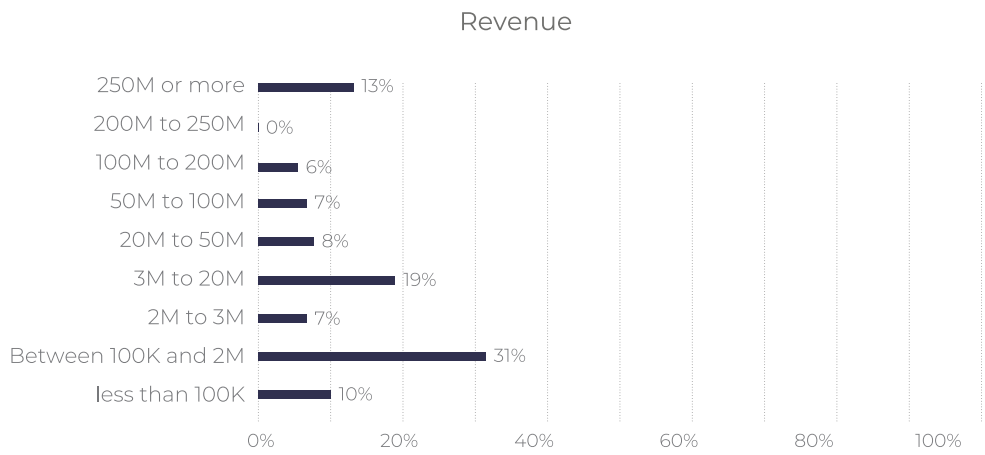


Figure 47. Annual revenue among private sector companies responding to this survey.

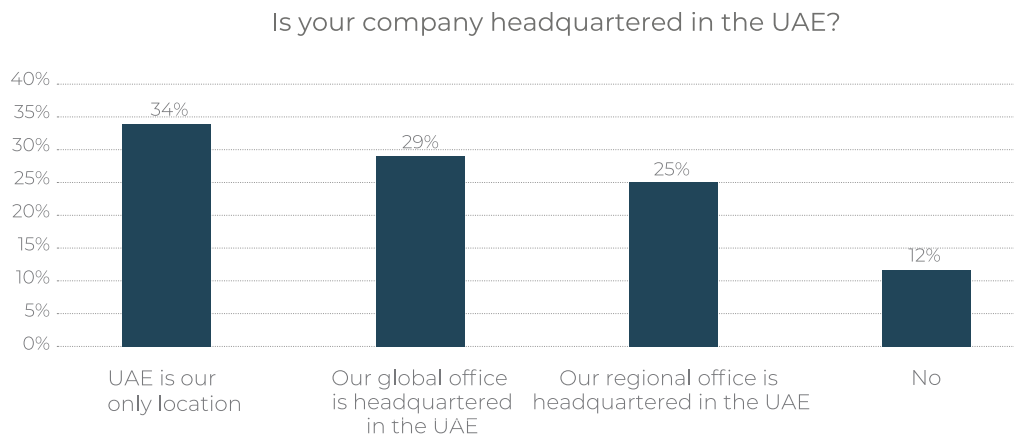


Figure 48. Percentage of responding companies based in the UAE .

Would you say that your entity/company is a “digital economy” entity?

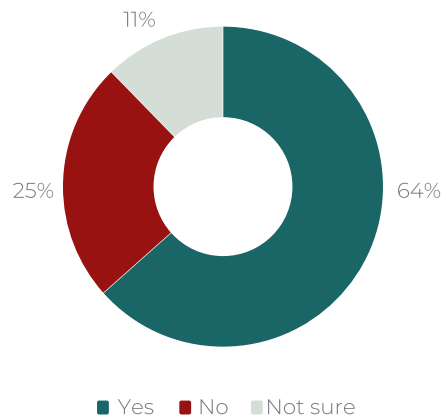


Figure 49. Percentage of digital economy companies among private sector respondents³.

Which of the following business models best captures your company's activities within the 'digital economy'?

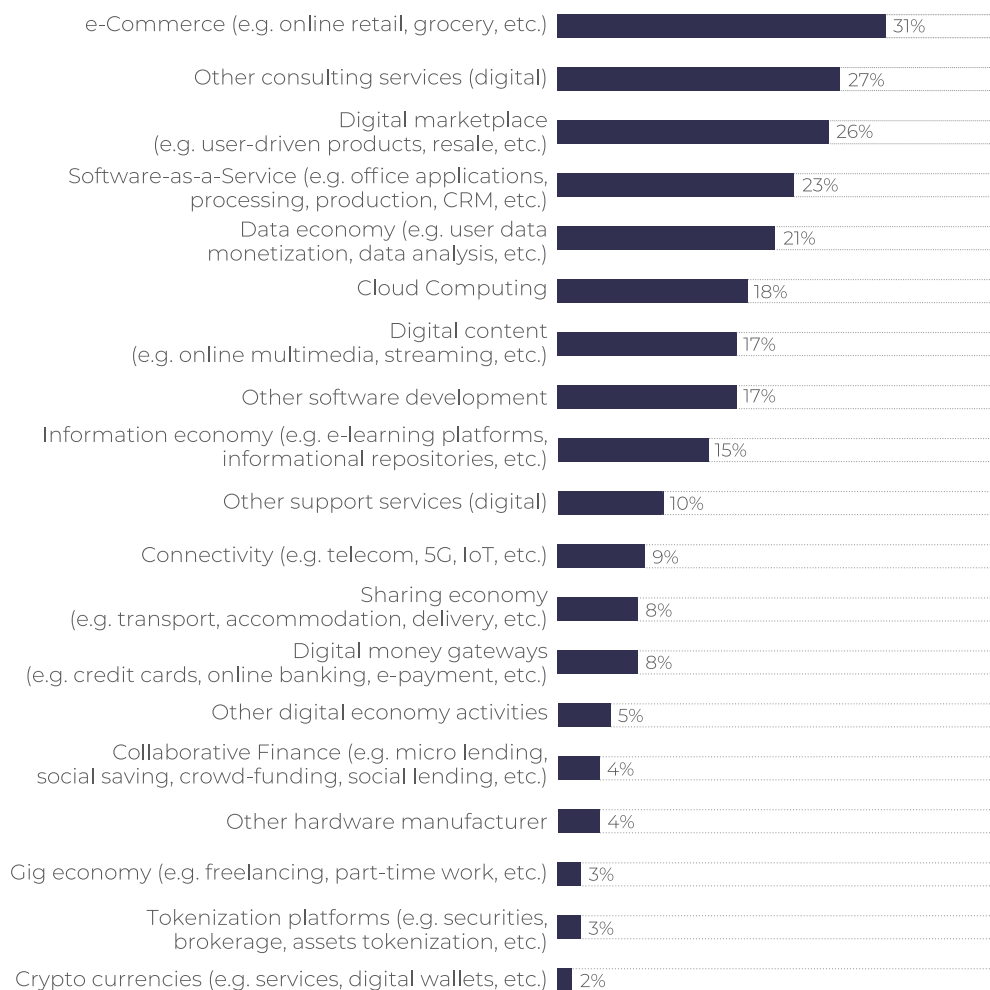


Figure 50. Representative business models among digital economy respondents.

4 The full text for this question was as follows: In this survey, “Digital Economy” organizations are those whose activities are reliant on, or significantly enhanced by the use of digital technologies, digital infrastructure, digital services and data. Based on this description, would you say that your entity/company is a “digital economy” entity?

Digital products and services

20% of the companies that reported being a digital economy company, delivered less than 25% of their products and services digitally, compared to 54% of non-digital economy companies. 22% of digital economy companies delivered more than 75% of their products or services online and 27% delivered all of their products or services online.

Among digital economy companies, 42% reported high adoption of digital tools by their customer base, and 46% reported moderate adoption.

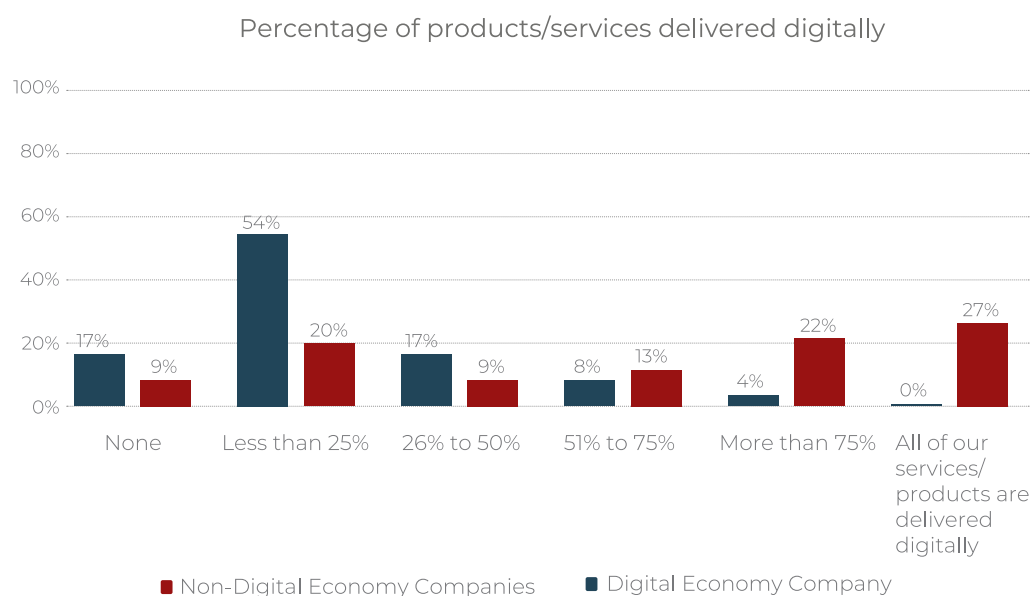


Figure 51. Percentage of products or services delivered digitally among private sector entities

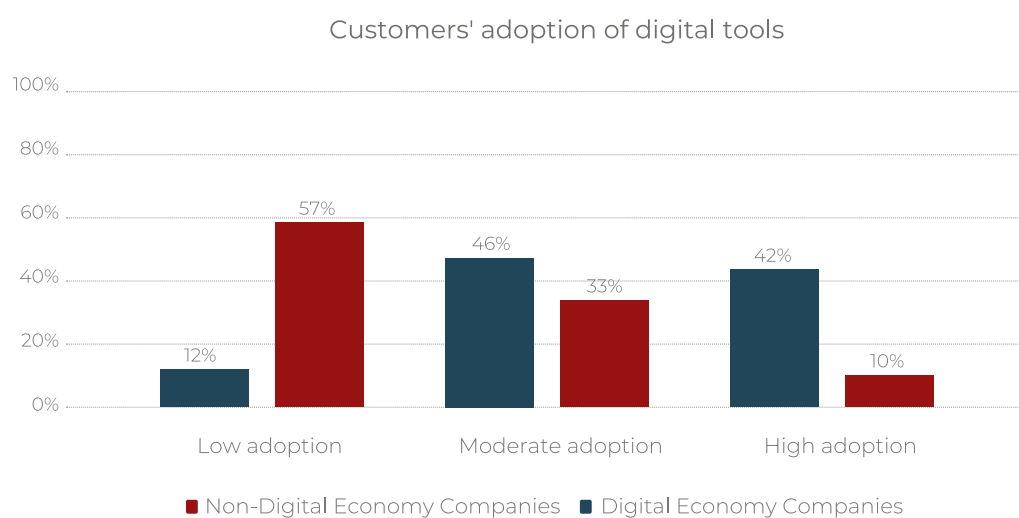


Figure 52. Customer adoption of digital tools among responding private sector companies

AI maturity among surveyed companies

Based on AI Singapore’s AI maturity model (Singapore AI Readiness Index) which categorizes companies into four tiers: AI Unaware, AI Aware, AI Ready and AI Competent (see figure 4.), 45% of our respondents qualified as AI Unaware, 9% were AI aware, 7% were AI ready and 23% were AI Competent (17% chose not to indicate).

	AI Unaware	AI Aware	AI ready	AI Competent
Interpretation	<ul style="list-style-type: none"> • Organisation might hear about AI, but is unaware of AI applications 	Organisation is aware of AI applications and could identify potential use cases	<ul style="list-style-type: none"> • Organisation has the capabilities to integrate pre-trained AI models into products or business processes 	<ul style="list-style-type: none"> • Organisation has the capabilities to develop customised AI models and solutions for specific business needs
Key characteristics	<ul style="list-style-type: none"> • Wait for vendors to convince with use cases and business value of AI • Consume ready-made AI solutions 	<ul style="list-style-type: none"> • Seek AI solutions to address business needs • Identified potential use cases for AI applications • Consume ready-made AI solutions 	<ul style="list-style-type: none"> • Explored viability of commercially available pre-trained AI models for business needs 	<ul style="list-style-type: none"> • Developed product development roadmap for AI implementation
Focus	<ul style="list-style-type: none"> • Increasing AI literacy of organisation 	<ul style="list-style-type: none"> • Getting organization to adopt AI solution from ISV and COTS 	<ul style="list-style-type: none"> • Helping organization to accelerate their AI adoption 	<ul style="list-style-type: none"> • Deepening organisational AI capabilities
AI Singapore's Programmes	AI For Everyone			
	AI Clinics			
	AI Discovery			
	AI For Industry + AI Certification			
	AI For Everyone			
	AI Bricks			
	AI Advisory Projects (<3 months)			
	100Experiments (with AI and Data Apprenticeship Programme)			
				AIAPX

Table 1. . AI Singapore’s AI maturity model.

AI Unaware	AI Aware	AI Ready	AI Competent
52	10	8	26
45%	9%	7%	23%

Table 2. AI maturity among responding private sector companies

With this largely representative snapshot of digital economy companies in Dubai, the findings highlight that almost half (45%) of companies operating within the digital economy realm in Dubai consider themselves “AI Unaware”, with only 9% viewing themselves as aware of AI as companies. On the positive side, 23% of companies surveyed considered themselves AI-competent, indicating high levels of maturity in AI applications and development. It is important to highlight

that the sample of companies targeted in the survey had a large representation of companies operating within different AI domains.

To leverage the potential of AI within the digital economy, the upcoming challenge for policymakers is to develop roadmaps to shift “AI Unaware” companies (almost half of digital economy companies) to an “AI ready” status at least.

PRIVATE SECTOR SURVEY RESULTS

Digitization

/68

Digital readiness activities

/69

Adoption of advanced technologies



RESULTS SUMMARY

Digital readiness refers to the amount of preparation of an organization's personnel to migrate into digitized processes facilitated by software and technology. A digital and technological transformation is more than simply an organization's investment in IT assets; it comprises three compo-

nents: culture, process, and technology.

There was a diversity in digitization efforts across private sector entities in Dubai. Digital economy companies reported investing more effort and resources than non digital economy companies.

21%

Spent more than 20% of their budgets on digitization

54%

Had a digital transformation strategy in place

37%

Had a digital transformation team in place

39%

Already
implemented
cloud computing

48%

Revised their data
privacy policies in
the past year

27%

Conducted a
digital readiness
assessment in the
past year

DIGITAL TRANSFORMATION READINESS

On average, less than 75% of companies who responded to this survey spent more than 15% of their budgets on digital transformation initiatives. 35% spent under 35% of their budgets on digital transformation and 21% spent more than 20% on such initiatives. These numbers change drastically when considering a sample set of only non-digital economy companies, with none spending more than 20% on digital transformation and 56% spending less than 5% of their budgets on the same.

37% of responding entities had a digital transformation team or unit, and 54% reported having a digital transformation strategy. Comparatively, 18% of Non-digital economy companies reported having a digital transformation team or unit and 36% reported having a digital transformation strategy in place.

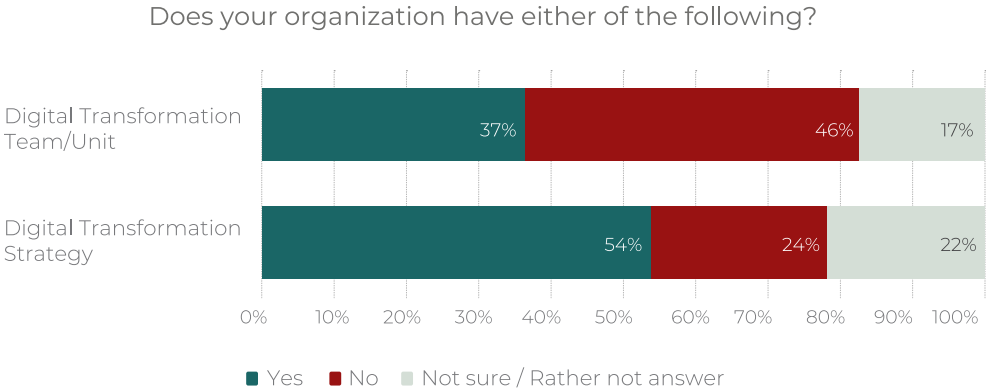


Figure 53. Digital transformation governance among responding private sector entities ⁴.

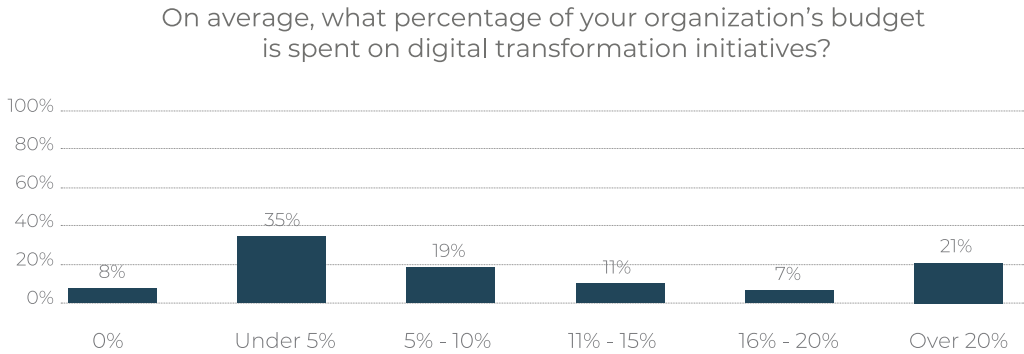


Figure 54. Digital transformation spending among responding private sector entities (N=75) ⁵.

4. Unless otherwise indicated, the number of responses recorded for each chart is 115

5. Where questions were optional and fewer than 115 companies responded., this will be indicated with an N

In terms of digital transformation activities, 40% of responding companies had already, within the past year, revised their data privacy policies, and reviewed third party data sharing and privacy agreements. Only 28% had reviewed data ethics policies; 27% had assessed employee

digital capabilities, and 37% had provided training to their employees on digital skills. Less than 25% performed data mapping exercises or conducted a readiness assessment.

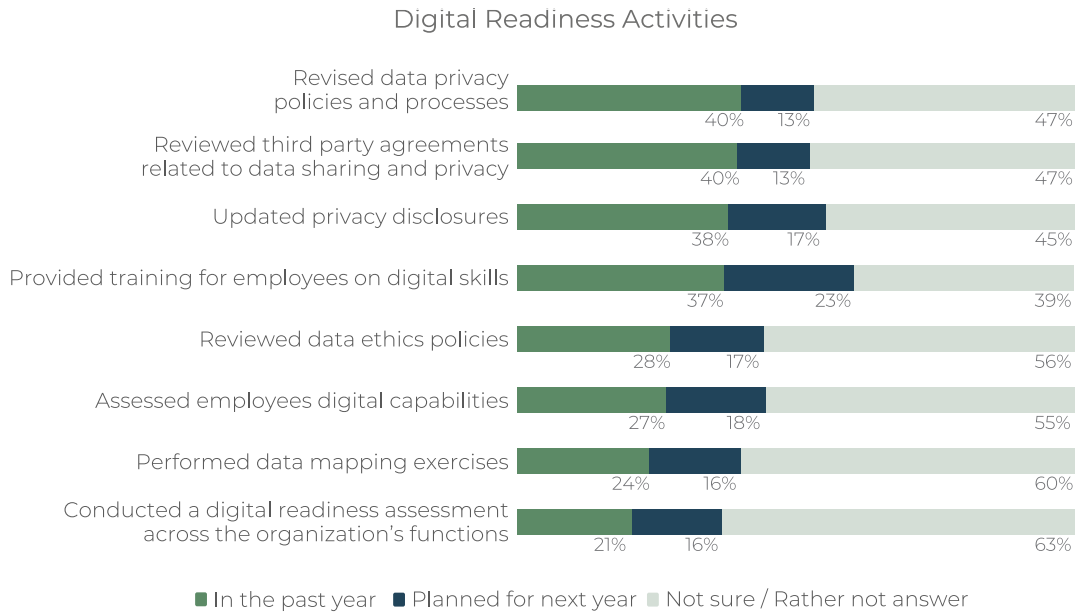


Figure 55. Digital readiness among responding companies (N=96).

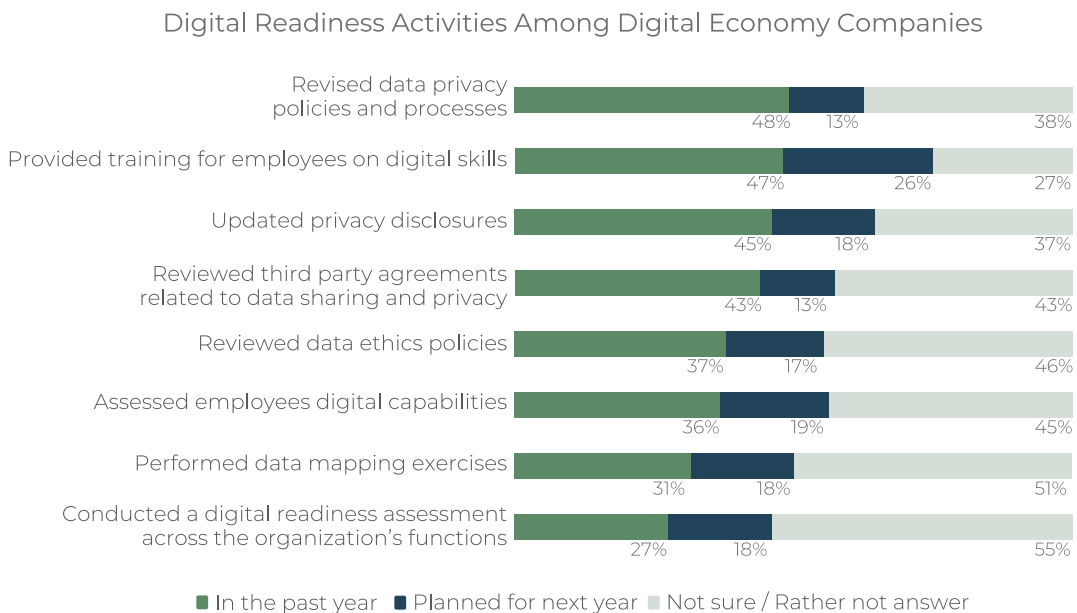


Figure 56. Impact of remote work policy implementation of Dubai Government entities (N=64)

Adoption of advanced technologies

The most adopted advanced technology among responding companies was cloud computing with 39% of companies reporting that they have fully adopted cloud computing within their organizations and another 27% starting to deploy it. Even amongst non-digital economy companies, cloud computing was widely adopted with 59% already having adopted it and 36% considering adopting it. Advanced data analytics was also widely adopted with 55% of respondents having already deployed them. This number was considerably lower amongst non-digital economy companies,

with only 22% having already deployed advanced data analytics technology.

3D printing, crypto protocols and extended reality tech (AR/VR) technologies were the least adopted amongst our respondents. As considerable movement is taking place around the potential of the Metaverse within the economy, the low adoption of AR/VR and crypto protocols may indicate low readiness to adopt metaverse applications by digital economy companies in Dubai.

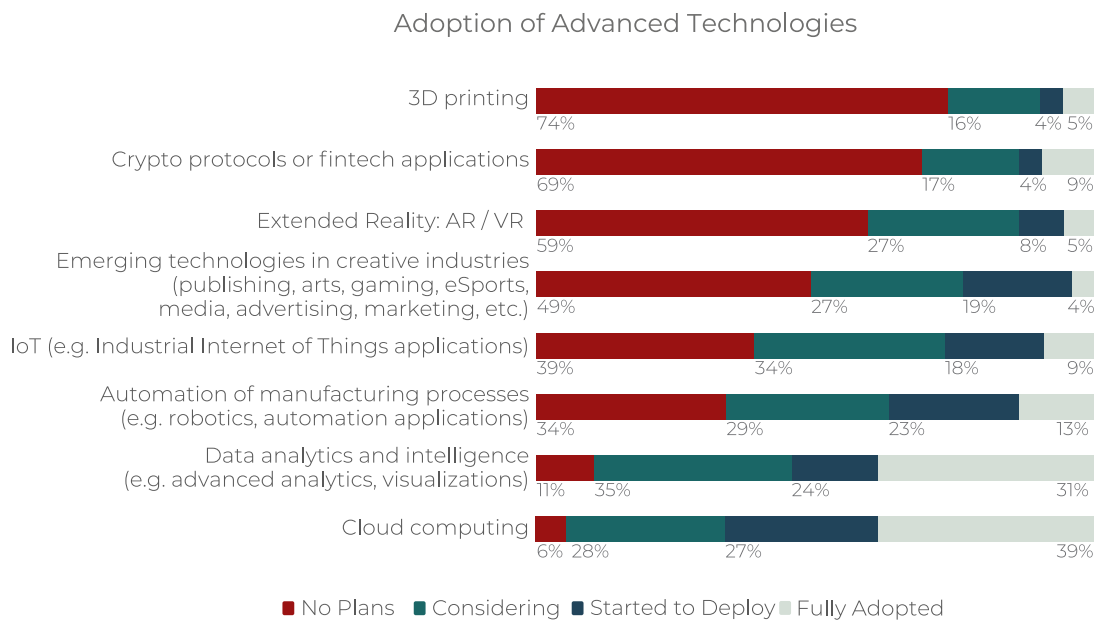


Figure 57. Adoption of advanced technologies among responding companies (N=88).

PRIVATE SECTOR SURVEY RESULTS

Data Collection & Usage

/73

Data governance

/74

Data collection and storage

/77

Data sharing



RESULTS SUMMARY

According to our survey, a majority of private sector entities in Dubai collected some kind of data in the course of their business. A small majority had some kind of data privacy policy in place.

In general, use of big data was not prevalent amongst companies that did not develop AI.

Most companies used data for forecasting, decision-making and marketing purposes.

63%

Have a data privacy policy in place

37%

Had an ethical data use policy in place

15%

Use government
big data sources

53%

Use data for
strategic decision-
making

50%

Collect customer
data

23%

Have a specialized
data team or unit

39%

Share
consolidated data
with partners

USE & GOVERNANCE OF DATA

Overall, 63% of responding companies reported having data privacy policies in place and 44% reported having a data governance strategy. A relatively smaller percentage of companies (23%) indicated having a specialized data team or unit. 37% indicated having an ethical data policy in place. Adoption of data privacy policies is equally high amongst non-digital economy companies, with 61% indicating that they have one. However, only 25% of non-digital economy

companies reported having a data governance strategy and only 21% had an ethical data use policy. Data privacy and ethical data use policy adoption was highest amongst companies who reported that they developed AI technology, with 77% and 64% adopting data privacy and ethical data use policies respectively. These differences reflect the degree of use and collection of data amongst digital economy companies as compared to non-digital economy companies.

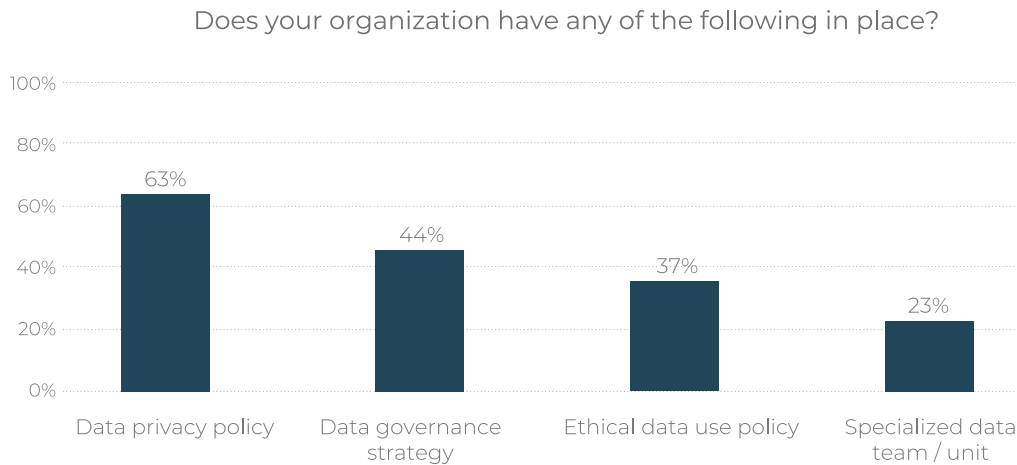


Figure 58. Data governance among responding private sector companies.

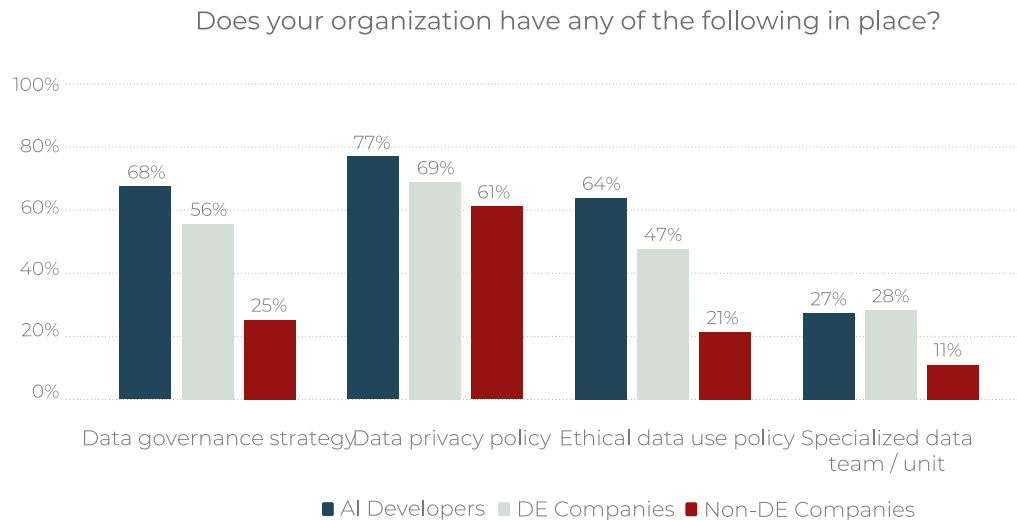


Figure 59. Data governance among responding companies, compared by DE criteria.

Data collection and storage

Overall, 50% of responding companies reported collecting personal customer data, while 33% collected engagement data and 23% collected behavioral and attitudinal data. Comparatively, 61% of non-digital economy

companies reported collecting customer data and 32% said they collected engagement data. 50% of AI developers, on the other hand, reported collecting engagement data and 45% of them collected behavioral data.

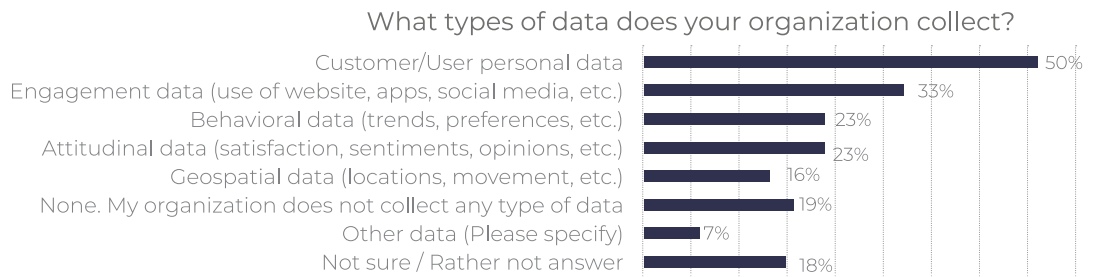


Figure 60. Types of data collected by responding companies.

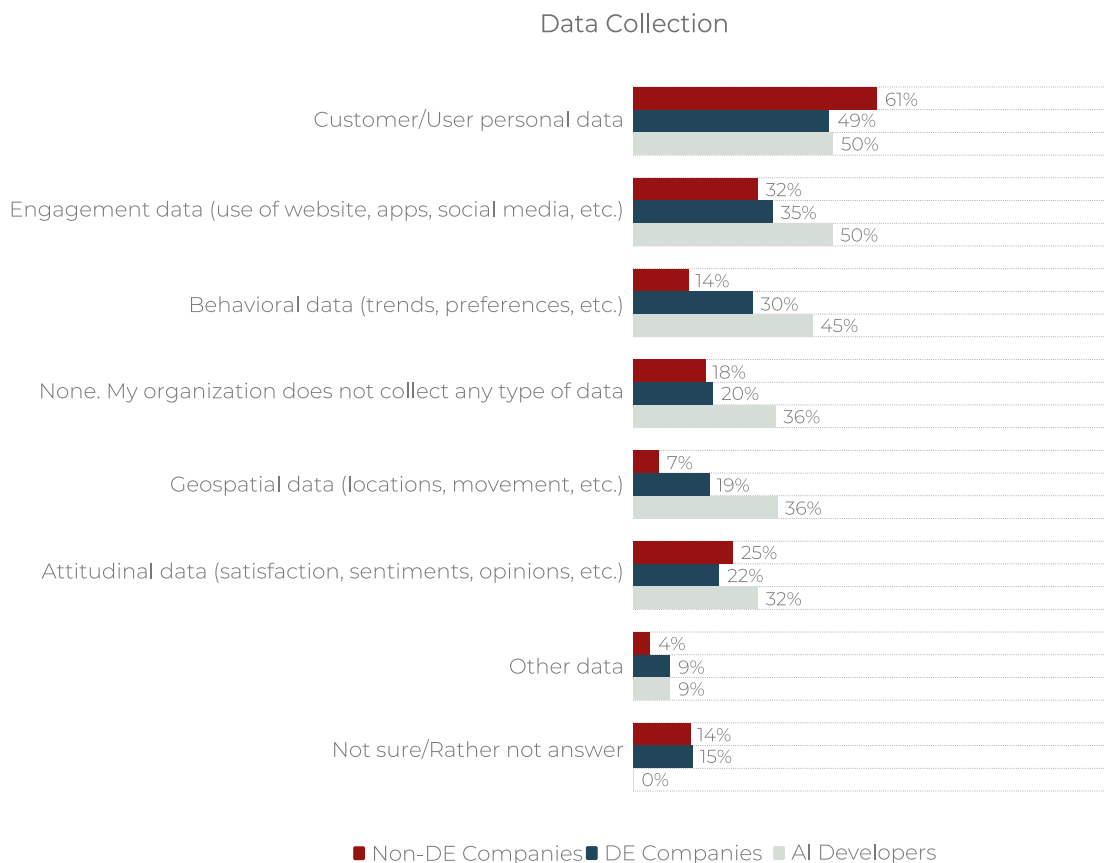


Figure 61. Types of data collected by responding companies, compared by digital economy criteria

Big data utilization was not common amongst the companies who were surveyed for this report. 17% reported utilizing big data scraped from online sources, and 15% reported utilizing open government data sources. 13% said that they used mass data from users, individuals or companies, and only 10% reported using public IoT data.

These percentages, though still low, are much higher when considering only companies who reported developing AI technologies. Amongst those AI developers, 32% reported utilizing data that is scraped from online sources, located in open government sources and or collected from Public IoT sources.

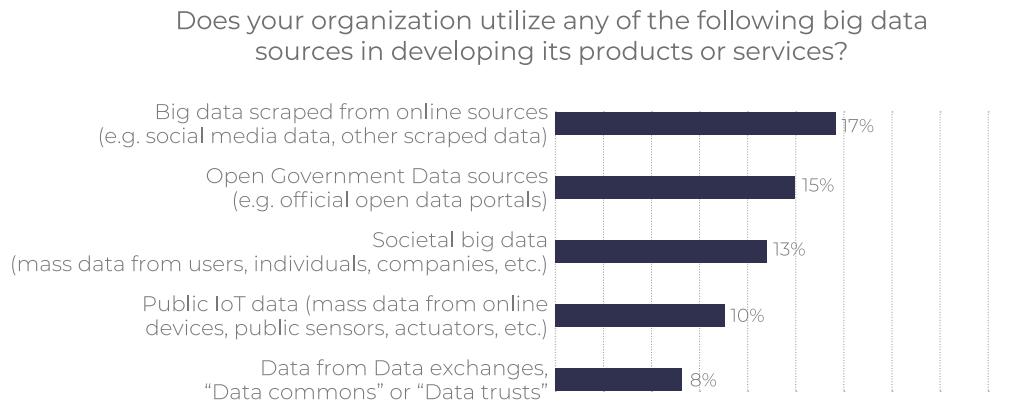


Figure 62. Utilization of big data sources among responding companies.

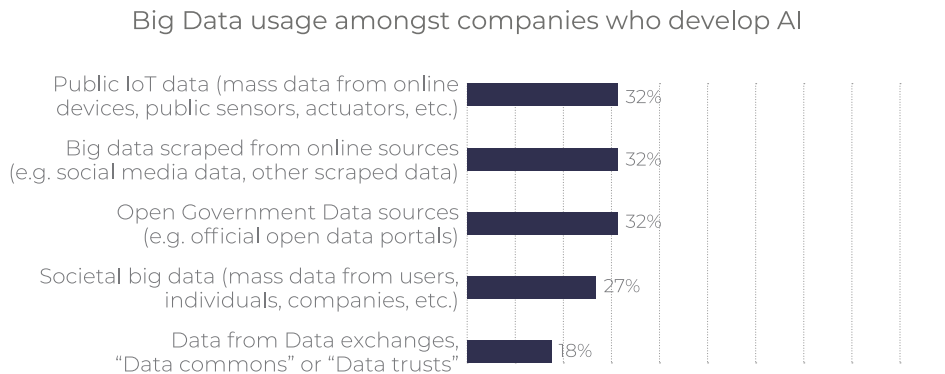


Figure 63.. Big data usage amongst companies that develop AI (N= 22)

Data collected by responding Dubai private databases whether with meta data (28%) or sector companies is largely stored in central without (44%).

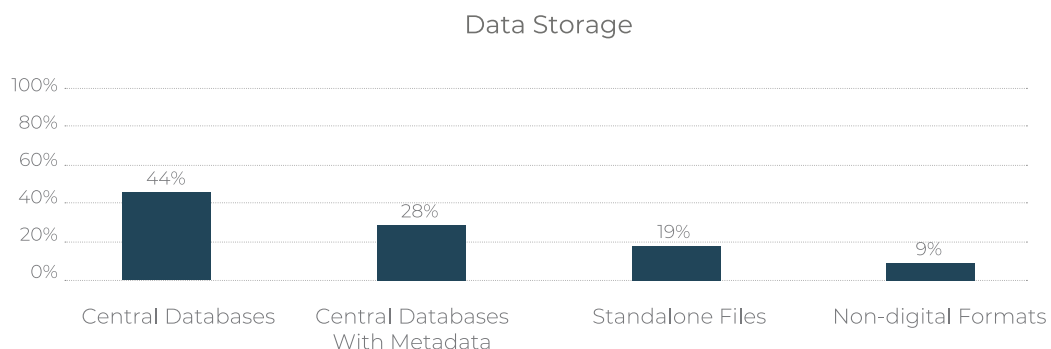


Figure 64. Data storage among responding companies.

Data utilization and sharing

The primary use of data amongst responding companies was for forecasting (54%) and decision making (54%), as well as product/service development (51%) and marketing (51%). 68% of AI developers reported utilizing data for service or product development, compared to only 29%

of non-digital economy companies. We see a similar trend with data for product/service personalization where 32% of non-digital economy companies reported using data for that purpose, compared to 51% of digital economy companies and 55% of companies who develop AI.

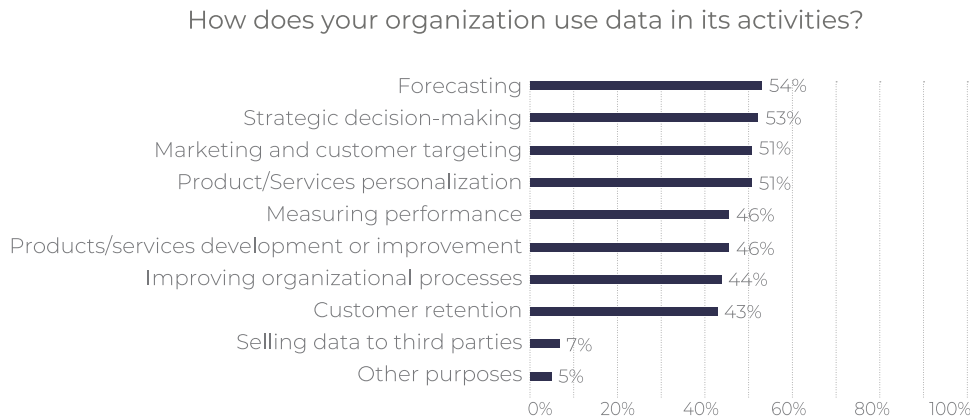


Figure 65. Data utilization amongst responding companies.

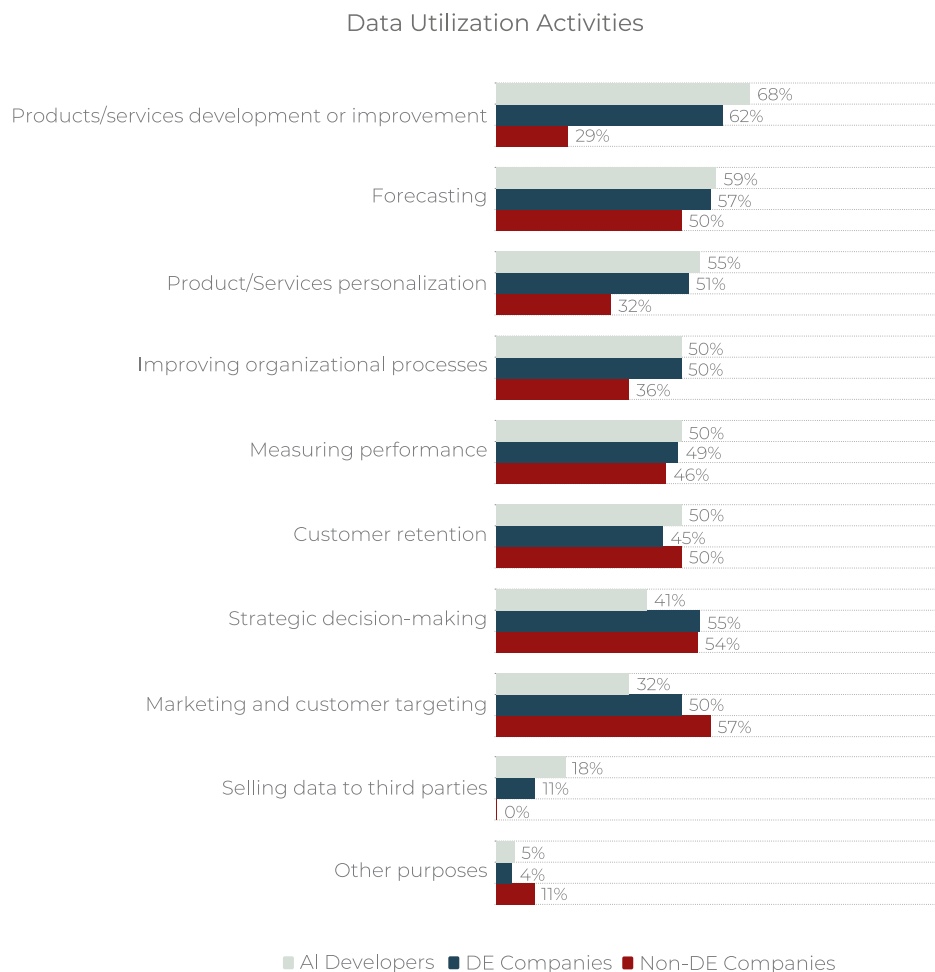


Figure 66. Data utilization amongst responding companies, compared by DE criteria.

By and large, responding companies do not share data except with partners. 39% of companies reported sharing data with partners while less than 15% reported sharing data with vendors or the public.

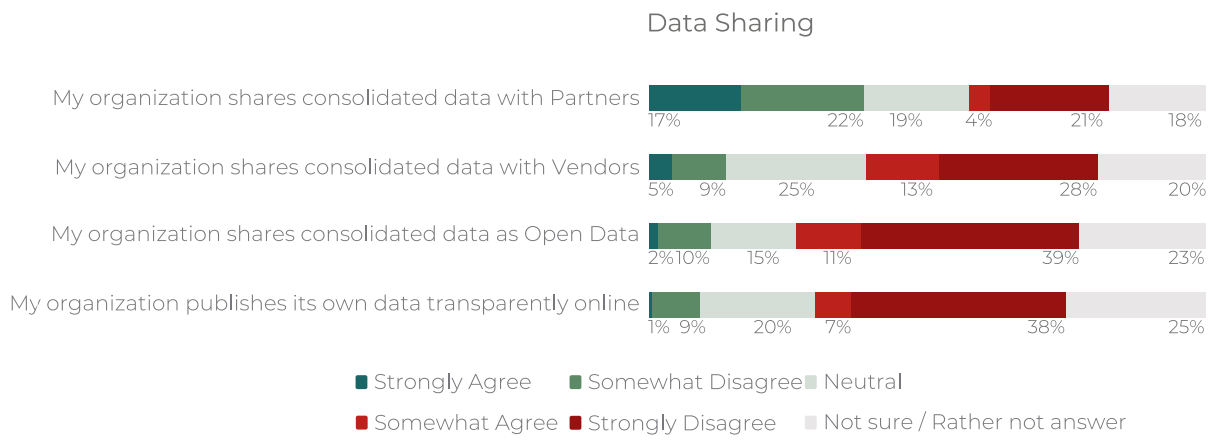


Figure 67. Data sharing among responding companies.

PRIVATE SECTOR SURVEY RESULTS

Artificial Intelligence Adoption

/82

AI adoption and implementation

/84

AI adoption by business function

/88

Barriers to AI adoption



RESULTS SUMMARY

AI adoption was strong among responding Dubai private sector organizations. Attitudes toward AI adoption were favorable, showing a conviction that AI would help businesses become more competitive, efficient, and productive. However, most respondents disagreed that AI is

essential for organizational success.

The most benefit of implementing AI technology were reported within product development functions.

30%

Use AI but do not develop it

25%

Have an AI strategy in place

24%

Use and develop AI applications or technology

22%

Adopted AI
within product
development
functions

23%

Adopted
machine learning
applications

37%

Reported lack of AI
talent as at least a
major barrier to AI
adoption

19%

Have AI ethics
guidelines in place

AI TECHNOLOGY ADOPTION

Overall, AI Literacy amongst employees in responding companies is limited to a specialized few. 41% of companies reported that less than 25% of their employees are AI literate, while 19% reported that more than 75% of their employees are AI literate. Considering the sample of companies who develop AI, this number becomes

significantly higher. 55% of AI developers reported that more than 75% of their employees are AI literate, and 23% reported that between 51% and 75% of their employees are AI literate. This is reflective of the nature of the work that these companies do.

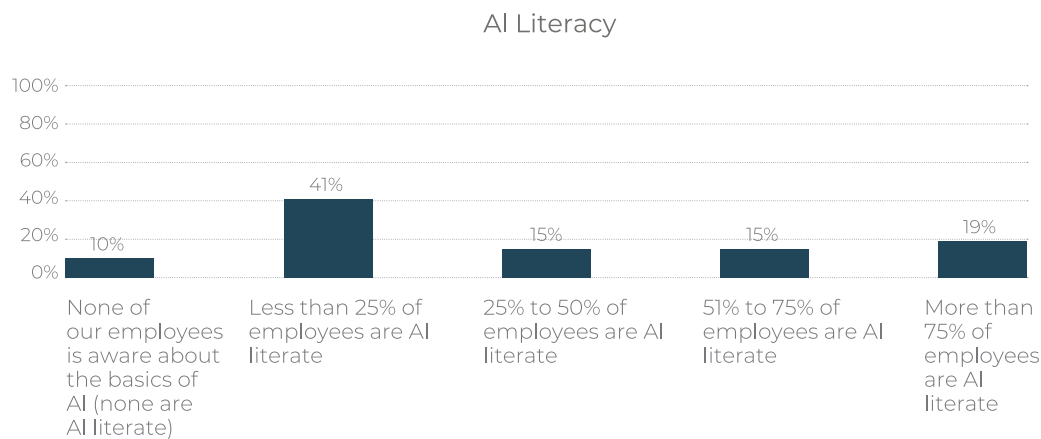


Figure 68. AI literacy among responding companies.

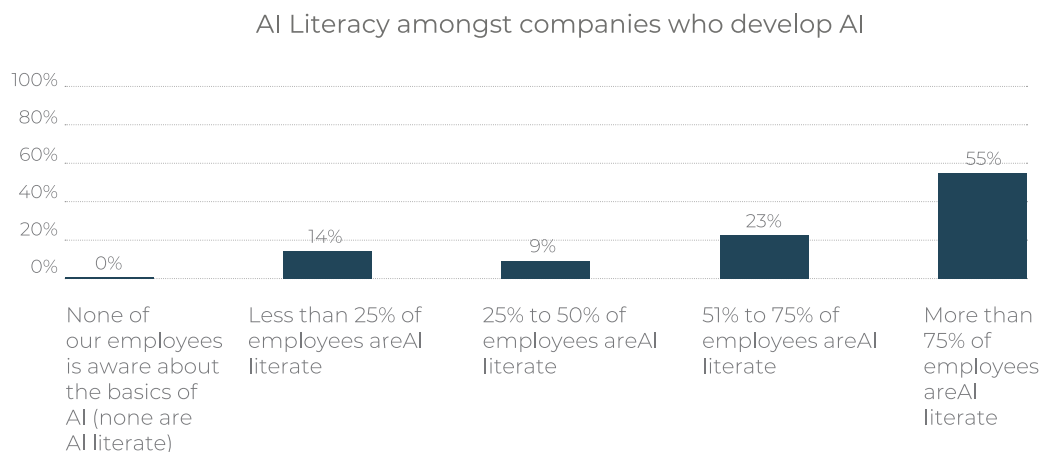


Figure 69. AI literacy among responding companies who develop AI (N=22).

AI adoption amongst responding companies was high, with 54% of all companies reporting using AI and 24% reporting developing AI. 46% of the responding entities neither used or developed AI.

In terms of future plans to implement AI technology, 12% of respondents said that they had solid plans to apply AI technologies within the next 12 months, 10% said that they are

already experimenting with AI technology, 2% AI application and another 2% said that already said they have already developed a prototype have one or more active AI applications.

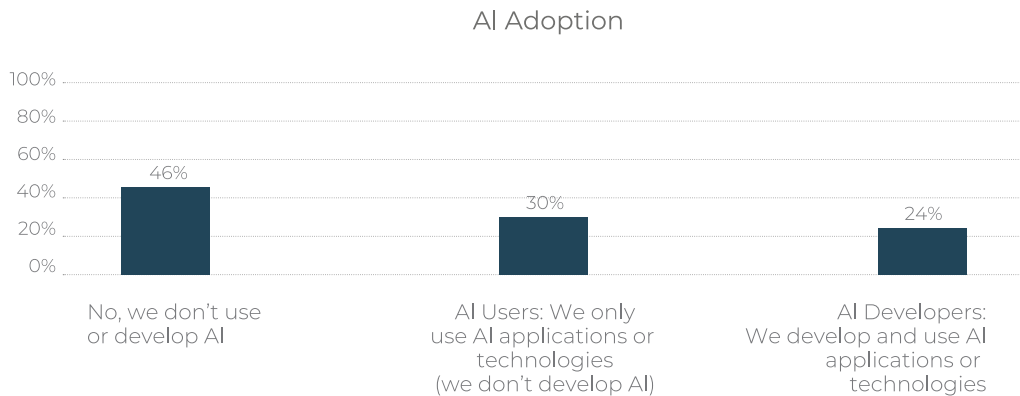


Figure 70. AI adoption among responding companies.

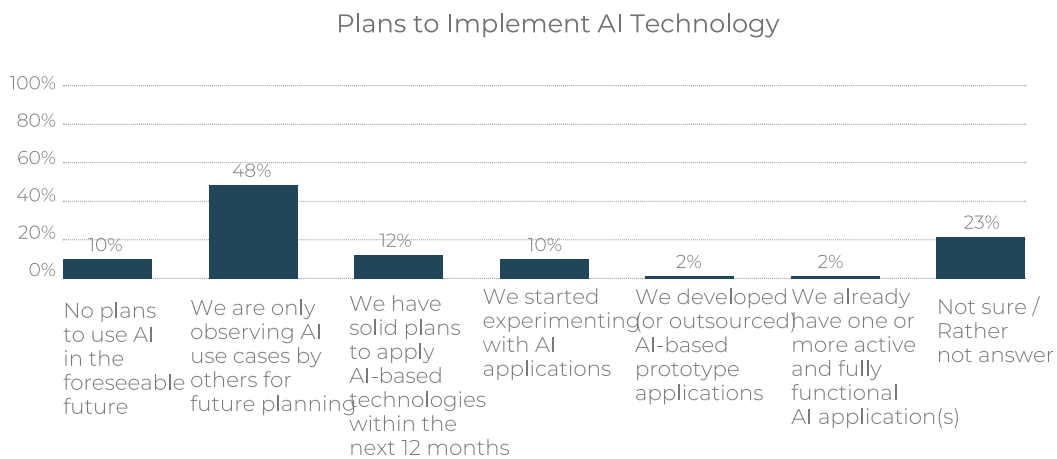


Figure 71. Plans to adopt AI among responding companies.

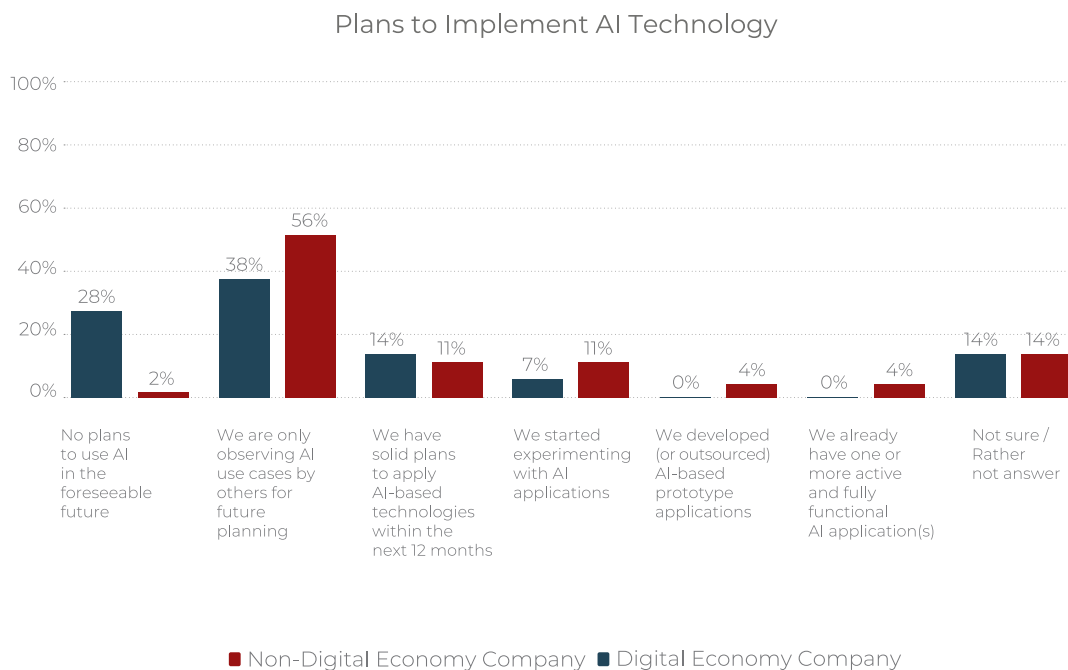


Figure 72. Plans to adopt AI among responding companies compared by DE criteria

Overall, 25% of responding companies said that they had an AI strategy in place, while 20% had an AI team or unit within their organization. 19% of responding companies reported that they had a AI ethics guideline or policy in place. Comparatively, 77% of companies who develop

AI have an AI strategy, 68% have a dedicated AI team or unit, and 50% have an AI ethics policy in place. No non-digital economy company reported having either an AI strategy or AI ethics guidelines.

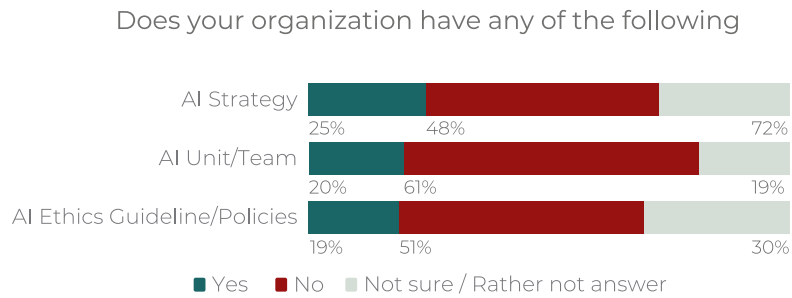


Figure 73. Governance of AI among responding companies.

Overall, attitudes toward AI adoption were positive, reflecting a belief that AI adoption will make companies more competitive, efficient, and

productive. However, a large majority (82%) of respondents did not agree that AI is critical for company growth.

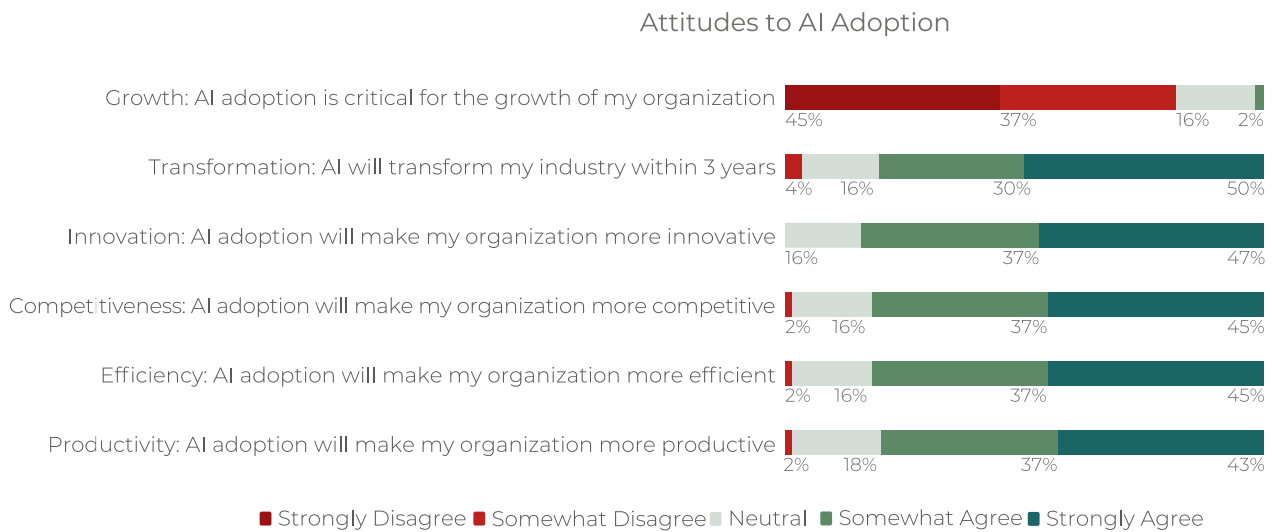


Figure 74. Attitudes toward AI adoption among responding companies (N=49)

AI adoption

Of the 54% companies that reported either using or developing AI technology, 22% implemented it within product development and 21% implemented it within service development operations. The percentage of implementation drops to 14% within risk assessment functions and 13% within strategic planning functions. Similar trends can be seen amongst DE companies, 30%

said that they adopted AI within product development functions and 26% said they use it in service development operations.

In comparison, a large percentage of AI developers utilized AI in product development (82%) and service development (64%).

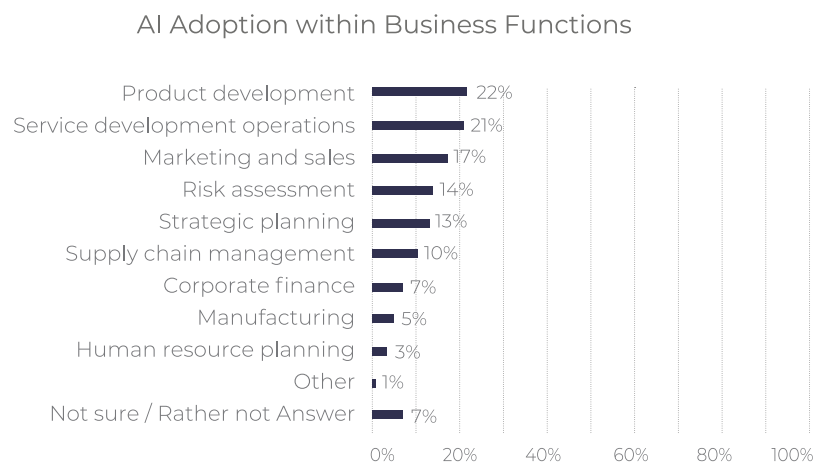


Figure 75. AI adoption by business function among responding companies.

AI Adoption within business functions amongst DE companies

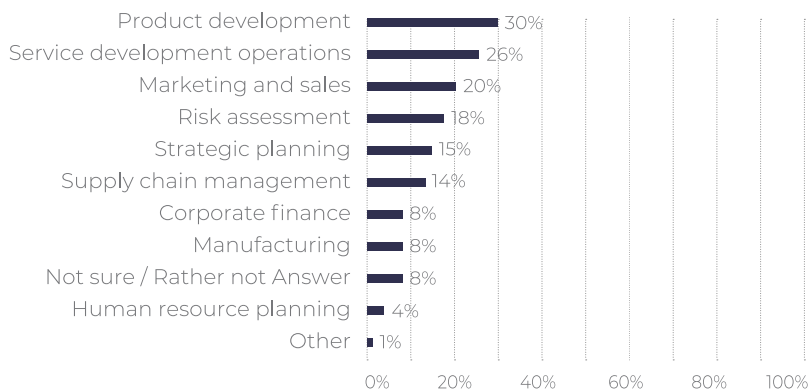


Figure 76. AI adoption by business function among responding companies.

Only a small number of respondents indicated a benefit to applying AI technologies within their business functions. Less than 20% of respondents reported a benefit to any one single business function. The functions that benefit most from AI Adoption are product development and

marketing/sales functions. In comparison, 64% of AI developers indicated receiving benefit within their product development function and 55% indicated that service development operations benefitted from AI adoption.

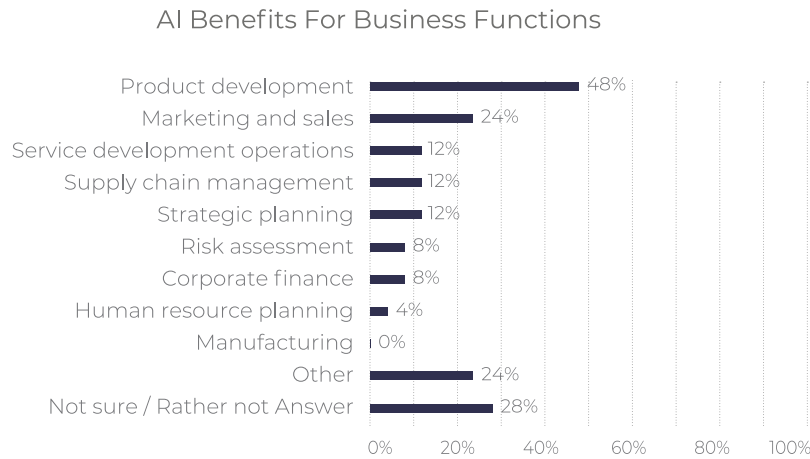


Figure 77. Reported benefits of AI adoption by business function among surveyed companies who are already implementing AI.

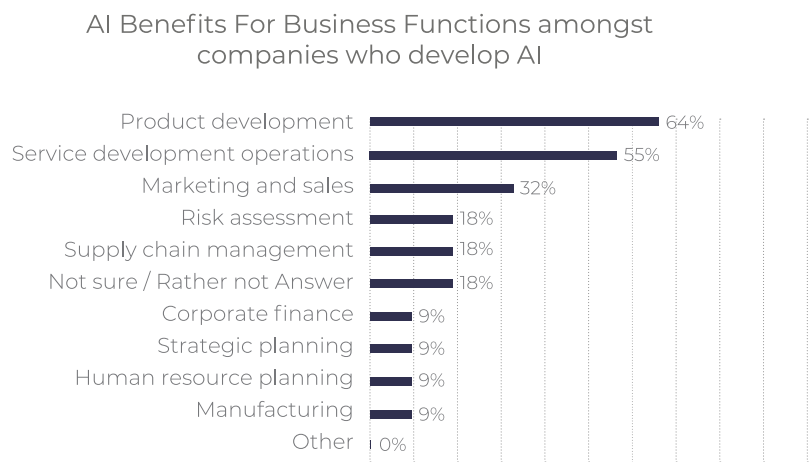


Figure 78. Reported benefits of AI adoption by business function among AI developers (N=22).

The most common application of AI within responding private sector companies was through machine learning (23%) and virtual agents (17%), followed by natural-language text understanding

(15%). In comparison, 77% of companies who develop AI have applied machine learning, 55% have applied natural language text understanding, and 50% have employed virtual agents.

AI Applications within the Organization

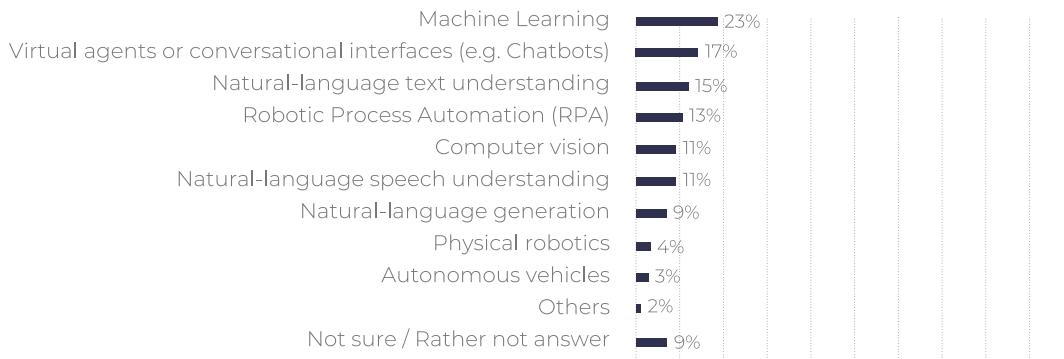


Figure 79. AI applications implemented within responding companies.

AI Applications within companies who develop AI

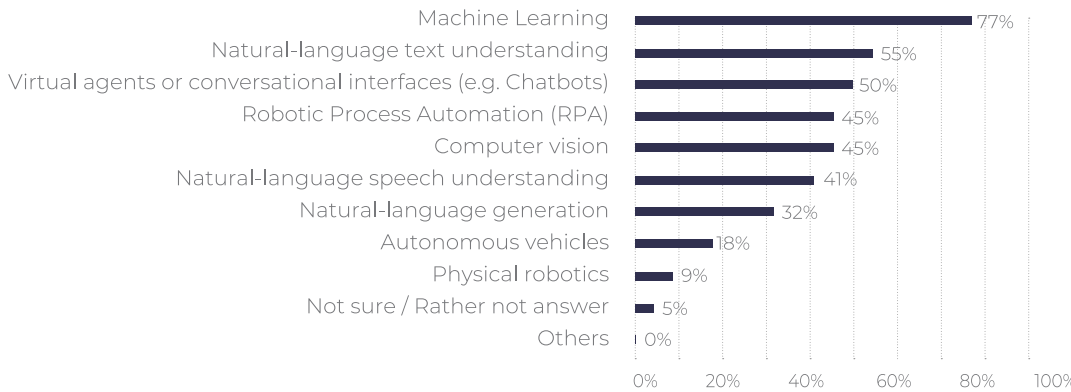


Figure 80. AI applications implemented within responding companies who develop AI (N=22)

In terms of AI capabilities (45 companies responded to this question), 30% of responding companies reported having well defined AI governance processes in place, and 42% said that they had clear AI ethics guidelines in place

regarding the use of data in AI solutions. 59% of companies reported having protocols in place to ensure data quality. 56% of companies reported Companies who develop AI were comparatively more ready than their counterparts. 47% of AI

AI Capabilities

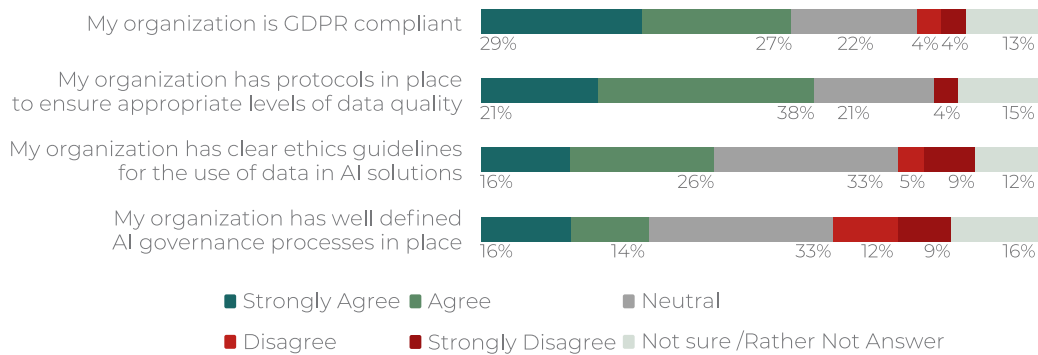


Figure 81. AI capabilities among responding companies.

developers reported having well defined AI governance processes in place, 58% had clear AI ethics guidelines in place, 85% had protocols in place

to ensure data quality, and 65% were GDPR compliant.

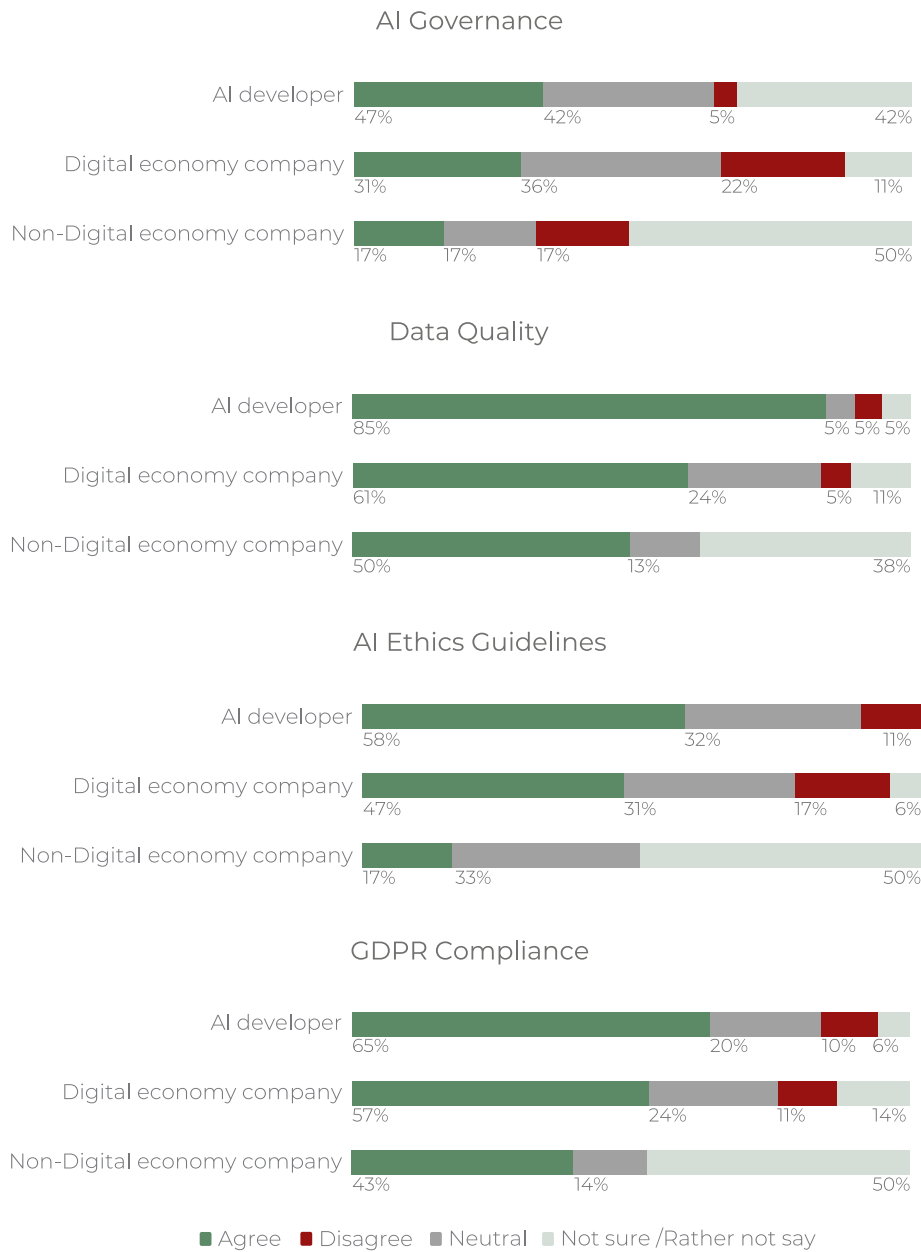


Figure 82. AI capabilities among responding companies, compared by DE criteria.

Barriers to AI adoption

The most restrictive barrier reported by private sector companies, as it relates to AI adoption, was the lack of AI related talent and skills amongst employees, with 37% of companies indicating that lack of talent was at least a major barrier. Data availability and data quality also emerge as major barriers with 26% reporting that data quality was at least a major barrier, and 28% reporting that

it was a moderate barrier. Only 10% indicated that data quality was not a barrier at all. 26% of respondents reported that data availability was at least a major barrier and another 22% reported that it was a moderate barrier. The AI regulatory environment was another important barrier with 30% of companies reporting it as at least a major barrier.

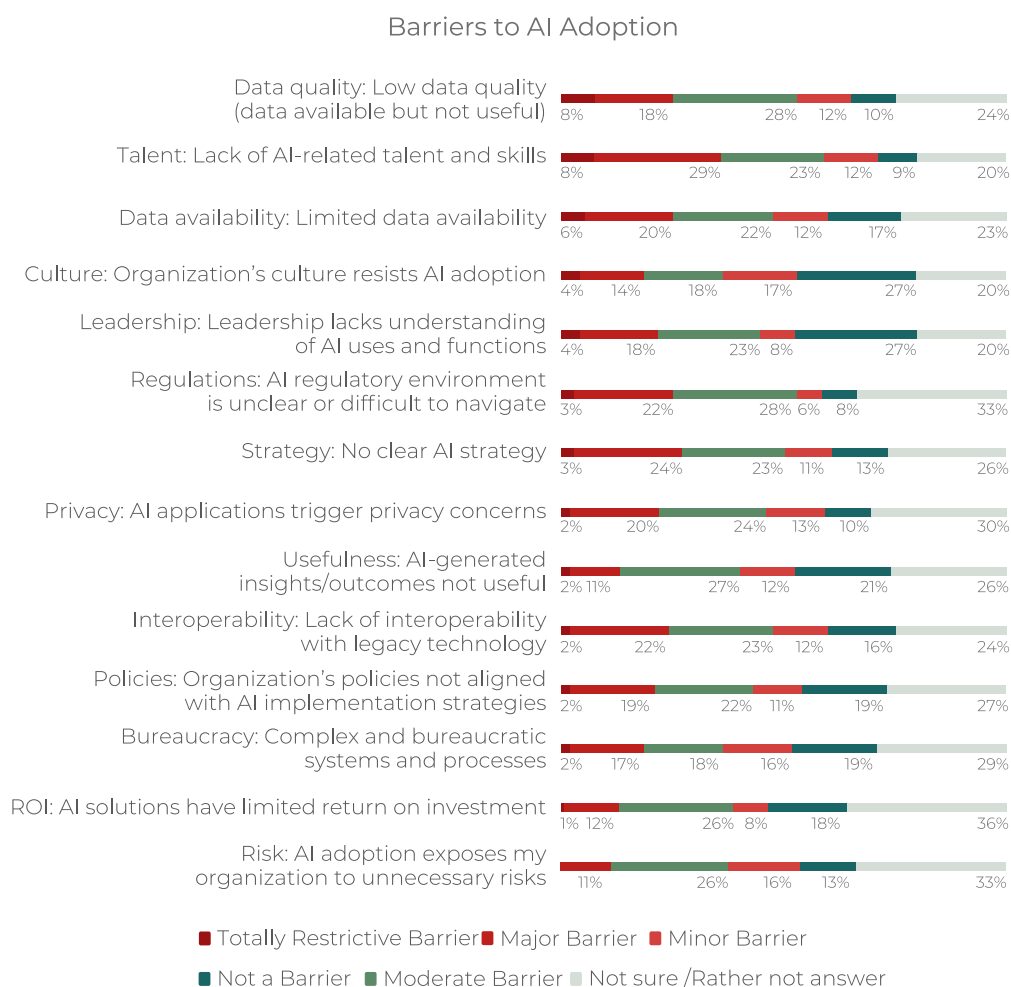


Figure 83. Barriers to AI adoption among responding companies, compared by DE criteria.

Lack of talent emerged as the most restrictive barrier to AI adoption for private sector companies. In order to address AI skill gaps, 50% of responding entities reported hiring talent

from outside the UAE to work remotely, 42% reported hiring consultancies and 40% retrained or upskilled existing staff. In comparison, 73% of AI developers reported hiring transnational talent

to work remotely, and 55% reported that they retrain or upskill existing staff.

Overall, when it comes to barriers to adoption, non-digital economy companies reported internal/organizational barriers like

misalignment of policies and strategy, leadership support, organizational culture and bureaucracy as more important barriers than reported by digital economy companies.

How does your organization address AI skill gaps?

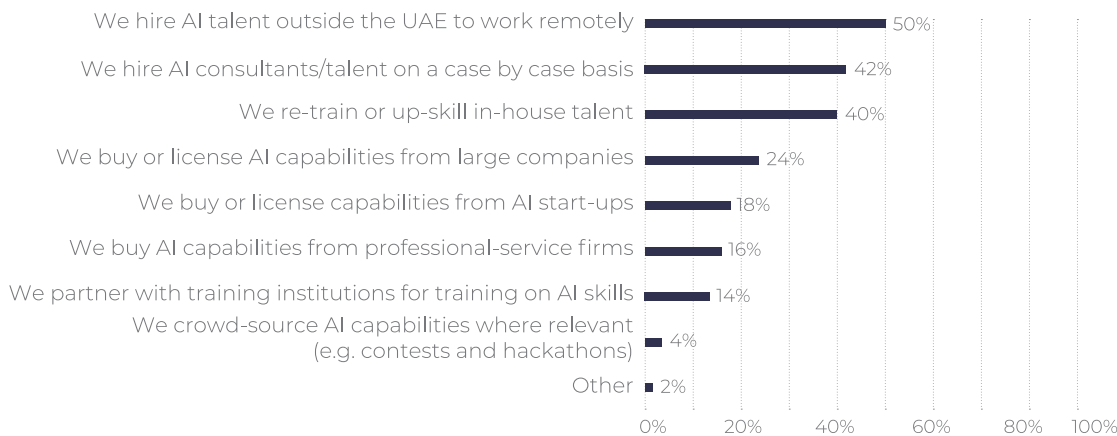


Figure 84. Initiatives to bridge AI skill gaps among responding companies.

Addressing AI Skill Gaps - AI Developers

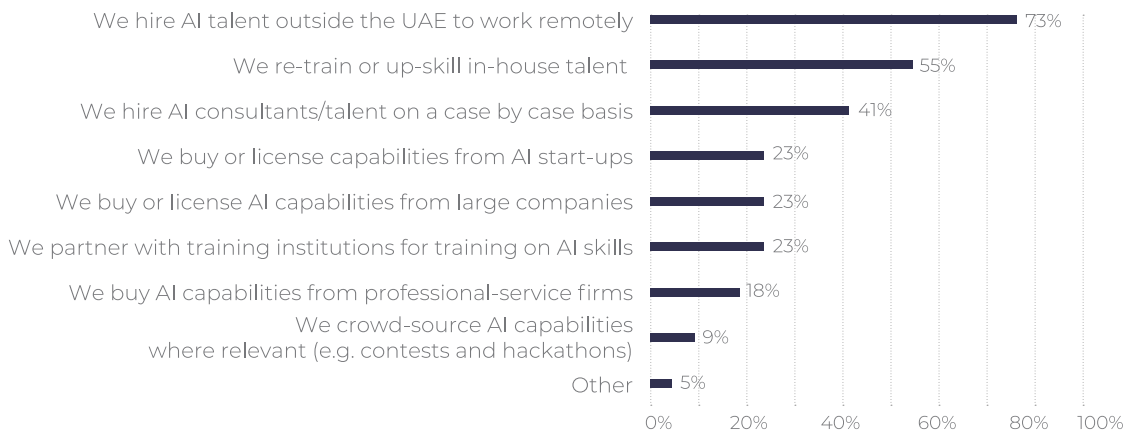


Figure 85. Initiatives to bridge AI skill gaps among responding companies who develop AI (N=22)

PRIVATE SECTOR SURVEY RESULTS

Blockchain Adoption

/93

Blockchain adoption

/94

Barriers to blockchain adoption



RESULTS SUMMARY

4%

Already applying
blockchain
technology

32%

Reported lack uncertainty
about regulations as at
least a major barrier to
blockchain adoption

30%

Reported data harmonization challenges as at least a major barrier to blockchain adoption

28%

Reported lack of industry standards as at least a major barrier to blockchain adoption

BLOCKCHAIN TECHNOLOGY ADOPTION

Overall, 4% of responding companies reported that they were already applying blockchain technology, with another 5% reporting that they plan on implementing blockchain technology within a year. 27% of companies were just observing blockchain technology for the time being. 40% said they had no plans to implement blockchain technology for the foreseeable future. 18% of companies who develop AI reported that they are already applying blockchain technology.

Blockchain adoption is low amongst private sector companies regardless of their internal readiness and digital capabilities.

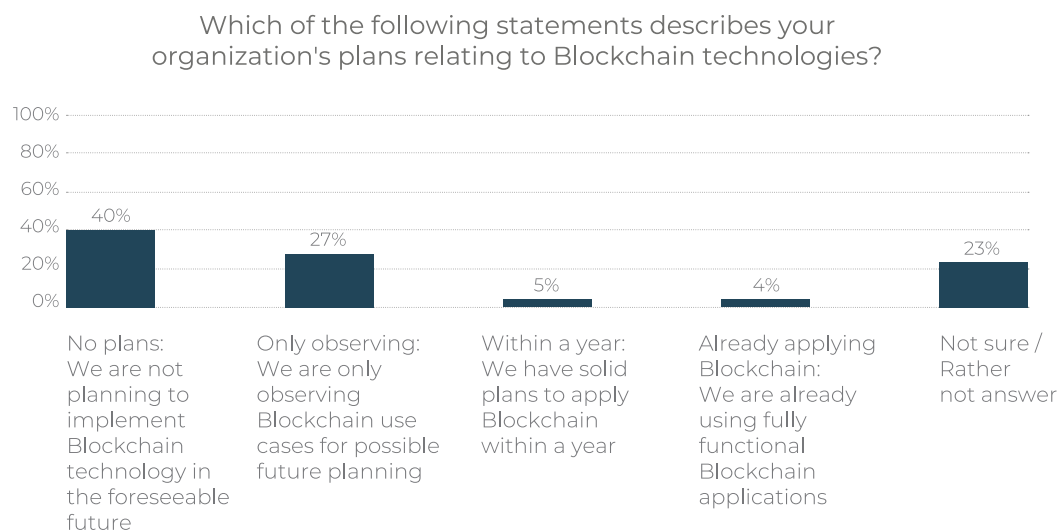


Figure 86. Plans to implement blockchain technology among responding companies.

Barrers to blockchain adoption

The most important barrier to blockchain adoption amongst responding private sector companies is the regulatory environment. 32% of responding companies indicated that uncertainty about regulations related to blockchain technology was at least a major barrier to blockchain

adoption. Lack of talent emerges once again as a restrictive barrier with 32% reporting it as at least a major barrier. Lack of awareness of what blockchain is and its potential, as well as a lack of strategy for how to implement it were also reported as important barriers.

Barriers to blockchain adoption

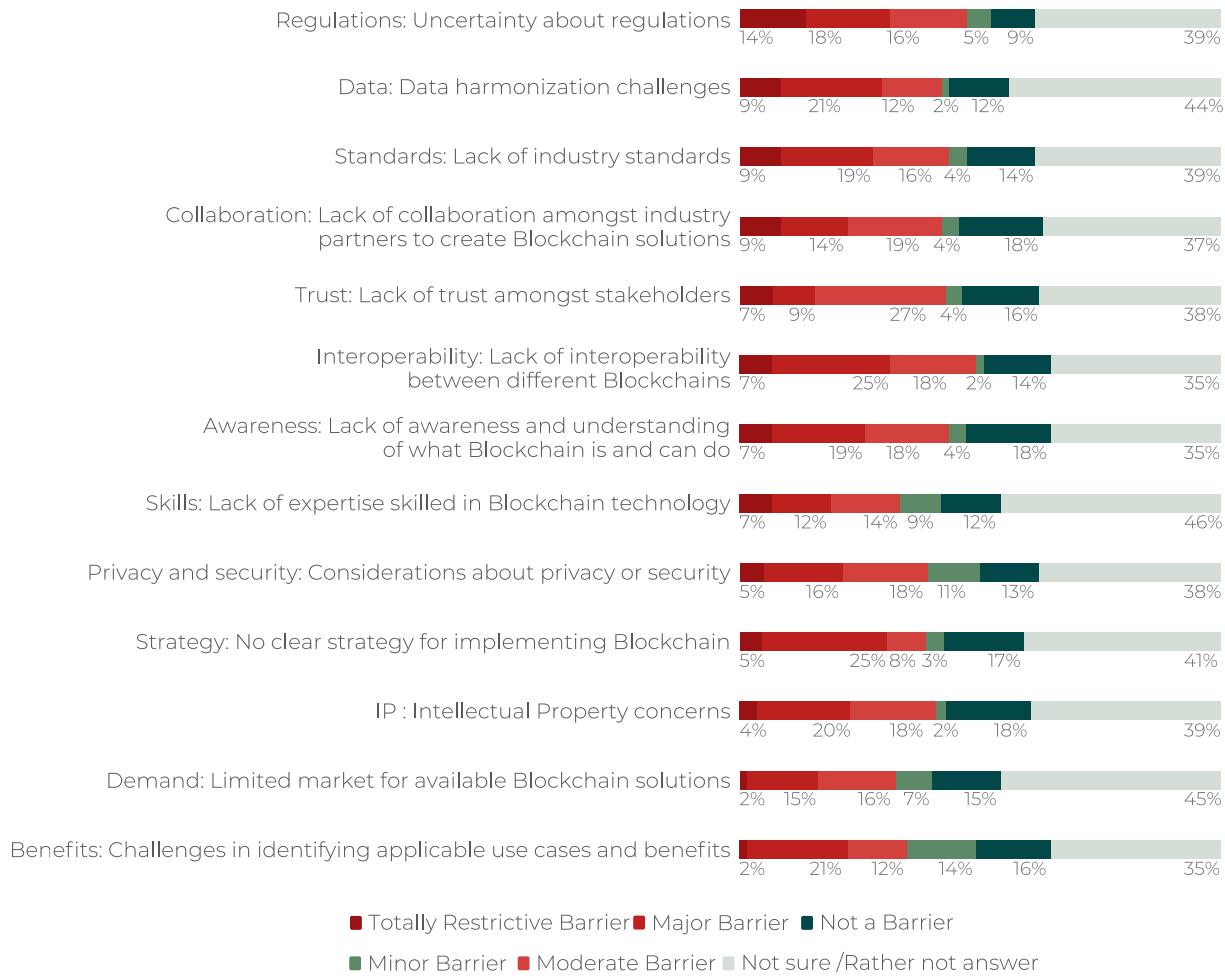


Figure 87. Barriers to blockchain adoption among responding companies.

PRIVATE SECTOR SURVEY RESULTS

Remote Work

/98

Trends in remote work

/101

Impact of remote work



RESULTS SUMMARY

In the summer of 2021, a large minority of Dubai private sector entities reported that they planned on applying some form of remote work policy indefinitely.

However, remote work trends seemed to be

declining. A small percentage of respondents reported that more than half of their staff worked remotely.

Companies who develop AI had a larger percentage of employees participating in remote work.

34%*

Reported that more than 50% of their employees working remotely

45%*

Reported having a remote work policy in place

32%*

Plan to keep applying remote work policies permanently

*These results are from the summer of 2021

62%

Reported that the lifting of VoIP restrictions had a positive impact on their business

51%

Reported IT infrastructure as the most important enabler of remote work

47%*

Reported that remote work had a positive impact on employee productivity

46%*

Reported that their remote workers are concentrated in support services functions

TRENDS IN REMOTE WORK

12% of responding private sector companies reported that 100% of their staff are working remotely. 16% reported that over 75% of their staff were remote workers. 40% of companies reported that less than 10% of their staff were working remotely.

In comparison, 36% of AI developers reported that more than 75% of their staff were (at the time of the survey) working remotely.

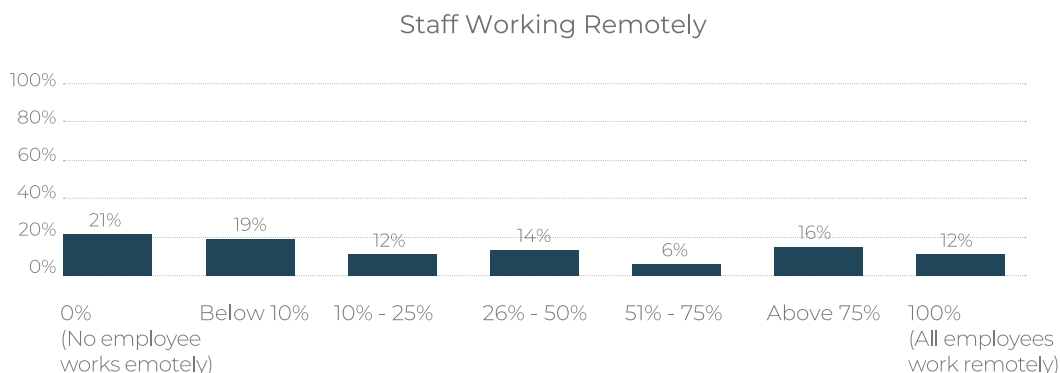


Figure 88. Percentage of staff working remotely in responding companies.

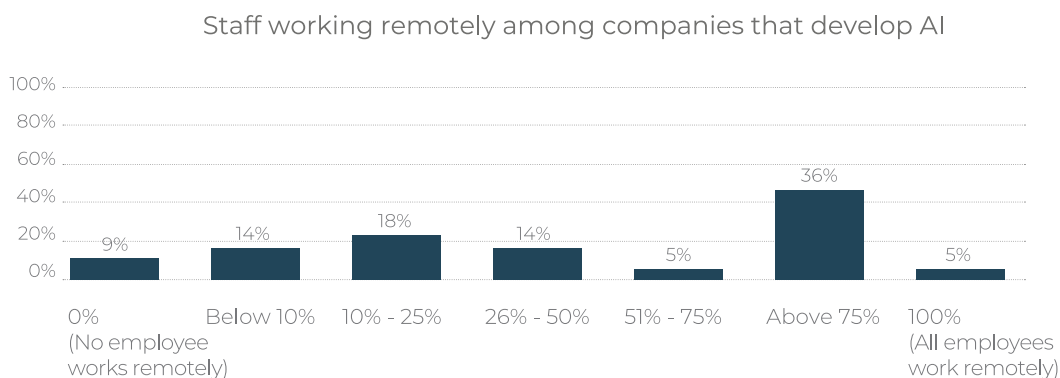


Figure 89. Percentage of staff working remotely in responding companies who develop AI.

In general, remote workers in responding private sector companies were concentrated in support services (46%) and marketing functions (30%). 30% of responding companies reported

that their remote workers were in product development roles.

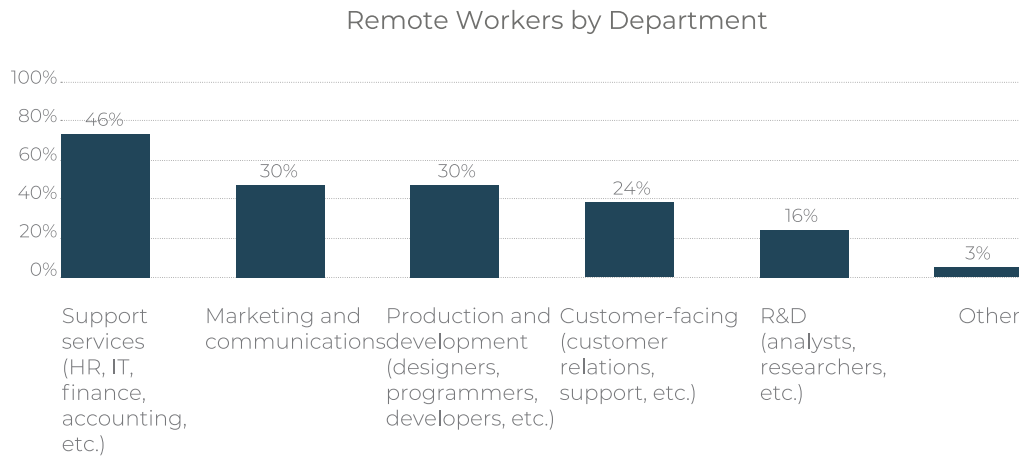


Figure 90. Concentration of staff working remotely among responding companies.

45% of responding companies indicated that they had a remote work policy in place and 32% intended on applying that policy permanently, while another 32% planned on applying it only temporarily.

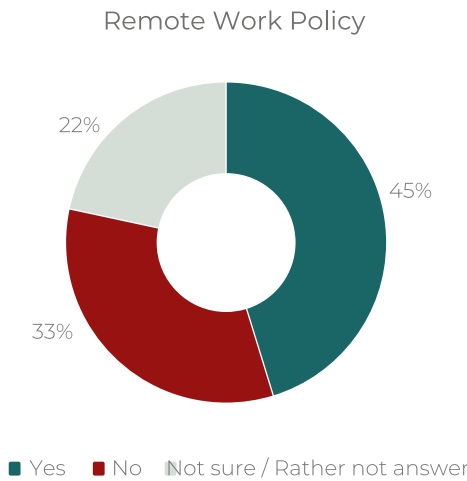


Figure 91 Remote work policy implementation among responding companies.

Does your organization plan to keep applying remote work policies

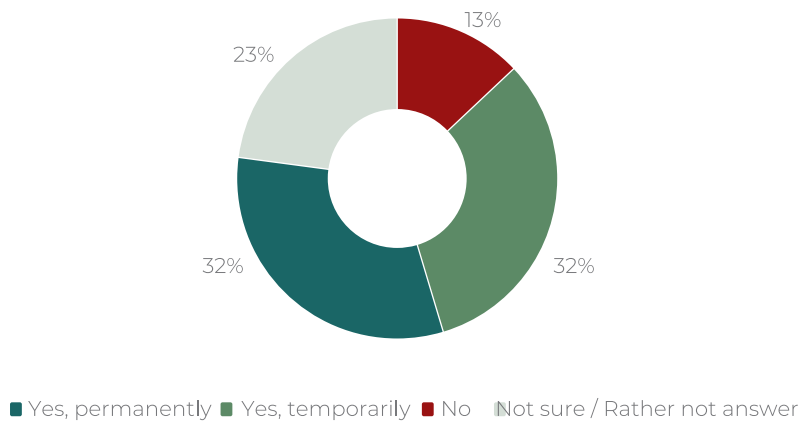


Figure 92. Plans to continue applying remote work policies implementation among responding companies.

The most important enabler according to our responding companies was having the right IT infrastructure (51%) followed by having appropriate virtual collaboration tools. 32% reported that an agile culture was important for successful implementation of remote work policies.

AI developers placed a higher premium on agility and named it as the second most important enabler for remote work (59%) following IT infrastructure. AI developers also named having an outcome-focused team or culture as being crucial, with 45% indicating that it was an important enabler

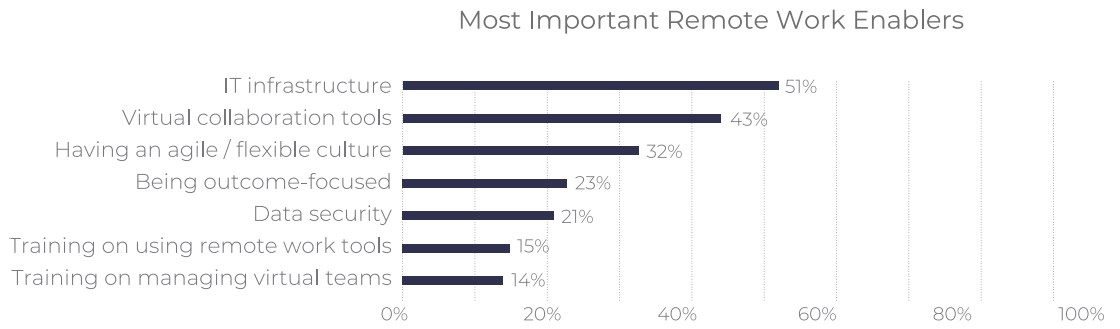


Figure 93. Most important remote work enablers among responding companies.

In terms of virtual tools that are being used by responding private sector companies, Microsoft Teams and Zoom were the most commonly used

(77%). Amongst small businesses and start-ups, Zoom was the most commonly used virtual tool (96%).

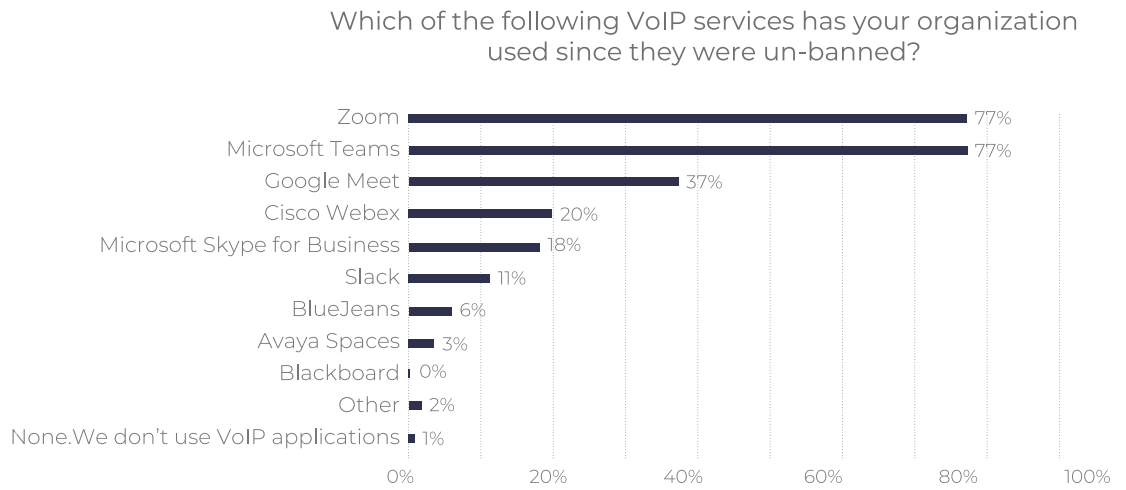


Figure 94. VoIP usage among responding companies.

Impact of remote work

Overall, remote work had a positive impact on employee well-being (51%) and productivity (47%). Responding companies indicated that remote work has reduced the cost of doing business (45%) but has had both a negative and positive impact on collaboration. 31% reported a

positive impact on collaboration amongst teams and 36% reported a negative impact on collaboration. Organizational culture, and client relationships were also reported to suffer as a result of remote work policy implementation.

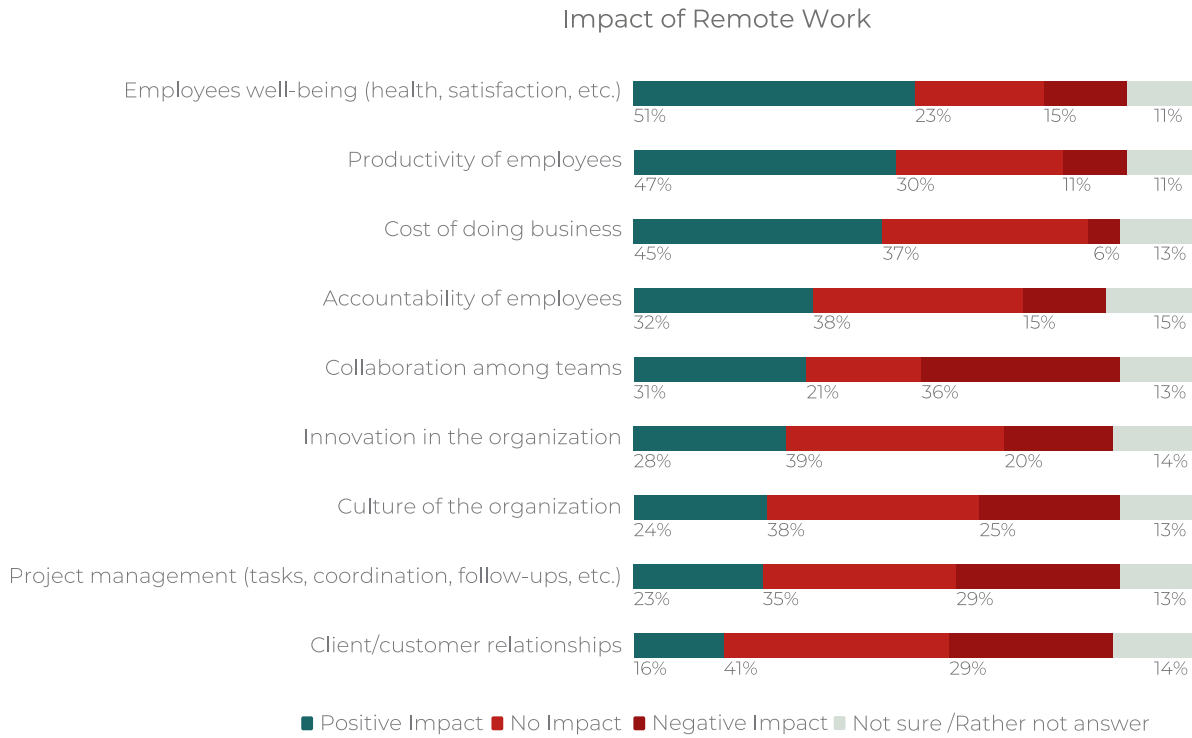


Figure 95. Impact of remote work policy implementation in responding companies.

Relaxing connectivity restrictions had an overall very positive impact on responding private sector companies. 62% said that removal of VoIP restrictions had a very positive impact on their

company. 52% reported a positive impact due to removal of VPN restrictions and 49% reported that fixing broadband speeds had a positive impact on their company.

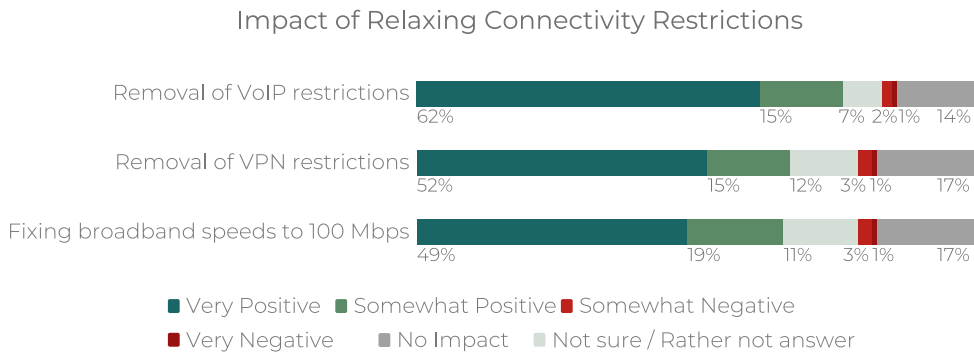


Figure 96. Impact of relaxing connectivity restrictions for responding companies.

PRIVATE SECTOR SURVEY RESULTS

Regulatory Barriers to Growth

/105

Regulatory barriers to growth

/107

Data regulation concerns

/109

Talent attraction
challenges



RESULTS SUMMARY

45%

Reported that technological restrictions were at least a major barrier to growth for their company

24%

Reported that telecommunications costs were at least a major barrier to growth for their company

60%

Reported that their company relied on global talent at least somewhat

55%

Reported that the link between visas and real estate was a talent attraction challenge

25%

Reported that cost of financing was at least a major barrier to growth for their company

32%

Reported low confidence in the legal system's ability to protect their IP

40%

Reported that lack of technical and legal expertise in their organization was a major concern with regards to data regulation compliance

REGULATORY BARRIERS TO GROWTH

Regulatory Barriers to Growth

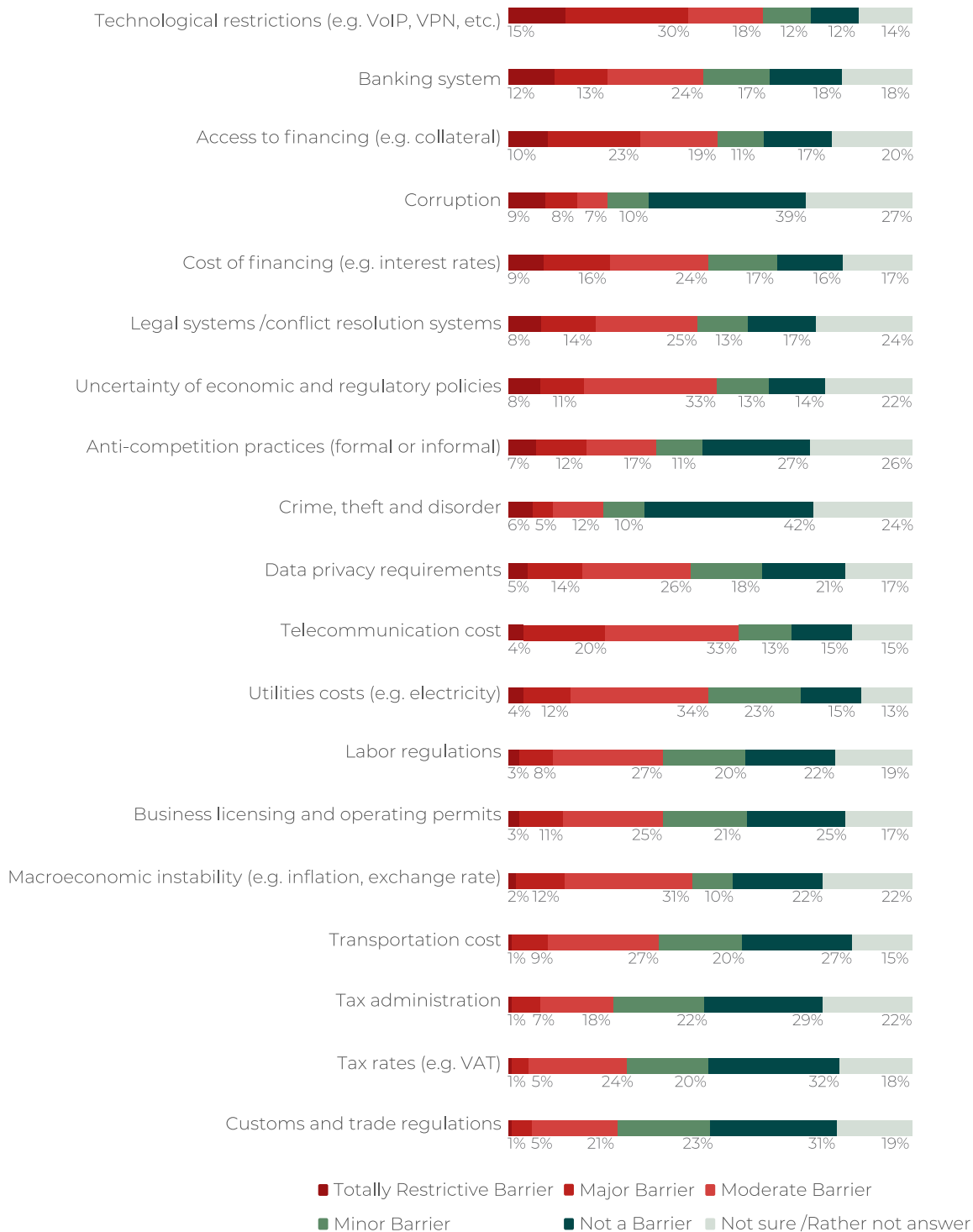


Figure 97. Regulatory barriers to growth as reported by responding companies (N=102).

According to our respondents, the most significant barrier to the growth of their companies was technological restrictions to VoIP, VPN, etc. 15% of respondents indicated that this was a totally restrictive barrier for them, 30% indicated that it was a major barrier, and 18% indicated that it was a moderate barrier. Only 12% of respondents indicated that it was not a barrier at all. Among AI developers, technological restrictions were considered at least a major barrier by 52% of respondents.

The second most significant regulatory barrier to growth was telecommunications cost with 24%

of respondents citing it as at least a major barrier, and 33% citing it as a moderate barrier.

Access to financing also emerged as a major barrier with 33% of respondents citing it as at least a major barrier and 19% indicating that it was a moderate barrier.

Law and order was not considered a significant barrier by the majority of respondents; however, the capacity of the legal system to resolve conflicts as well as the clarity of policies and regulations were both considered important barriers to growth.

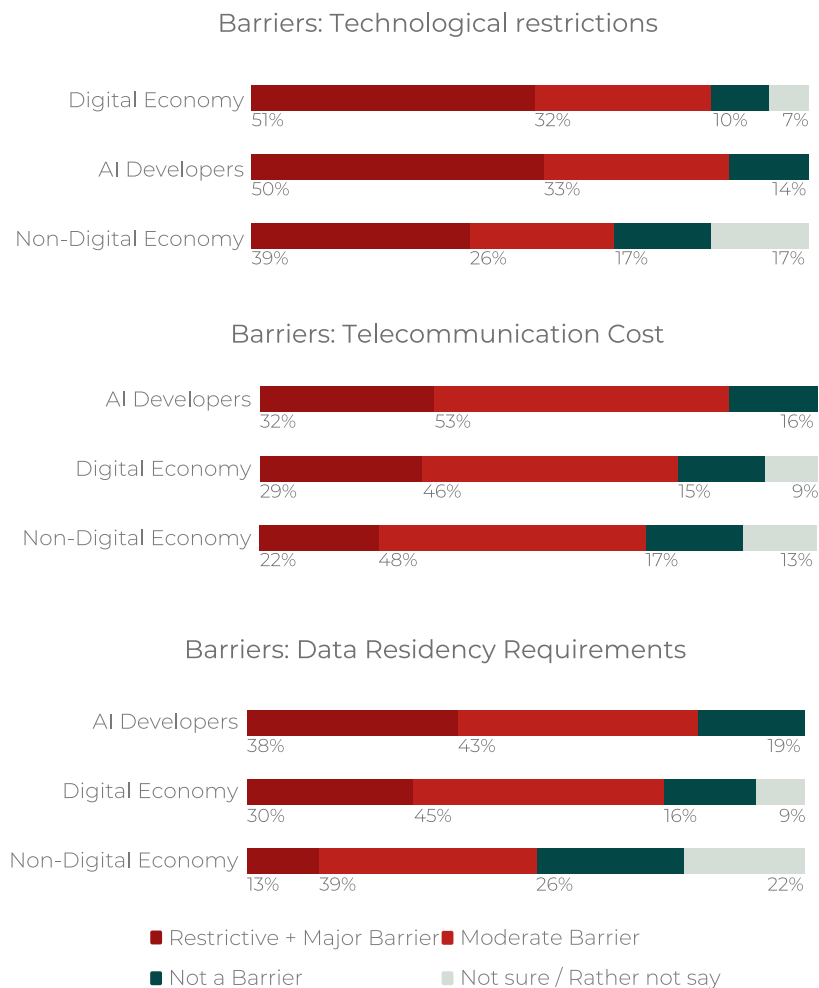


Figure 98. Regulatory barriers to growth as reported by responding companies, compared by DE criteria

Data regulation concerns

In terms of data regulation concerns, 15% of respondents indicated that they were very concerned that they did not possess the technical or legal expertise to implement data regulations, 25% indicated that this was somewhat concerning to them. 14% indicated that the capacity of the court system was a major concern for them. Another 17% indicated that this was somewhat concerning for them.

Related to these concerns were also concerns around the ambiguity of terminology used in regulations (42% were at least somewhat concerned),

capacity of local regulators (39% were at least somewhat concerned) and the potential uneven application of the law (34% were at least somewhat concerned).

Another concern was the cost of compliance with 51% indicated that they were concerned about this (10% were very concerned, and 41% were somewhat concerned). Lack of time to prepare for compliance was another concern with 36% of respondents indicating that they were at least somewhat concerned about this.

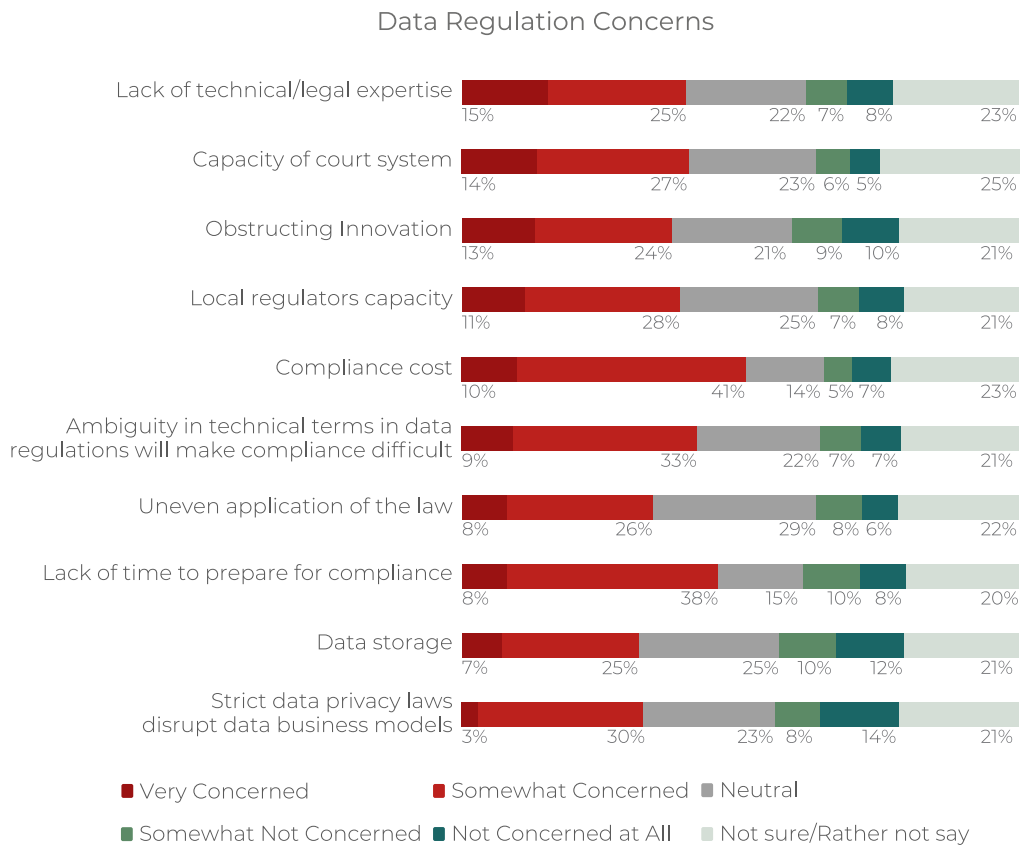


Figure 99. Data regulation concerns as reported by responding companies.

Intellectual property related challenges

According to our respondents, the most significant challenge facing them in relation to Intellectual Property was the high cost of registering trademarks, followed by the difficulty of filing for patents. Indicating that the procedures attached to policy implementation may be an obstacle even if policies are in place to protect IP.

Again, the capacity of the legal system to mediate conflicts as well as the clarity of policies and lack of available legal expertise in the area of IP emerge as challenges.

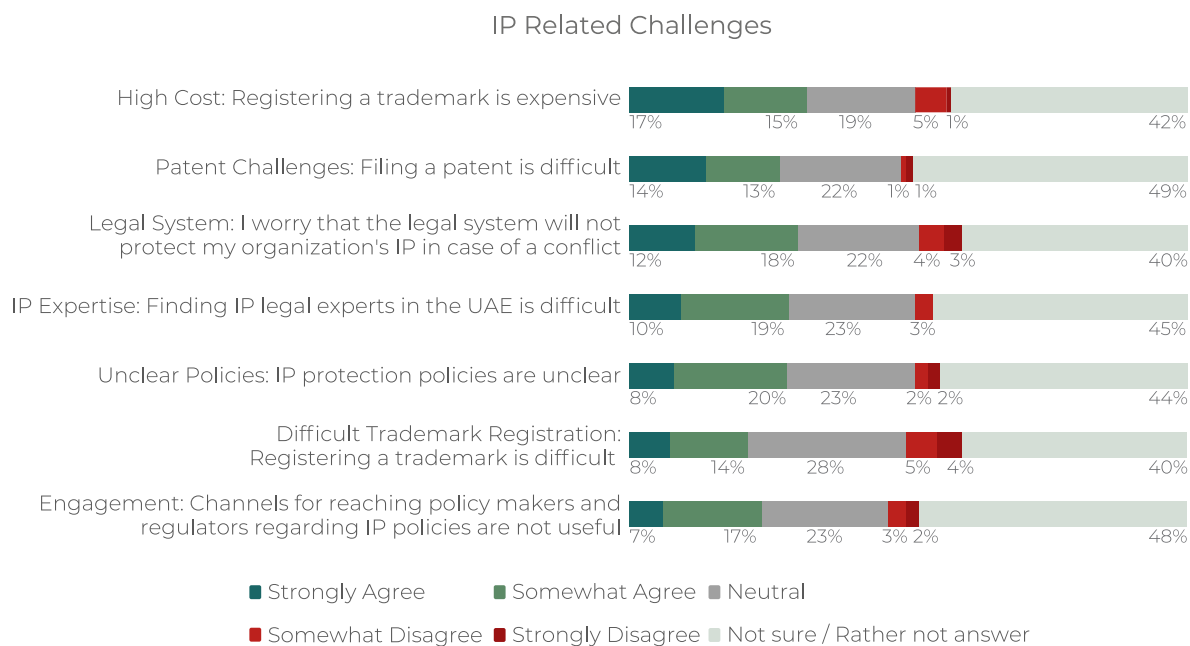


Figure 100. IP related challenges as reported by responding companies.

Talent attraction challenges

According to our respondents, the most significant challenge facing them in relation to Intellectual Property was the high cost of registering trademarks, followed by the difficulty of filing for patents. Indicating that the procedures attached to policy implementation may be an obstacle even if policies are in place to protect IP.

Again, the capacity of the legal system to mediate conflicts as well as the clarity of policies and lack of available legal expertise in the area of IP emerge as challenges.

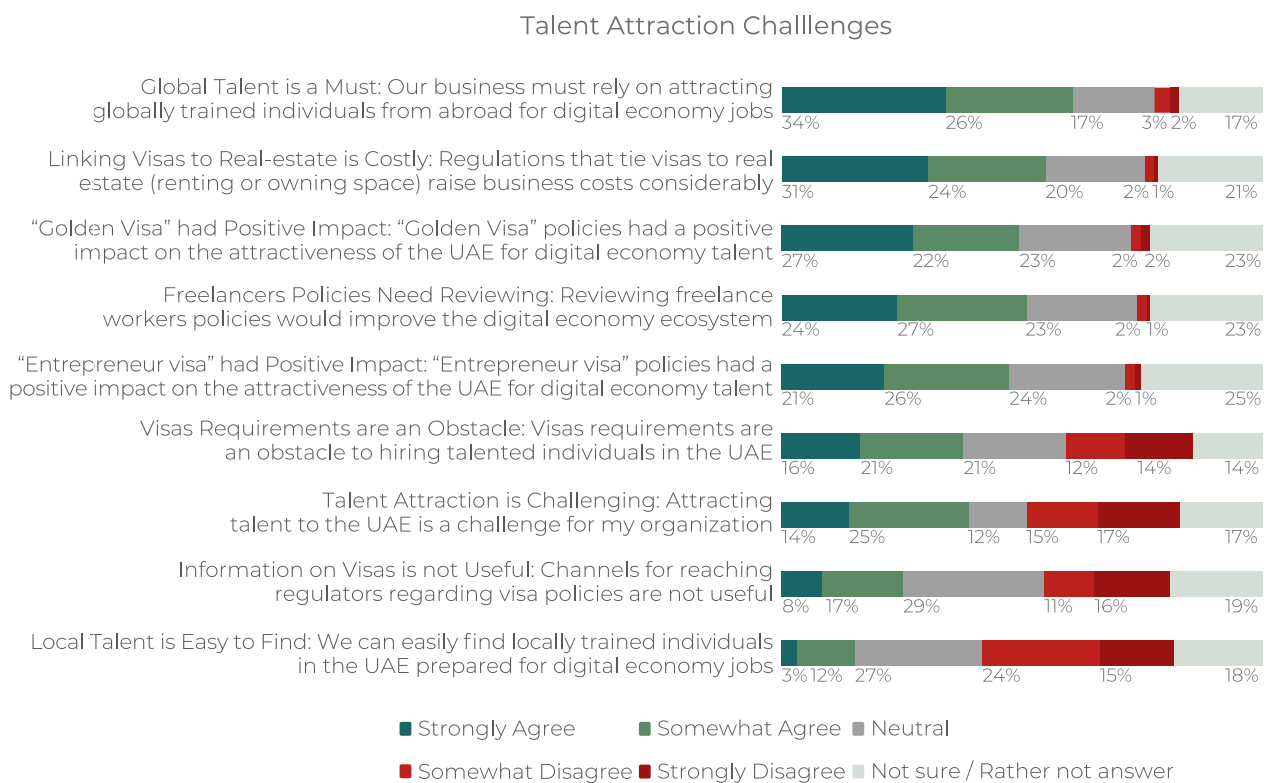


Figure 101. Talent attraction challenges as reported by responding companies.

Future regulations

There was a general enthusiasm among respondents for the implantation of new regulations for the digital economy. Around 59% of respondents indicated that the introducing a UAE data law would be a positive development. Similarly, 58% indicated that the introduction of national AI ethics frameworks would be a positive development and 58% indicated that the introduction of an e-transaction law would be a positive

development. The policy options of introducing an “e-Transaction” regulation, an “Anti-trust” framework, a “Cloud First” regulation and “Data Law” had each more than a third of responding companies viewing them as unequivocally positive. Yet, overall, it is important to point that 30-40% of companies stated that they were not sure or rather not provide an opinion on these policy options.

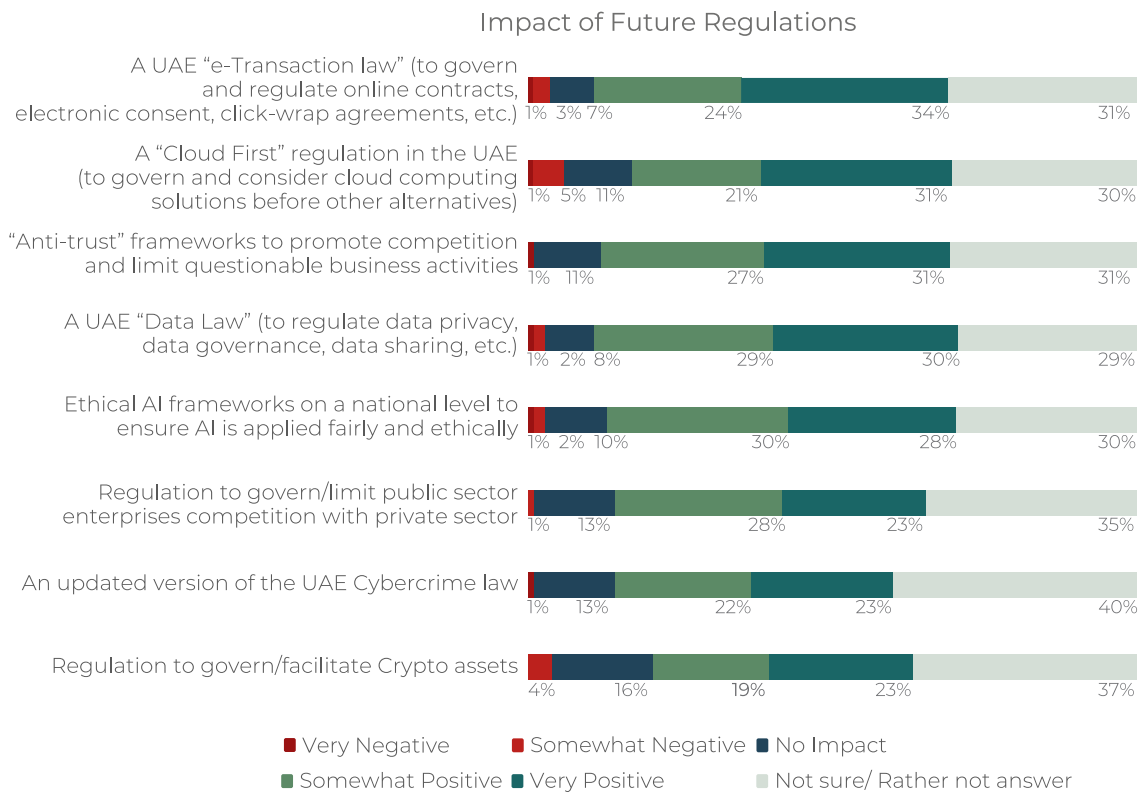


Figure 102. Impact of future regulations as reported by responding companies.

3

ANALYSIS AND POLICY DIRECTIONS

THE DIGITAL ECONOMY ECOSYSTEM: LESSONS FROM THE SURVEY

The Digital Economy Ecosystem (DEE) is multifaceted and requires attention to areas that may or may not be directly categorized as “digital”. This includes paying attention to cost of living, talent attraction, and education for the digital age amongst others. Creating a thriving Digital Economy Ecosystem in Dubai requires coordination and cooperation across agencies and stakeholders.

In Dubai this requires alignment between the Federal and Local government around definitions related to the digital economy – such as what constitutes a digital economy, the classification of digital economy participants, data producers, and AI developers and targeted policies for each of the different facets of the digital economy.

As it stands, many barriers to AI adoption, as well as challenges to the digital economy can be described as “wicked problems”. This means that the challenges have complex interdependencies and that targeting one or more elements of the problem may reveal other hidden issues. In many other cases, problems may be simple with quick win solutions, but face challenges related to inter-agency collaboration, opposing, or overlapping mandates, and contradictory national priorities.

The digital economy ecosystem itself contains within it several important interdependencies. Namely between data availability and quality, possibility of adequate data flows, machine learning and AI development, innovative digital

solutions, foreign investment, financing for SMEs and a robust and stable macroeconomic environment.

The regulatory environment and digital economy policies act as facilitators that ensure that the ecosystem is stable, resilient, and trustworthy.

ACCESSING RESOURCES

Digital Infrastructure

Digital Infrastructure	
Challenges	Opportunities
<p>Costly access to broadband and telecommunication more broadly</p> <p>Limited access to low-cost and open technologies like VoIP</p> <p>Lack of clarity on certain technologies created unstable investment environment</p>	<p>World-class telecommunications infrastructure</p> <p>100% internet penetration</p> <p>High broadband and mobile adoption</p>

Dubai has one of the most advanced digital infrastructures in the region. It is a global leader in 5G adoption and has one of the highest internet penetration rates in the region, with 100% of the population having internet access. Of course, the quality of access is not equal across the board. Despite having an extremely high internet penetration rate, Dubai has a higher threshold to internet access than other countries in the region or the world more broadly.

This is an important limitation. While Dubai has a world class digital infrastructure, the way that this infrastructure is being used is highly dependent on barriers to access, of which cost (rather than location, for example) is the most significant. The high cost of broadband, for example, has resulted in low broadband adoption in the UAE, below even some of the UAE's less digitally advanced neighbors in the MENA region. According to the 2019 World Economic Forum Global Competitiveness Report, while the UAE ranked 2nd globally in mobile internet subscriptions, it ranks 27th in broadband subscriptions.

The cost of telecommunication emerged as an important barrier for many small businesses in Dubai. In addition to adding to the cost of

running a business, the hosting costs in the UAE far exceed those in other countries in the region. As a result, Dubai's competitiveness as a digital economy hub could be impacted by these telecommunication barriers.

Moreover, while digital infrastructures in Dubai are some of the best in the region, arbitrary restrictions to necessary technologies like VoIP and VPN introduce inefficiencies and unnecessary barriers to businesses and individuals benefiting from the digital ecosystem. While some of these restrictions have been lifted due to Covid-19 remote working needs, the fact that this is a temporary measure contributes to the instability of the regulatory environment and reduces confidence in the ecosystem. This not only affects the performance of the economy, potentially costing Dubai millions of dollars in economic productivity, but also impacts the entry of foreign direct investment and start-ups into the ecosystem. Principles of internet neutrality cannot be upheld so long as critical technologies that are freely accessible all over the world continue to be restricted in Dubai.

Our research shows that private sector and public sector companies have benefited tremendously from the lifting of restrictions on VoIP.

With a majority of respondents indicating that lifting more of these restrictions and doing so permanently will improve their organizational effectivity, earning potential and enable more confident investment in digitization. Leveraging VoIP has significant benefits for companies – it

restricts costs, makes different working conditions possible (such as hybrid or remote work), allows easy connectivity for global teams, and increasing a company's ability to scale. All of which are important elements for driving growth in the digital economy.

Accessing Talent Pools

Digital/AI Skills Gap	
Challenges	Opportunities
Lack of necessary skills in local labor market	New regulations related to expanding visa categories and work permits already yielding positive outcomes.
Difficulty in recruiting talent to the UAE	Existing educational infrastructure that can develop in-country talent

Dubai has a high digital literacy rate, and while that is true, our research shows that there is a major talent gap when it comes to the digital skills in demand in the market. The talent gap can be understood as having two major facets 1. Existing talent in the UAE (local) labor market does not have the necessary AI or data skills that are in demand by digital economy companies and organizations and 2. Global talent (outside the UAE) whose skills fit the need of digital economy companies and organizations is difficult to attract to Dubai and the UAE more broadly. New regulations around long-term visas and work permits should make the UAE a more attractive place for highly talented individuals. The results of these regulations remain to be seen, but their impact can already be felt. The 2022 regulations have expanded work permit and visa and residency categories to allow talented individuals to live and work in the UAE without the need for sponsorship or employment contracts. Previous freelancing licenses in the UAE could only be approved

for individuals working within the fields of media or education. The 2022 regulations extended access to the freelance license to people working within the fields of technology, accounting and finance, data analysis and even customer service. This is a welcome and important change that will enable a freer and more efficient labor market. As it stands, information about these amendments is still difficult to navigate. With freelance permits being facilitated by multiple free zones and intermediaries, more work needs to be done to ensure a unified and effective system that inspires confidence and trust.

Our data shows that talent attraction and retention initiatives and visa options such as the Golden visa and Entrepreneur visa have already had a positive impact on our respondents. 49% of our private sector respondents indicated that the Golden Visa has already had a positive impact of the attractiveness of Dubai for outside talent and 47% said the same of the Entrepreneur Visa.

Accessing Financial Resources

Financing for Businesses	
Challenges	Opportunities
<ul style="list-style-type: none"> Accessing loans/ cumbersome banking regulations (seed money) Difficulty accessing Venture Capital and other forms of investment (scaling) Government tenders too complex/ difficult for small businesses Limited crowdfunding opportunities 	<ul style="list-style-type: none"> Growing VC sector in the UAE Mature banking sector

Accessing financial resources, an important part of growing local start-ups is still a challenge for Dubai companies. Access to financial resources is challenging primarily for small businesses and start-ups, which make up a large proportion of our respondents and the private sector in the UAE at large. Our data indicated that accessing financing is still a major barrier. More than 50% of AI developers indicated that access to financing was at least a major barrier and 37% of digital economy companies indicated the same. Focus group results indicate that start-ups and small businesses who were not incubated in UAE incubators had an especially difficult time fundraising due to the difficulty of accessing seed money, loans and Venture Capital.

The availability of funding has been primarily challenging for companies who are starting up (seed money) and for companies in an expansion or scaling phase. Put simply, while the development of accelerators and the expansion of venture capital markets has improved the start-up ecosystem in Dubai tremendously, it has done so primarily for companies in early or growth stages. Our focus group data supports the findings of our survey and indicates that starting and scaling a business in Dubai remains challenging.

Globally, crowdfunding has been a solution to the “Capital Gap” for the start-up sector. In the USA and Europe both donation and equity crowdfunding is legal. Crowdfunding in the UAE

is extremely limited and includes government sponsored and developed platforms. While this is a step forward, these platforms limit funding opportunities due to the limited audience that these platforms allow. Global platforms like Kickstarter host a much larger audience and therefore provide access to more funding opportunities.

Funding challenges are exacerbated by the de-facto exclusion of small businesses from government tenders. While, technically, small businesses can compete for government contracts, in practice, tender requirements are too restrictive and effectively exclude small businesses. All over the world, governments remain some of the biggest consumers of digital and AI products and services. Countries like Germany and Singapore have demonstrated the importance of government support for start-ups, this is especially true for start-ups in the digital economy. Our focus groups indicated that the requirements imbedded in government tenders are untenable for small businesses. Moreover, the unreliability of timely payments from government clients makes building a sustainable business difficult for companies with a government clientele, no matter the quality of the service or product being offered.

REGULATING DIGITAL

Data regulations

Overall, the ambiguity of the terms used in data regulations emerged as an important challenge for companies operating in Dubai. Focus group data align with our survey findings and suggest that navigating this regulatory environment was especially difficult for small companies which could not avail of in-house legal counsel or policy experts. This insight was supported by our data in which lack of in-house legal expertise and lack of confidence in the legal system's capacity to implement regulations emerged as important concerns for our respondents.

While there was a general support for the development and implementation of data privacy and security policies in the UAE, there was a worry amongst our respondents that even if such policies were to be developed, regulatory bodies would not have the capacity to effectively implement them or monitor their implementation thus delegating the burden to companies who are already struggling to navigate the current regulatory environment.

IP regulations

59% of the digital economy companies surveyed indicated that they had not registered any IP related to their digital assets within the UAE. 45% of companies who said that they developed AI also did not register any IP related to their digital assets. This is an alarmingly high percentage given the nature of the work that these companies do. Our focus groups indicated that this may be due to the difficulty and lack of clarity of IP and Patent registration in Dubai and the UAE more broadly. 50% of AI developers and 29% of digital economy companies indicated that they

found IP regulations and procedures in the UAE unclear. Previous research done by the MBRSG has corroborated these findings, maintaining that IP regulations in the UAE are still an important barrier to innovation in general and to the growth of the digital economy in particular

Triggering AI Maturity: Helping Companies Climb the Maturity Ladder

1. Digital Transformation: Capacity and Spending

Around 54% of responding companies indicated that they had a digital transformation plan in place, while 37% indicated that they had a digital transformation team or unit in place.

Less than 35% of companies that responded to our survey indicated that they spent less than 5% of their budgets on digital transformation. 21% indicated that they spent more than 20% of their budgets on such efforts. Unsurprisingly, AI developers were amongst the higher spenders with

30% of them indicating that they spent more than 20% of their budgets on digital transformation.

This indicates a general hesitation on the part of companies to invest in digital readiness and digital infrastructures. Spending trends show that, on average, small businesses spend between 6-10% of their budgets on digital resources and technology. For companies that produce digital products and services, this number is bound to be higher. Our data shows that spending on digital transformation in Dubai is lower than global rates. This corresponds to our focus group data which showed that companies feel unsure about the ROI of digital transformation due to what they perceive as the instability of the regulatory system and the economy. Creating greater trust in the regulatory system and in the Dubai's economic stability will increase companies' confidence in the return that investments in digital transformation will bring.

This is an important part of driving digital-by-default strategies in the private sector. Even amongst digital economy companies, 38% of respondents delivered 50% or less of their services and products online. 22% of digital economy companies delivered more than 75% of their products or services online and 27% delivered all of their products or services online.

Of the technologies that were most commonly adopted, cloud-computing topped the list. 39% of companies responding indicated that they had wholly adopted cloud computing within their organizations and 27% had plans to implement cloud technology. Emerging technologies such as 3D printing, crypto protocols and extended reality technology were not widely adopted.

2. Data Collection and Usage

Close to 50% of companies responding to this survey indicated that they collected customer data, while 33% collected engagement data and 23% collected behavioral and attitudinal data. There is a general trend of understanding the significance of data privacy and ethical data use policies. 63% of responding entities had data privacy rules in place. These percentages were high even among

non-digital economy companies (61%).

In essence both digital economy and non-digital economy companies collected and utilized data only to different degrees. However, it is important to note that even among digital economy companies, the collection and utilization of data was uneven. Only 49% of digital economy companies collected customer data. 62% of digital economy companies used data for product/service improvement and 51% used it for product/service development.

Companies, whether in the digital economy or not, largely reported that usage of government open data sources as well as big data in general was low. In the case of open government data, this was in part because the quality of government open data did not lend itself to use by digital companies. Focus group data indicates that open government data was not of a high enough quality to be of use to private sector companies. Issues related to data have much to do with database management, and competence in maintaining data and ensuring its quality and different stages of collection and release. The primary challenges related to open data were: unusable data formats, incomplete or incorrect data, outdated data, or data that cannot be compared across different years. Generally, trust in public data is low.

This indicates that companies are still cannot take full advantage of either the data that exists in the ecosystem (big data/open data) or their own data (collected data). In other words, while companies are positioned to collect and use data, around half of the companies surveyed are not data-driven yet.

3. AI Adoption

While AI adoption has become an agreed upon must-have for businesses wishing to stay competitive in an increasingly digitizing economy, only 24% of our respondents were developers of artificial intelligence and 46% said they neither used nor developed AI technology. AI Adoption was low among even digital economy companies. With 56% of digital economy

company respondents still ‘observing’ use cases and 11% having already begun experimenting with AI technologies. Another 11% of digital economy companies have solid plans for AI implementation. Broadly speaking, this paints a picture of a still young AI environment in Dubai and the UAE more broadly.

Based on AI Singapore’s AI maturity model which categorizes companies into four tiers: AI Unaware, AI Aware, AI Ready and AI Competent, 45% of our respondents qualified as AI Unaware, 9% were AI aware, 7% were AI ready and 23% were AI Competent (17% chose not to indicate). This indicates that, overall, while Dubai based companies did rely on Data for their day-to-day business functions and product/service development, the adoption of AI technology was still nascent.

Multiple barriers were highlighted that may contribute to the low rate of AI adoption amongst private sector entities. The first and most restrictive barrier was related to talent. As discussed earlier, the lack of skills in the labour market was a major issue for companies looking to digitize or adopt AI. Data availability and data quality were also barriers to AI adoption which is a data driven technology. In order for machine learning and AI to be effectively adopted within an organization, it needs to either collect or have access to exploitable data. For the reasons discussed above, this remains a major barrier for private sector companies in the UAE.

The regulatory environment is also not considered to be incentivizing of AI adoption. Both the survey data and focus group discussions point to a regulatory environment which is ambiguous toward AI technology. The lack of clarity in regulation and potential issues that may arise in the future due to an unstable regulatory environment were impediments to AI adoption. A clearer regulatory environment would build confidence among public sector companies that they should invest in AI technology. Moreover, current policies that enable a freer flow of talent and more conducive working models (such as

short contracts and free-lancing) should go a long way in solving the AI skills gap.

REFERENCES

- 1997 revisited | Reuters.com. (n.d.). Reuters. Retrieved March 25, 2022, from <https://www.reuters.com/news/picture/1997-revisited-idJPRTXASZ5>
- Abu Dhabi announces new e-commerce policy | AD SME HUB. (n.d.). Retrieved March 25, 2022, from <https://www.adsmehub.ae/en/explore/post-details/abu-dhabi-announces-new-e-commerce-policy>
- ABU DHABI GOVERNMENT DATA MANAGEMENT POLICY. (n.d.). systems & information centre.
- Accenture. (2019). Reinventing Internet Safety for the Digital Economy. <https://www.accenture.com/us-en/services/security-index>
- Advanced Skills Strategy—The Official Portal of the UAE Government. (n.d.). Retrieved March 25, 2022, from <https://u.ae/en/about-the-uae/strategies-initiatives-and-awards/federal-governments-strategies-and-plans/advanced-skills-strategy>
- Ae024en.pdf. (n.d.). Retrieved March 25, 2022, from <https://www.wipo.int/edocs/lexdocs/laws/en/ae/ae024en.pdf>
- AI ETHICS PRINCIPLES & GUIDELINES. (n.d.).
- AIDhaheri, S. (2020). Building an AI Nation: Accelerating Artificial Intelligence Adoption through Agile Policymaking - The Case of the UAE. Dubai. <https://dubaipolicyreview.ae/building-an-ai-nation-accelerating-artificial-intelligence-adoption-through-agile-policymaking-the-case-of-the-uae/>
- Andrieu, E., Jamet, S., Marcolin, L., & Squicciarini, M. (2019). Occupational transitions: The cost of moving to a “safe haven” (OECD Science, Technology and Industry Policy Papers No. 61; OECD Science, Technology and Industry Policy Papers, Vol. 61). OECD Science. <https://doi.org/10.1787/6d3f9bff-en>
- Anita Siassios. (2012). Regulation of digital content in the UAE – Part One. Al Tamimi & Company. <https://www.tamimi.com/law-update-articles/regulation-of-digital-content-in-the-uae-part-one/>
- Arab Commission for Digital Economy. (2019). Arab Federation for Digital Economy, Arab Digital Economy Strategy. Arab Commission for Digital Economy. <https://www.arab-digital-economy.org/wp-content/uploads/2019/12/Integrated-summary-report-V18-.pdf>
- Artificial Intelligence Strategy Dubai | AI Lab | Digital Dubai. (n.d.). <https://www.digitaldubai.ae/initiatives/ai-lab>
- Bank guarantees in the UAE. (n.d.). Al Tamimi & Company. Retrieved March 25, 2022, from <https://www.tamimi.com/law-update-articles/bank-guarantees-in-the-uae/>
- Bayanat | Open Data Portal. (n.d.). Batanat.Ae. Retrieved March 25, 2022, from <https://bayanat.ae/en/Data>
- Bayoumi, M., Luomi, M., Fuller, G., Al-Sarihi, A., Salem, F., & Verheyen, S. (2022). Arab SDGs Index and Dashboard 2022. Retrieved from Dubai: <https://www.arabsdgindex.com/>

Blockchain in the UAE government—The Official Portal of the UAE Government. (n.d.-a). Retrieved March 25, 2022, from <https://u.ae/en/about-the-uae/digital-uae/blockchain-in-the-uae-government>

Blockchain in the UAE government—The Official Portal of the UAE Government. (n.d.-b). Retrieved March 25, 2022, from <https://u.ae/en/about-the-uae/digital-uae/blockchain-in-the-uae-government>

Buller, A. (2019). Cloud computing surges in the UAE in 2019. ComputerWeekly.Com. <https://www.computerweekly.com/news/252475177/Cloud-computing-surges-in-the-UAE-in-2019>

Cattaneo, G., Micheletti, G., Glennon, M., La Croce, C., & Mitta, C. (2020). The European data market monitoring tool. Key Facts & Figures, First Policy Conclusions, Data Landscape and Quantified Stories. Final Study Report. Luxembourg: Publications Office of the European Union.

Central Bank of the UAE. (2020). Consumer Protection Regulation. https://centralbank.ae/sites/default/files/2021-03/Consumer%20Protection%20Regulation_0.pdf

Central-bank-uae-stored-value-facilities-regulation.pdf. (n.d.). Retrieved March 25, 2022, from <https://www.pwc.com/m1/en/tax/documents/2020/central-bank-uae-stored-value-facilities-regulation.pdf>

Coos, A. (2019). A Guide to NESA IAS Compliance. Endpoint Protector Blog. <https://www.endpointprotector.com/blog/a-guide-to-nesa-ias-compliance>

Corporate Tax. (n.d.). UAE Ministry of Finance. Retrieved March 25, 2022, from <https://www.mof.gov.ae/en/resourcesAndBudget/Pages/faq.aspx>

Craggs, M. (2017). The new UAE Bankruptcy Law | Global law firm | Norton Rose Fulbright. <https://www.nortonrosefulbright.com/en/knowledge/publications/imported/2018/07/18/05>. <https://www.nortonrosefulbright.com/en/knowledge/publications/97324a48/the-new-uae-bankruptcy-law>

Crypto Businesses Now Able to Set Up at DMCC in Dubai Following SCA Agreement. (n.d.). DMCC. Retrieved March 25, 2022, from <https://www.dmcc.ae/news/crypto-businesses-now-able-set-dmcc-dubai-following-sca-agreement>

Cyber attacks in UAE increased over 190% following remote working shift—Arabian Business. (n.d.). Retrieved March 25, 2022, from <https://www.arabianbusiness.com/industries/technology/460814-cybersecurity-risks-rise-with-remote-working>

Data. (n.d.). Dunaipulse. Retrieved March 25, 2022, from <https://www.dubaipulse.gov.ae/>

Data Ownership. (2018). Centre for International Governance Innovation. <https://www.cigion-line.org/publications/data-ownership/>

Determann, L. (2020). Where data is stored could impact privacy, commerce and even national security | World Economic Forum. <https://www.weforum.org/agenda/2020/06/where-data-is-stored-could-impact-privacy-commerce-and-even-national-security-here-s-why/>

Dinçer, A. V. (2020, June 19). These Trends Are Changing the Payments Industry in UAE. Fineksus. <https://fineksus.com/these-trends-are-changing-the-payments-industry-in-uae/>

DLA Piper. (n.d.). Up Again UAE: Privacy and Data | Topics | DLA Piper Global Law Firm. DLA Piper. Retrieved March 25, 2022, from <https://www.dlapiper.com/en/bahrain/insights/>

topics/upagain-uae-privacy/

Dubai cyber security strategy—The Official Portal of the UAE Government. (n.d.). Retrieved March 25, 2022, from <https://u.ae/en/about-the-uae/strategies-initiatives-and-awards/local-governments-strategies-and-plans/dubai-cyber-security-strategy>

Dubai FDI. (2019). Digital Economy Investment Opportunity Brief. Dubai Advantage. https://thedubaiadvantage.ae/wp-content/uploads/2019/10/DubaiAdvantage_Digital_Economy_v4.0.pdf

Dubai Government. (2019). The State of Small and Medium Enterprises (SMEs) in Dubai 2019. Dubai SME.

Dubai Government, Dubai Digital Authority. (n.d.). Retrieved March 25, 2022, from <https://www.digitaldubai.ae>

Dubai, T. | W., Webshops & E. -marketing |. (n.d.-a). DIFC | DFSA introduces regulatory framework for Investment Tokens. DIFC. Retrieved March 25, 2022, from <https://www.difc.ae/newsroom/news/dfsa-introduces-regulatory-framework-investment-tokens/>

Dubai, T. | W., Webshops & E. -marketing |. (n.d.-b). DIFC | Intellectual Property Law DIFC Law No. 4 of 2019. DIFC. Retrieved March 25, 2022, from <https://www.difc.ae/business/laws-regulations/legal-database/intellectual-property-law-difc-law-no-4-2019/>

Dubai, T. | W., Webshops & E. -marketing |. (2020). DIFC | Data Protection Law DIFC Law No. 5 of 2020. DIFC. <https://www.difc.ae/business/laws-regulations/legal-database/data-protection-law-difc-law-no-5-2020/>

Emirates News Agency—Hamdan bin Mohammed chairs Executive Council meeting, approves E-commerce strategy. (n.d.). Retrieved March 25, 2022, from <https://www.wam.ae/en/details/1395302791053>

Enrico Benni, Tarek Elmasry, Jigar Patel, & Jan Peter aus dem Moore. (2016). Digital Middle East: Transforming the region into a leading digital economy | McKinsey. <https://www.mckinsey.com/featured-insights/middle-east-and-africa/digital-middle-east-transforming-the-region-into-a-leading-digital-economy>

Ericsson. (2019). Ericsson Mobility Report.

ESCWA. (2017). Perspectives of Digital Economy in the Arab Region. Inited Nations. <http://www.unescwa.org/publications/perspectives-digital-economy-arab-region>

European Commission. (2021). DESI | Shaping Europe’s digital future. <https://digital-strategy.ec.europa.eu/en/policies/desi>

FEDERAL DECREE-LAW NO. 3 OF 2003. (n.d.). Retrieved March 25, 2022, from <https://wipolex.wipo.int/fr/text/499575>

First Abu Dhabi Bank. (n.d.). SME Growth Loan | First Abu Dhabi Bank—UAE. SME Growth Loan | First Abu Dhabi Bank - UAE. Retrieved March 25, 2022, from <https://www.bankfab.com/en-ae/cib/business/sme-growth-loan>

Fiturism. (n.d.). Dubai just appointed a “State Minister for Artificial Intelligence.” Futurism. Retrieved March 25, 2022, from <https://futurism.com/dubai-just-appointed-a-state-minister-for-artificial-intelligence>

- Fuentes, P., Nettel, A. R., Westgarth, T., Iida, K., Mbayo, H., Finotto, A., . . . Ladak, Y. (2022). Government AI Readiness Index 2021. Retrieved from <https://www.oxfordinsights.com/government-ai-readiness-index2021>
- G20 Japan. (2020). G20 AI Principles.
- Golden visa—Long-term residence visas in the UAE - The Official Portal of the UAE Government. (n.d.). Retrieved March 25, 2022, from <https://u.ae/en/information-and-services/visa-and-emirates-id/residence-visa/long-term-residence-visas-in-the-uae>
- Gurry, F. (2019). Intellectual property in a data-driven world. *WiPO Magazine*. https://www.wipo.int/wipo_magazine/en/2019/05/article_0001.html
- Haniahs, F. (n.d.). Fadi Haniah's 4 research works in Economics and Engineering. ResearchGate. Retrieved March 25, 2022, from <https://www.researchgate.net/scientific-contributions/Fadi-Haniah-2182747253>
- Hatem, L., Ker, D., & Mitchell, J. (2020). A Roadmap toward A Common Framework for Measuring the Digital Economy. *OECD Digital Economy Outlook 2020*, Saudi Arabia. <https://doi.org/10.1787/bb167041-en>.
- How it works. (2020, June 1). Beehive. <https://www.beehive.ae/how-it-works/>
- Hutchison, K., Morris, M., & Michael Morris. (2021). UAE Bankruptcy Law Update – Emergency Financial Crisis: Clyde & Co. <https://www.clydeco.com/insights/2021/03/march-2021-uae-bankruptcy-law-update-emergency-fin>
- Idlebi, N. (2019). Can Open Government Be Implemented in the Arab World? *Dubai Policy Review*, 91)(Public Policy for a Digital Future). doi:<https://doi.org/10.46993/DPR/EN008>
- Internet Access Management. (2017). TDRA. <https://tahseen.ae/media/2692/uae-regulations-on-internet-access-management-2017.pdf>
- ITA. (n.d.). UAE New Data Privacy Law. International Trade Administration. Retrieved March 25, 2022, from <https://www.trade.gov/market-intelligence/uae-new-data-privacy-law>
- ITU. (2020, May 12). Why 5G is key to the future in the United Arab Emirates. ITU Hub. <https://www.itu.int/hub/2020/05/why-5g-is-key-to-the-future-in-the-united-arab-emirates/>
- Jacobides, M. G., Sundararajan, A., & Alstyne, M. V. (2019). *Platforms and Ecosystems: Enabling the Digital Economy*. WEF and Deloitte.
- Jarrar, Y., Yasin, N., Al-baradi, L., Salem, F., Alkarawi, I., & Biygautane, M. (2022). *The State of Public Management in the Arab Region*.
- Katz, R., & Callorda, F. (2018). The economic contribution of broadband, digitization and ICT regulation. ITU Publications, 52.
- Kennedy, D., & Cheung, D. C. (2020). *Digital Infrastructure Sector Analysis* (p. 103). Asian Infrastructure Investment Bank (AIIB).
- Khan, S. (2020). Abu Dhabi earmarks 15% of procurement spending to SMEs and micro businesses. *The National*. <https://www.thenationalnews.com/business/economy/abu-dhabi-earmarks-15-of-procurement-spending-to-smes-and-micro-businesses-1.1012424>
- Kitchin, R. (2014). *The Data Revolution: Big Data, Open Data, Data Infrastructures & Their*

Consequences. SAGE Publications Ltd. <https://doi.org/10.4135/9781473909472>

latham & watkins. (2020). United Arab Emirates – New Regulations for Stored Value Facilities. 11. Law in UAE - General—DLA Piper Global Data Protection Laws of the World. (n.d.). Retrieved March 25, 2022, from <https://www.dlapiperdataprotection.com/index.html?t=law&c=AE>

MBRSG Signs MoU with Tata Consultancy Services at Expo. (2022). http://www.tradearabia.com/news/EDU_392722.html

Ministerial Decree No 281. (2020). UAE Ministry of Human Resources & Emiratisation. <https://www.mohre.gov.ae/en/home.aspx>

MoF stresses the importance of reinvigorating government procurement to enable local entrepreneurs to overcome the repercussions of COVID-19. (2020). <https://www.mof.gov.ae/en/media/materials/News/Pages/1572020.aspx>

Mubaydeen, I. Y. (2020). MEED | Priority financing improves Abu Dhabi insolvency law. <https://www.meed.com/priority-financing-improves-abu-dhabi-insolvency-law>

National Program for Coders. (n.d.). Artificial Intelligence Office, UAE. Retrieved March 25, 2022, from <https://ai.gov.ae/np4c/>

National Programme for Artificial Intelligence concludes UAE AI CAMP 3.0. (2021). Wam. <https://www.wam.ae/en/details/1395302969491>

National Strategy for Higher Education 2030—The Official Portal of the UAE Government. (n.d.). Retrieved March 25, 2022, from <https://u.ae/en/about-the-uae/strategies-initiatives-and-awards/federal-governments-strategies-and-plans/national-strategy-for-higher-education-2030>

Nexdigm Private Limited. (2021). Introduction Of The Data Protection Law 2020 In DIFC - Privacy—United Arab Emirates. <https://www.mondaq.com/data-protection/1059430/introduction-of-the-data-protection-law-2020-in-difc>

Nicol, C., & Reid, J. (2019). Mapping the world's prices 2019 (p. 44). Deutsche Bank.

OECD. (2016). OECD Recommendation on Digital Government Strategies—OECD. OECD. <https://www.oecd.org/gov/digital-government/recommendation-on-digital-government-strategies.htm>

OECD. (2019). MANAGING DIGITAL SECURITY AND PRIVACY RISK. 42.

Oton, A. (2022). The Effect of Free Zones on Dubai and the UAE's Economy. <https://uae-eu.com/blog/the-effect-of-free-zones-on-dubais-economy.html>

Our Capital Community—Hub71. (n.d.). Hub71. Retrieved March 25, 2022, from <https://www.hub71.com/investor-overview/>

Oxford Economics. (2016). Google Data Centers: Economic Impact and Community Benefit. Oxford Economics. <https://www.oxfordeconomics.com/recent-releases/d8d830e4-6327-460e-95a5-c695a32916d9>

Pantazi, C. (2016). These are the world's most expensive cities to start a business. World Economic Forum. <https://www.weforum.org/agenda/2016/08/these-are-the-worlds-most-expensive-cities-to-start-a-business/>

- Prasad, A., Refass, S., Saidi, N., Salem, F., & Shepherd, B. (2022). Global Economic Diversification Index. Retrieved from Dubai: <https://economicdiversification.com/>
- Regulations. (n.d.). Digital Dubai. Retrieved March 25, 2022, from <https://www.digitaldubai.ae/data/regulations>
- Regulatory-Framework-For-Stored-Values-And-Electronic-Payment-Systems-En....pdf. (n.d.). Retrieved March 25, 2022, from <https://www.centralbank.ae/sites/default/files/2019-12/Regulatory-Framework-For-Stored-Values-And-Electronic-Payment-Systems-En....pdf>
- Rizvi, R. (2020). In brief: Telecoms regulation in United Arab Emirates—Lexology. <https://www.lexology.com/library/detail.aspx?g=4df25429-cfba-4278-97e6-5c32642fe22f>
- Saleem, S. (2016). An Update on the Dubai Data Law. Al Tamimi & Company. <https://www.tamimi.com/law-update-articles/a-update-on-the-dubai-data-law/>
- Salem, F. (2006). Exploring E-Government Barriers in the Arab States. Dubai Initiative, Harvard Kennedy School (Policy Brief 2). Retrieved from <https://www.belfercenter.org/publication/exploring-e-government-barriers-arab-states>
- Salem, F. (2016). A Smart City for Public Value: Digital Transformation through Agile Governance – The Case of “Dubai Digital Authority”. Retrieved from Dubai: <https://www.world-governmentsummit.org/api/publications/document?id=9ceb69c4-e97c-6578-b2f8-ff0000a7ddb6>
- Salem, F. (2017a). Arab Social Media Report 2017: Social Media and the Internet of Things: Towards Data-Driven Policymaking in the Arab World - Potential, Limits and Concerns. Retrieved from Dubai: <http://ssrn.com/abstract=2911832>
- Salem, F. (2017b). The Arab World Online 2017-2021: Digital Transformations and Societal Trends in the Age of the 4th Industrial Revolution. Retrieved from Dubai: <http://dx.doi.org/10.2139/ssrn.3059445>
- Salem, F. (2020). Government AI Readiness Index 2020 - MENA Regional Analysis In E. Shearer, R. Stirling, & W. Pasquarelli (Eds.), Government AI Readiness Index 2020: Oxford Insights.
- Salem, F., & Geray, O. (2021). From Electronic Government to Smart City: Dubai’s Digital Transformation. In R. Beschel & T. Yousef (Eds.), Public Sector Reform in the Middle East and North Africa: Lessons of Experience for a Region in Transition (Vol. 1, pp. 119-138). Washington, D.C. : Brookings Institution Press.
- Salem, F., & Jarrar, Y. (2012). Learning from Failure: Braving the Multifaceted Challenges to E-Government Development. In Organizational Learning and Knowledge: Concepts, Methodologies, Tools and Applications (4 Vol) (pp. 22): Information Resources Management Association.
- Salem, F., & Shaer, S. (2020). The Future of Public Management in the Arab World: Pathways towards Digital-Era Public Institutions.
- Schwab, K. (n.d.). The Global Competitiveness Report 2019. 666.
- Silver, onathan. (2016). SMEs In The UAE - Corporate/Commercial Law—United Arab Emirates. <https://www.mondaq.com/corporate-and-company-law/530664/smes-in-the-uae>
- Singapore’s Enhanced EntrePass Scheme Benefits Global Startups. (2017). StartupDecisions. <https://www.startupdecisions.com.sg/blog/enhanced-entrepass-scheme-benefits-global-startups/>

Shearer, E., Stirling, R., Pasquarelli, W., Chung, Y., Cussins, J., Salem, F., . . . Scrollini, F. (2020). Government AI Readiness Index 2020. Retrieved from <http://oxfordinsights.com/government-ai-readiness-index-2020>

Sriraman, N. (n.d.). Council Post: Data Residency Laws Are Debilitating For Data Lakes, But That Doesn't Have To Be The Case. Forbes. Retrieved March 25, 2022, from <https://www.forbes.com/sites/forbestechcouncil/2020/11/25/data-residency-laws-are-debilitating-for-data-lakes-but-that-doesnt-have-to-be-the-case/>

Stopel, & Vergote. (2021). Middle East North Africa Competition Forum—OECD. <https://www.oecd.org/competition/middle-east-north-africa-competition-forum.htm>

Stored Value Facilities (SVF) Regulation | CB UAE. (n.d.). Retrieved March 25, 2022, from <https://centralbank.ae/en/node/1934>

Svantesson, D. (2020). Data localisation trends and challenges: Considerations for the review of the Privacy Guidelines. OECD. <https://doi.org/10.1787/7fbaed62-en>

TAMM - Abu Dhabi Government services. (n.d.). Retrieved March 25, 2022, from <https://www.tamm.abudhabi/en/>

TDRA. (n.d.). Digital economy—The Official Portal of the UAE Government. Retrieved March 25, 2022, from <https://u.ae/en/about-the-uae/economy/digital-economy>

TDRA. (2018). Public Consultation: Cloud First Policy, Strategy, and Guidelines – to establish the United Arab Emirates as a Regional Data Hub. . <https://www.tra.gov.ae/userfiles/assets/QqQuIA0SR5C.pdf>

TDRA. (2019). UAE: TDRA launches UAE National Cybersecurity Strategy. TDRA. <https://www.dataguidance.com/news/uae-tra-launches-uae-national-cybersecurity-strategy>

Tech.Pass | Singapore EDB. (n.d.). Retrieved March 25, 2022, from <https://www.edb.gov.sg/en/how-we-help/incentives-and-schemes/tech-pass.html>

The cybercrime story of 2020—The UAE and the pandemic—KPMG United Arab Emirates. (n.d.). Retrieved March 25, 2022, from <https://home.kpmg/ae/en/home/insights/2021/03/the-cybercrime-story-of-2020-the-uae-and-the-pandemic-part-3.html>

The Economist. (2021). Ransomware highlights the challenges and subtleties of cybersecurity. The Economist. <https://www.economist.com/briefing/2021/06/19/ransomware-highlights-the-challenges-and-subtleties-of-cybersecurity>

The National Employment Strategy 2031—The Official Portal of the UAE Government. (n.d.). Retrieved March 25, 2022, from <https://u.ae/en/about-the-uae/strategies-initiatives-and-awards/federal-governments-strategies-and-plans/the-national-employment-strategy-2031>

The UAE Digital Government Strategy 2025—The Official Portal of the UAE Government. (n.d.). Retrieved March 25, 2022, from <https://u.ae/en/about-the-uae/digital-uae/uae-national-digital-government-strategy>

The UAE Smart Data Framework. (2019).

Thought Leadership. (2021). Addressing legal challenges SMEs face in the UAE. <https://www.adsmehub.ae/en/explore/post-details/addressing-legal-challenges-smes-face-in-the-uae>

Tolley, G. (2021, September 5). What is the UAE's new data law? The National. <https://www.thenationalnews.com/uae/2021/09/05/what-is-the-uaes-new-data-law/>

TDRA. (2015). The National Plan for UAE Smart Government Goals.

Turak, N. (2020, March 26). UAE loosens some VoIP restrictions as residents in lockdown call for end to WhatsApp and Skype ban. CNBC. <https://www.cnbc.com/2020/03/26/coronavirus-lockdown-uae-residents-call-for-end-to-whatsapp-skype-ban.html>

UAE. (n.d.-a). Emirates Blockchain Strategy 2021—The Official Portal of the UAE Government. Retrieved March 25, 2022, from <https://u.ae/en/about-the-uae/strategies-initiatives-and-awards/federal-governments-strategies-and-plans/emirates-blockchain-strategy-2021>

UAE. (n.d.-b). The UAE's Fourth Industrial Revolution (4IR) Strategy—The Official Portal of the UAE Government. Retrieved March 25, 2022, from <https://u.ae/en/about-the-uae/strategies-initiatives-and-awards/federal-governments-strategies-and-plans/the-uae-strategy-for-the-fourth-industrial-revolution>

UAE. (n.d.-c). UAE digital government maturity model—The Official Portal of the UAE Government. Retrieved March 25, 2022, from <https://u.ae/en/about-the-uae/digital-uae/uae-digital-government-maturity-model>

UAE 5G - TDRA. (n.d.). Retrieved March 25, 2022, from <https://tdra.gov.ae/en/uae-5g>

UAE based Lleida becomes first private entity to offer Blockchain enabled UAE Pass solution—UNLOCK Blockchain. (n.d.). Retrieved March 25, 2022, from <https://www.unlock-bc.com/news/2021-04-26/uae-based-lleida-becomes-first-private-entity-to-offer-blockchain-enabled-uae-pass-solution>

UAE Cabinet Resolutions | UAE Ministry of Finance. (2018). <https://www.mof.gov.ae/en/lawsAndPolitics/CabinetResolutions/Pages/default.aspx>

UAE Employment Law Update. (2022). The National Law Review. <https://www.natlawreview.com/article/uae-employment-law-update>

UAE Federal Law Number 5 of 2012 on Combating Information Technology Crimes (Cyber Crimes Law)—STA Law Firm. (n.d.). Retrieved March 25, 2022, from <https://www.stalawfirm.com/en/blogs/view/legislation-commentary-on-federal-law.html>

UAE Federal Law Number 5 of 2012 on Combating Information Technology Crimes (Cyber Crimes Law)—STA Law Firm. (2012). <https://www.stalawfirm.com/en/blogs/view/legislation-commentary-on-federal-law.html>

UAE Government. (2021). The impact of SMEs on the UAE's economy—The Official Portal of the UAE Government. <https://u.ae/en/information-and-services/business/crowdfunding/the-impact-of-smes-on-the-uae-economy>

UAE: New Consumer Protection Law Issued November 2020. (n.d.). Retrieved March 25, 2022, from <https://www.natlawreview.com/article/consumer-protection-law-uae>

UAE Pass: The digital identity solution unlocking thousands of services in the United Arab Emirates. (2020). ITU Hub. <https://www.itu.int/hub/2020/11/uae-pass-the-digital-identity-solution-unlocking-thousands-of-services-in-the-united-arab-emirates/>

UAE Regulatory | . (n.d.). Retrieved March 25, 2022, from <https://www.grcaca.com/>

uae-regulatory/

UNCTAD. (2019). Digital economy report 2019: Value creation and capture : implications for developing countries. United Nations.

UNDESA. (2020). UN E-Government Survey 2020: Digital Government in the Decade of Action for Sustainable Development. Retrieved from New York: <https://publicadministration.un.org/en/Research/UN-e-Government-Surveys>

United Arab Emirates. FEDERAL LAW No. 15 OF 1980 GOVERNING PUBLICATIONS AND PUBLISHING, 1980. (n.d.). Retrieved March 25, 2022, from <https://www.ilo.org/dyn/natlex/docs/WEBTEXT/62110/65257/E80ARE01.htm>

United Arab Emirates—Digital and Information Communication Technology (ICT). (n.d.). Retrieved March 25, 2022, from <https://www.trade.gov/country-commercial-guides/united-arab-emirates-digital-and-information-communication-technology-ict>

United Arab Emirates—Information and Telecommunications | export.gov. (2019). Expert.Gov. <https://legacy.export.gov/article?id=United-Arab-Emirates-Information-and-Telecommunications>

VanLear, S., Clark-Sutton, K., Gonzalez, M., Brown, E., Lim, B., & Depro, B. (2018). RTI International 3040 E. Cornwallis Road Research Triangle Park, NC 27709. 14.

VzjmlB3CM34.pdf. (n.d.-a). Retrieved March 25, 2022, from <https://tdra.gov.ae/userfiles/assets/vzjmlB3CM34.pdf>

VzjmlB3CM34.pdf. (n.d.-b). Retrieved March 25, 2022, from <https://tdra.gov.ae/userfiles/assets/vzjmlB3CM34.pdf>

WAM. (n.d.-a). Effective June 1st, UAE Commercial Companies Law allows 100% foreign ownership. Wam. Retrieved March 25, 2022, from <https://wam.ae/en/details/1395302935804>

WAM. (n.d.-b). UAE Council for Artificial Intelligence and Digital Transactions holds first meeting in 2022. Wam. Retrieved March 25, 2022, from <http://wam.ae/en/details/1395303023327>

WEF. (2017). Accelerating Workforce Reskilling through 4IR.

West, D. M. (2016, October 6). Internet shutdowns cost countries \$2.4 billion last year. Brookings. <https://www.brookings.edu/research/internet-shutdowns-cost-countries-2-4-billion-last-year/>

World Bank. (2020). The Human Capital Index 2020 Update: Human Capital in the Time of COVID-19. World Bank. <https://doi.org/10.1596/34432>

World Bank. (2021). Harnessing Artificial Intelligence for Development on the Post-COVID-19 Era: A Review of National AI Strategies and Policies. World Bank Group. <https://openknowledge.worldbank.org/handle/10986/35619>

World Bank. (2021). World Development Report - Data For Better Lives.

World Wide Web Foundation. (2017). Open Data Barometer Global Report: Fourth Edition. Retrieved from London: <http://opendatabarometer.org/4thedition/report/>

Www.legal-issues-in-ecommerce.ae. (n.d.). Al Tamimi & Company. Retrieved March 25, 2022, from <https://www.tamimi.com/law-update-articles/wwwlegal-issues-in-ecommerceae/>

Yu-Che Chen, Fadi Salem, & Anneke Zuiderwijk. (2019, June). Governance in the Age of

Artificial Intelligence. Paper presented at the Proceedings of 20th International Conference on Digital Governance Research (DGO2019), Dubai.

Zawya. (2021). The United Arab Emirates ranks Third Globally for Digital Government Services. https://www.zawya.com/mena/en/press-releases/story/The_United_Arab_Emirates_ranks_Third_Globally_for_Digital_Government_Services-ZAWYA20210614103829/

Zuiderwijk, A., Chen, Y.-C., & Salem, F. (2021). Implications of the Use of Artificial Intelligence in Public Governance: A Systematic Literature Review and a Research Agenda. *Government Information Quarterly*, 38(3). doi:<https://doi.org/10.1016/j.giq.2021.101577>

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The views expressed in this report are those of the author(s) and do not necessarily reflect those of the trustees, officers and other staff of the Mohammed Bin Rashid School of Government (MBRSG) and its associated entities and initiatives.

Acknowledgements

The author(s) wish to express personal appreciation to the following individuals and entities for their input to the different stages of producing this report and for providing essential input and assistance into the report and its related materials:

HE Younus Al Nasser (Digital Dubai)
Akmaral Orazaly (Digital Dubai)
Andrew Collinge (Digital Dubai)
Ahmed El Essawi (Microsoft)
Hazar Alzaki (Microsoft)
Nadim Hasbani (Microsoft)
Ahmed Al Dabbagh (MBZUAI)
Dubai Statistics Center

The authors would also like to acknowledge the time and effort that was generously provided us by public and private sector entities across Dubai and the UAE more broadly. Due to anonymity requirements, we are unable to thank organizations by name, but wish to express our appreciation for entities who responded to our survey and participated in our focus groups and without whom this work would not have been possible.

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