













National Program for Artificial Intelligence

Program and Snapshot – April 2025

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Executive Summary

Recent years have seen artificial intelligence (AI) pervade all avenues of life, heralding a global technological revolution, with the maturation of generative AI accelerating the process even further. This technological advancement has brought about major economic, social, legal, and regulatory changes, increased global competition in the field, and presented new challenges now facing the Israeli high-tech industry and society.

However, alongside the many challenges, it is widely understood that artificial intelligence will usher far-reaching advancements in almost all spheres of life, bolstering the global economy, improving productivity, increasing the standard of living, and fundamentally changing society, high-tech, security, and the economy. This understanding induces governments worldwide to invest considerable resources and budgets in research and development (R&D) infrastructures and in implementing AI tools within the public sector, to ensure they can enjoy a substantial share of the expected benefits. This investment race coincides with the ongoing Chip War, the efforts made by leading countries to ensure computational infrastructure sovereignty, and the resulting geopolitical implications.

Israel, as a country that aspires to socioeconomic leadership and even relies on its technological leadership status for its national defense, has begun addressing this revolution and its various implications several years ago. In 2021, Israel launched its National Program for Artificial Intelligence, initially focusing on R&D infrastructures, as these presented the most pressing need at the time. The program included the investment of efforts and budgets in computational resources, talent, data, basic and applied research infrastructures, in generating breakthroughs in the high-tech industry, in developing sandboxes for experimentation, and in establishing a regulatory environment that supports innovation. It was later expanded to encompass issues of Al usage by government entities, as well as international activity to help establish the global regulatory approach in the face of technological advancements, focusing on Israel's geotechnological positioning.

The National Program is currently in its fourth year and is successfully garnering impressive achievements in all its defined areas of activity. Nonetheless, national activity must be further expanded, with an emphasis on preparation by government ministries for the changes expected in their domains as a result of the technological revolution. This includes comprehensive preparations by many major elements, such as the education, transportation, healthcare, employment, energy, and agriculture systems. Considerable transformations are already underway in each of these fields, generating threats but also great opportunities for diminishing social inequality, increasing productivity, streamlining systems, bolstering the Israeli economy's competitiveness, reducing education disparity, strengthening the labor market and improving Israeli talent, increasing life span and quality, and more.

Israel is consistently ranked in the top ten of world countries in terms of private investment and R&D in AI. About a quarter of all high-tech companies in Israel are AI companies, with corresponding rates of investment. To maintain Israel's leading status in

the face of increasing competition, further investment in R&D infrastructures and in the high-tech sector's capabilities is required, while also accelerating governmental activity to prepare the economy for the rapid changes taking place in the ministries' domains.

Israel's main AI challenges include:

- Shortage in AI researchers and experts a challenge shared by all the world's leading countries in AI. Although Israel is a leader in AI talent concentration, it still faces shortage in academic faculty in core AI disciplines, as well as a shortage in AI experts in the private sector. While other countries also face the same challenge, Israel's dependency on its "high-tech economy" means this issue is more consequential here.
- Shortage in computational infrastructure and data accessibility Given the high demand, Israel has a relatively limited access to and availability of central computational infrastructures, delaying the progress of R&D. Another challenge worth mentioning is making Israel's unique databases accessible as a basis for R&D and for generating innovative solutions in academia and high-tech.
- Regulation establishing a regulatory environment that encourages responsible innovation, while maintaining compatibility with international regulation and standards.
- Operational environment and implementation implementing AI-driven solutions in the public and private sectors to accelerate digital transformation processes and improve service for Israeli citizens, as well as forming regulatory sandboxes for experimentation.
- Comprehensive governmental preparation realizing the beneficial potential this technology represents in relation to the domains of various government ministries.

The purpose of this paper, pertaining to the National Program for Artificial Intelligence, is to present a coherent and coordinated plan for all relevant fields, to support the retainment and enhancement of Israel leadership status in AI.

Vision: "global AI leadership, to support an improved standard of living and to ensure Israel's national resilience and economic growth".

This vision anchors the National Program for Artificial Intelligence, which integrates the activities of the various government ministries and agencies responsible for promoting AI in Israel. It is based on the Artificial Intelligence Program promoted by Telem (the National Infrastructure Forum for Research and Development) – comprised of the Ministry of Innovation, Science and Technology, Ministry of Finance, Ministry of Defense's Directorate of Defense Research & Development, Council for Higher Education's Planning and Budgeting Committee, and Innovation Authority, as well as the National Digital Agency and the Ministries of Foreign Affairs and Justice. The Program is led by a central directorate, and is consulted by a scientific advisory committee chaired by Prof. Yoav Shoham involving leading researchers, high-tech professionals, and winners of prestigious scientific awards from Israel and abroad.

Objectives

The National Program for Artificial Intelligence is a multi-year program (2021-2026), budgeted at about NIS 1 billion so far. It relies on a central directorate and on the implementation capabilities of its member organizations. Its operations include coordinating the work of all relevant governmental entities. The Program is intended to create a toolbox and organizational environment that will later facilitate AI development and the securing of Israel's leading status, alongside incremental establishment of the necessary regulatory mechanisms, while fostering responsible AI usage. It relies on a comprehensive view of all relevant aspects, including technological infrastructure, talent, investment in basic and applied research, encouraging innovation, and promoting AI use within the public sector.

The program has five main objectives:

- Reinforcing Al infrastructure and research by means such as establishing computational infrastructures, encouraging groundbreaking basic and applied research, expanding the domestic Al talent pipeline across academia and industry, promoting data infrastructures and data accessibility, and developing natural language processing (NLP) infrastructures in Hebrew and Arabic.
- 2. Creating leaps in AI adoptions in high-tech industry by forming regulatory sandboxes in highly regulated fields that present a high financial potential, supporting pilot-stage projects, realizing the potential of Israel's unique data assets, and improving the capability of domestic industry to attract the best AI minds from around the world.
- **3. Implementing AI in public sector** implementing knowledge, capabilities, and tools in national and municipal government. Improving public service, streamlining processes, and improving decision-making processes based on data and technology.
- 4. Securing Israel's global geo-technological position in AI Preserving and expanding Israel's technological sovereignty and qualitative edge; deepening strategic partnerships via joint research and dual-use technology development; Positioning Israel as a regional AI hub and trusted partner; Actively participating in international forums to shape global AI standards and regulatory frameworks, to influence the future of AI and maintain Israel's freedom of action.
- 5. Promoting AI at the national level Maximizing the societal and economic benefits entailed in AI, by promoting comprehensive preparation and adaptation plans by government ministries in their domains. Equipping the public and workforce with AI-relevant skills, in aspects of education, employment, regulation, Responsible and trustworthy AI, and others.

It should be noted that this paper does not pertain to defense preparations as they relate to AI, and that such aspects are handled separately by the responsible entities.

Main actions and efforts:

- Promoting academic and research excellence in AI Israel is considered a global leader in AI research and development. Nonetheless, the number of academic faculty in AI is stagnating, and there is a need to enhance basic research and increase future faculty potential in order to maintain Israel's relative advantage.
- Encouraging commercial and applied research and promoting excellence by transferring knowledge from academia to industry entities – incentivizing applied research to generate synergy between Israel's academic innovation and the domestic industry's practical needs. This will facilitate commercialization and transfer of knowledge, will lead to the creation of new workplaces, and will enhance high-tech's contribution to Israeli economy.
- Strengthening Israel's R&D infrastructures, including computational infrastructure Al requires extensive computational power, and the availability of such infrastructures to researchers and high-tech companies. There is also additional importance to the availability and accessibility of databases, and to minimizing the gap between existing language processing capabilities in Hebrew and Arabic as compared to English.
- Generating data assets as a basis for diverse R&D Israel's data assets are considered unique and constitute a high-quality basis for groundbreaking R&D in high-tech and academia. These assets can later serve Israel in other fields and will also support Israel's participation in global competition.
- Promoting Al implementation in the public sector to improve public service and standards of living, diminish social inequality, streamline the work of government ministries and agencies, promote operational efficiency, improve decision-making processes, and more.
- Establishing sandboxes for experimentation to promote and facilitate collaborative and safe learning by regulators alongside the high-tech industry, in an effort to accelerate technological disruption in Israeli industry while leveraging the existing assets to promote macro-economic benefits, by adopting solutions developed by the local high-tech industry.
- Leading international AI collaborations strengthening existing collaborations with foreign countries as well as promoting new ones.
- Formulating and establishing AI regulatory framework in Israel promoting "responsible innovation" in all the aforementioned activities, while protecting Israeli citizens and their rights from the risks AI entails. All this in accordance with the Israeli regulatory approach to AI, as reflected in Israel's Policy on Artificial Intelligence Regulation and Ethics published by the Ministry of Innovation, Science and Technology and the Ministry of Justice. This approach espouses encouraging innovation, while

meticulously protecting basic and human rights, and synchronizing with the regulation being established globally.

This paper comprises two main sections: the first section presents an in-depth analysis of current global AI state of play, and on Israel's relative status (investments, consequences, technological advancements, and more). The second section details Israel's strategic program, its objectives, components, and guiding principals, including future avenues of action.



Introduction

Israel's national resilience relies on the convergence of economy, society, and defense. These are based on excellent talent pool and on science and technology infrastructures. Maintaining Israel's scientific-technological leadership in the world and its position at the forefront of knowledge in varied disciplines are critical to its continued prosperity. One of the fields with highly accelerated research and technological advancements in recent years is artificial intelligence, leading a global technological revolution, which was accelerated even further with the maturation of generative AI in late 2022. This technological advancement has led to significant economic, social, and regulatory changes, as well as to increased global competition.

To maintain Israel's leading status in the face of the intensifying competition, Israel must utilize a coherent strategy encompassing all the relevant governmental entities, and provide an organizational, physical, human, legal, and regulatory infrastructure for the sustainable development of technological innovation, while leveraging its benefits for Israeli economy, society, and national defense.

The purpose of this document is to detail the components of a national strategic program for AI, which will allow Israel to continue maintaining its leading global status. The program encompasses infrastructure components including computational, data, talent, regulatory components, main actions for public-sector adoption, characteristics of the necessary international collaborations, tools for encouraging innovation and experimentation, as well as the planning and management mechanisms and the longterm goals that support the program.

The program has five main objectives:

- 1. Al infrastructures establishing computational infrastructures, supporting groundbreaking basic and applied research, extending the talent pool in high-tech and academia, promoting data infrastructures and data accessibility, and developing natural language processing infrastructures in Hebrew and Arabic.
- 2. Al in high-tech facilitating in the removal of regulatory barriers in areas with an economic potential by forming regulatory sandboxes, supporting pilot-stage projects along with select regulators, streamlining the process of bringing foreign residents into the high-tech industry (including returning residents, new immigrants, and foreign experts) and facilitating their assimilation, career-change tracks for graduates of scientific degrees.
- **3. Implementing AI in public sector** implementing knowledge, capabilities, and tools in national and municipal government. Improving public service, streamlining processes, and improving decision-making processes based on data and technology.
- **4.** Securing Israel's global geo-technological position in AI leveraging Israel's capabilities to enhance its technological independence and ensure its qualitative

advantage; increasing Israel's strategic value among its allies, through technological and economic collaborations; promoting Israel' status as a regional AI leader and as a center for technological partnerships with the countries of the region; promoting Israel's involvement in international forums for establishing regulation and standards, to influence the future of AI and maintain Israel's freedom of action.

5. Promoting AI at the national level – actualizing the social benefits entailed in AI, as well as comprehensive national preparation by government ministries in their domains. Enhancing public preparedness for AI, in aspects of education, employment, regulation, safe artificial intelligence, and others.

Since 2019, Israel had nominated several expert committees that formulated various proposals for a national AI program, all including tools for strengthening infrastructures and promoting Israel's status. In 2021, the National Program for Artificial Intelligence, led by Telem, was launched, intended to prepare for the challenges posed by the emergence of AI, and to outline a comprehensive national plan. Concurrently, Government Resolutions 212^1 and 173^2 are intended to secure the means of promoting regulation, ethics, representation in international forums, and AI adoption in the public-civil sector.

In addition, the Israeli government also promoted complementary actions for accelerating the public sector's digital transformation, including the government cloud project (Project Nimbus) derived from Government Resolution 1700. The purpose of Nimbus is to transfer most governmental computational infrastructures to the cloud, enabling access to the Al tools available on cloud platforms as part of that process.

The rate of AI advancement in the past two years, especially since the entry of generative AI in 2022, presents new challenges for Israel and the world at large. The National Program for Artificial Intelligence elucidates the challenges and solutions, enabling the provision of new tools for the government to address its AI challenges, in congruence with global circumstances.

The vision defined to anchor and lead the Program is: **"global AI leadership, to support** an improved standard of living and to ensure Israel's national resilience and economic growth".

This vision was determined in the face of rapid advancements in AI technology, application, and regulation, and in the face of increasing use of these technologies in the private and public sectors. It outlines objectives that necessitate cooperation between the various ministries. The Program breaks down the various components required to secure AI in Israel, while also emphasizing cooperation between different entities, including academia, industry, government, and society.

¹ Resolution 212 by Israel's 36th Government – Plan for Promoting Innovation, Encouraging Growth in High-Tech, and Strengthening Technological and Scientific Leadership (08/01/2021) <u>https://www.gov.il/he/departments/policies/dec212_2021</u>

² Resolution 173 by Israel's 37th Government – Enhancing Israel's Technological Leadership (02/24/2023) <u>https://www.gov.il/he/departments/policies/dec173-2023</u>

Section A – Global AI Landscape Review

Chapter 1: World-Changing Artificial Intelligence

1.1. The AI Revolution

With the increase of artificial intelligence usage³, recent years have seen a sharp upsurge in the variety of AI applications. Such applications, along with the removal of barriers leading to subsequent adoption, have made plain that this is a disruptive technology⁴, redefining industries, value chains, and even our perception of the difference between Man and machine.

The inception of artificial intelligence as a research field that aspires to create machines that simulate human intelligence is attributed to 1956⁵. Following a short term of growth, and facing considerable technological barriers, academic research in the field was abandoned for several decades, until late in the first decade of the 21st century. At this stage, conditions have matured for renewed growth in the field, including sufficient computational power and reduced cost, widespread availability of digital data, and enabling algorithmic breakthroughs.

A series of seminal research works by three researchers, sometimes referred to as the "Godfathers of AI"⁶, led to an impressive leap in AI capabilities around the year 2014.

The launch of consumer-access generative AI in November 2022 broke through the usability barrier and turned the foundation models into a flexible technological infrastructure that can be utilized in a plethora of ways. This advancement was the final seal of approval, indicating that AI is no longer a niche technology, but a disruptive technology that takes human-machine interactions to new realms, and destined to bring about a far-reaching revolution encompassing many spheres of life.

1.2. The Generative AI Revolution

In November 2022, OpenAI launched their Chat-GPT service, for the first time ever allowing free, dialogue-based interaction between any user and a machine. Users draft instructions or requests for the machine using natural language, and the machine fulfills the user's request, creating a designated and customized response text. This technology was named Generative AI, or gen-AI, and has revolutionized the way we perform research and consume information, as well as the way AI is perceived by all stakeholders. Large language models (LLMs), which were later developed into Foundation Models, have

³ The term Artificial Intelligence has received many definitions in recent years. The last and most widely accepted definition was completed in 2023 by the OECD. <u>https://www.oecd.org/en/publications/explanatory-memorandum-on-the-updated-oecd-definition-of-an-ai-system 623da898-en.html</u>

⁴ Disruptive innovation – Wikipedia (wikipedia.org)

⁵ <u>https://www-formal.stanford.edu/jmc//</u>

⁶ Yoshua Bengio, Geoffrey Hinton and Yann LeCun

turned into infrastructural tools to develop applications in a large range of disciplines, managing to surpass human capabilities in many benchmarks and tests.

Earlier AI systems (sometimes referred to as "narrow AI") were trained and designed to solve specific and well-defined problems, and could not compete with the human ability to learn new tasks and get better at them, to demonstrate creativity and adaptiveness. The emergence of gen-AI marks a new and significant stage in our advancement towards Artificial General Intelligence (AGI), which will be flexible enough to perform a wide variety of tasks much like a human, and will even be able to produce new content such as pictures, musical compositions, videos, texts, or software code, based on written human instructions, using computational learning algorithms and models.

In the upcoming years we can expect this accelerated technological advancement to proceed. Specifically, gen-AI systems are expected to constitute the basis for "AI agents" that specialize in various disciplines and can perform actions in the physical and digital space, much like humans.

A prominent and unique example for such agents is reflected in the long-standing aspiration of creating humanoid robots that can easily integrate in the human world, fulfill a wide range of tasks, and use tools and devices that were originally designed for humans. The accelerated advancement of integrating robotic tools, along with the flexible deduction and interaction capabilities of current foundation models, suggests the possibility of creating such humanoids within a few years, giving rise to a series of complex questions about reciprocity between these machines and the human environment.

1.3. Israel and the Global AI Race

In the past decade, the countries of the world have been competing for leadership in the AI field. This race places Israel in fierce competition with resource-rich countries such as the US, China, and the UK, with Israel ranked by various indices in the top five/ten among the nations. For example, according to the Tortoise Global AI Index⁷, ranking the 83 leading countries in the field, Israel is ranked 9th in the world, and 2nd relative to population size. Israel's relatively high ranking in this index is based on its strengths in R&D, commercialization, and talent concentration.

⁷ <u>https://www.tortoisemedia.com/intelligence/global-ai/</u>

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		Overall ÷	Talent	infrastruct	operating f	Inviron	Research	\$	ant	Governme ¢	Commerci ¢	al	Scale ¢	Intensity ¢
	United States	0	1	1	2		1	1		2	1		1	3
*2	China	2	9	2	21		2	2		5	2		2	21
C	Singapore	3	6	3	48		3	5		10	4		11	1
	United Kingdom	4	4	17	4		4	16		7	5		3	9
	France	5	10	14	19		6	4		9	8		6	10
:0;	South Korea	6	13	6	35		13	3		4	12		7	11
	Germany	0	3	13	8		8	11		8	9		5	15
+	Canada	8	8	18	16		9	10		3	6		8	8
\$	Israel	9	7	26	65		7	6		32	3		14	2
-	India	10	2	68	3		14	13		11	13		4	36
•	Japan	1	23	5	53		20	14		12	14		9	31
+	Switzerland	12	5	11	58		5	19		64	20		29	4
	The Netherlands	13	11	7	29		15	17		19	23		13	12
5,5113	Saudi Arabia	14	60	29	41		42	26		1	7		10	24
+	Finland	15	14	12	9		18	12		25	15		18	6
*	Hong Kong	16	21	8	40		10	18		59	11		20	7
*	Australia	17	17	39	13		11	7		42	21		15	18
4	Spain	18	18	19	17		26	21		6	32		12	25
=	Luxembourg	19	12	10	23		16	24		33	26		32	5
	United Arab Emirates	20	48	16	47		12	9		23	17		21	13

Figure 1 – World's leading nations by various indices in artificial intelligence Source: Tortoise Global Al Index

Another significant index mentioning Israel as a global leader, especially in development, is Standford University's AI Index Report, published every year, and last published on April 2025⁸. The report mentions Israel among the leading countries in AI innovation, mentioning its strengths in commercialization, investments, and talent concentration.

⁸ <u>https://hai.stanford.edu/ai-index/2025-ai-index-report</u>



Al talent concentration by geographic area, 2024

Figure 2 – Leading nations in AI talent concentration in artificial intelligence Source: Stanford AI Index 2025⁹

It places Israel in the 4th spot, after the US, China, and the UK respectively, in the number of AI companies that received funding in the years 2013-2024 (492 new Israeli companies accumulatively), and in the 5th spot in the scope of investments raised by Israeli companies during that same period (approx. \$15B).

⁹ <u>https://hai.stanford.edu/ai-index/2025-ai-index-report</u>





Source: Stanford AI Index 2025¹⁰

Global private investment in AI by geographic area, 2013-24 (sum)



Figure 4 – private investments in artificial intelligence by nations in the years 2013-2024 Source: Stanford AI Index 2025¹¹

Moreover, the report also ranks Israel 6th in the number of "notable models" developed within its borders.

¹⁰ <u>https://hai.stanford.edu/ai-index/2025-ai-index-report</u>

¹¹ <u>https://hai.stanford.edu/ai-index/2025-ai-index-report</u>

Chapter 2: AI Investment Race

2.1. Global Private Sector Investment in AI

As of 2019, a sharp increase is evident in the scope of investment in AI, in both absolute numbers and in comparison, to other investment fields.



Global corporate investment in AI by investment activity, 2013-24

Examining the geographic distribution of investments reveals that the US leads in overall investment, followed by China and Europe.

¹² https://hai-production.s3.amazonaws.com/files/hai ai index report 2025.pdf



Figure 6 – World map – overall investment (funding and transactions) in artificial intelligence globally in the fourth quarter of 2023

A sharp increase in investment scope is also evident in generative Al.



Figure 7 – Private investment in generative artificial intelligence 2019-2024 Source: Stanford AI Index 2025¹³

It is important to note that 2022, the year following the Covid-19 epidemic, was characterized by high inflation rates accompanied by frequent interest increases by central banks around the world, and by dramatic geopolitical events like the Russia-Ukraine war. Despite these uncertain conditions, which traditionally reduce investors' risk-taking tendencies, the opposite was true as it pertains to investment in AI – indicating optimism about the market potential of this field.

¹³ <u>https://hai-production.s3.amazonaws.com/files/hai ai index report 2025.pdf</u>

Additionally, the EU report indicates that in 2023, AI investment amounted to \$130B and are projected to increase to approx. \$1.9T by 2030¹⁴, with 2023 investment in AI in the US alone amounting to \$67.22B.

2.2. Private Sector Investment in AI in Israel

The tide in AI-technology investments, particularly in gen-AI, did not pass over Israel. The OECD's current bi-annual survey of Israel's economy included a dedicated chapter pertaining to AI in Israel. Within this analysis, the OECD researchers note the dominance of AI investment and of Israel's domestic high-tech industry. They mention that venture capital investment in AI companies amounts to more than 11% of Israel's GDP, and that the number of AI companies per capita is second only to that of Singapore.



Figure 8 - Venture capital investment and the number of AI companies per capita, based on OECD data



According to IVC data, venture-capital investment in AI is on the rise, with half of the investments in Israeli technological companies concentrated on AI companies in 2023. A report by RISE published in May 2024¹⁵ reflects a similar picture. The report also claims that AI companies tend to attract more financing capital than other high-tech companies. Nearly 70% of active AI companies managed to raise funds, compared to only 55% of other high-tech companies. AI companies' ability to raise funds is also reflected in their growing employee number. In 2023, a quarter of all new AI companies were gen-AI companies, garnering a third of all AI investments.

¹⁴ <u>https://www.europarl.europa.eu/RegData/etudes/ATAG/2024/760392/EPRS_ATA(2024)760392_EN.pdf</u>

¹⁵ <u>RISE Israel (rise.il.org) Israel's status in the artificial intelligence race</u>

Al Share of Investments

Source: RISE Israel analysis to IVC data

AI Share of Number of Funding Rounds

AI Share of Investment Amounts

- AI Share of All Investments Investments in AI (\$Bn)





Source: Global data from PitchBook, Israeli data from IVC

Investments in AI (2018=100)



Source: Global data from PitchBook, Israeli data from IVC

Figure 9 – Ratio of artificial intelligence out of venture capital investments Source: RISE analysis of IVC data, out of RISE report

Despite growth in company number, local investments, and encouraging data, Israel is still far from optimally utilizing the "boom" in gen-AI.

RISE data indicates that while investment in Israeli gen-AI companies rose by about 85% in the years 2020-2023, this growth is low compared to the growth rate observed in the US (900% growth) and Europe (300%). The same trend also applies to other areas of artificial intelligence. In addition, according to the same RISE report, Israel has experienced a mild 24% increase in investment in NLP in the years 2020-2023, much lower than the growth rates recorded in the US and Europe (183% and 54% respectively). Moreover, investment in computer vision decreased during the same period. Overall, Israel recorded lower growth in AI investments, and despite the investment peak of 2021, in 2023 investment decreased to 2018 levels, in contrast to the trends observed in Europe and the US, where high levels of AI investment were maintained despite the economic deceleration characterizing this period.

2.3. Economic Growth and Streamlining Thanks to AI Investment

It is widely understood, as reflected in many fields and disciplines, that artificial intelligence usage will result in far-reaching streamlining in almost all avenues of life, will bolster global economy, improve productivity, and improve standards of living. A report by McKinsey presents evidence of an increase in profitability (about 10%¹⁶) and a decrease in expenses following the adoption of AI technologies.

McKinsey's Economic Potential of Generative AI report of 2023¹⁷ indicates that gen-AI usage is expected to result in an economic streamlining amounting to \$2.6T-\$4.4T each year, based on a limited analysis of 63 active AI applications. The report also claimed that the ability of employees to access organizational information quickly using natural language will facilitate rapid and informed decision making, also leading to significant improvements in efficiency, especially in financial services, high-tech, media, and life sciences.

The CBINSIGHTS 2024 report¹⁸, based on McKinsey's reports, presents an analysis of fields in which the productivity rate is expected to increase most significantly as a result of adopting digital technologies, and specifically AI. In general, the more the field is based on services and information, the greater the streamlining potential. Profitability rates are projected to increase by about 9% in high-tech, by 4% in banking, by 3% in healthcare and education, and by 3% in insurance and media.

¹⁶ <u>McKinsey's Report: The state of AI in 2023: Generative AI's breakout year | by Raimund d'Aubigne | Medium</u>

¹⁷ Economic potential of generative AI | McKinsey

¹⁸ <u>https://www.cbinsights.com/research/report/generative-ai-predictions-2024</u>

2.4. Israeli High-Tech's Growth Potential

Israel has good baseline stance, allowing it to cope with the developing global competition and to leverage the AI revolution into economic growth – high-quality talent, excellent R&D and commercialization capabilities, large corporate investments, and more.

A report by Deloitte¹⁹ divides the AI industry's activity into several sub-categories, including five that are most relevant to Israel – infrastructures, foundation models, vertical applications, organizational automation, and consumer products. The report even analyzes the Israeli industry's growth potential in each of these sub-categories, and indicates Israel's comparative strengths in three out of the five – AI & Data Ops, vertical applications (focusing on specific industries such as healthcare, finance, defense, etc.) for developing industry-specific AI technologies, but also in "horizontal" cross-industry applications, in light of advanced capabilities in a variety of existing industries (cyber, robotics, etc).

Israel is also exhibiting a more moderate growth potential in other fields, such as hardware infrastructure and model security.

This analysis coincides with the characteristics of the local high-tech industry and appropriately reflects its growth potential. It focuses on technological strengths over areas in which an extremely large investment of capital is required (such as the development of foundation models).

2.5. Government Investment in AI

Hand in hand with the increase of corporate investment in AI, government spending in the field has also increased considerably. Various governments invest great resources in research and development infrastructures to secure their technological leadership, and to ensure they enjoy a significant share of the projected economic and societal benefits.

This investment race often coincides with the Chip War and with each country's efforts to ensure computational infrastructure independence. The computational power required to train and use advanced AI models has grown exponentially in recent years, causing a global shortage in the specific type of chips used for the training process (known as GPUs or AI-Accelerators). This has led several nations to invest immense resources in purchasing computational infrastructures, as well as to attempt to establish as much of the value chain as possible within their own borders. In 2022, the US launched a \$50B program, intended in large part to encourage the establishment of chip manufacturing factories within the country²⁰. Several months later, the EU launched its own counterpart program in a similar scope²¹. In 2014 The Chinese Government launched a \$150B

¹⁹ Future Forward: Israel's AI Expansion Blueprint Israel AI Blueprint Report

²⁰ <u>Biden Administration Releases Implementation Strategy for \$50 Billion CHIPS for America program | U.S. Department of Commerce</u>

²¹ European Chips Act - European Commission (europa.eu)

investment focused on chip design and manufacturing, planned to conclude in 2030²². Saudi Arabia, United Arab Emirates, the UK, France, and India have launched more targeted programs for the purchase of AI GPUs and for the establishment of computational infrastructures in each of these countries²³ at an accumulative scope of about \$40B.

Alongside the immense investment in infrastructures in order to actualize the economic benefits of AI, various governments are also striving to actualize the social benefits, primarily improving public service, improving quality of life, reducing inequality, streamlining the work of government ministries, improving decision-making processes, and streamlining municipal services in local government. According to McKinsey's report, the accumulative effect of implementing AI in these systems can produce an average 40% value to various economies.

Various national strategies combine investments in private sector companies, support for computational infrastructures, enhancement of talent, and R&D reinforcement. It goes without saying that these investments require a comprehensive strategic assessment, including plans for leading consortiums that combine research, society, and free economy, as well as regulatory action to allow AI to develop according to each country's needs.

Several prominent examples of national investment plans launched in the world in the past two years are listed below:

- The US billions of dollars invested in AI R&D plans for promoting AI adoption in industry and the public sector, and a new infrastructure to promote AI literacy, focusing on the necessary skills²⁴.
- China launched a strategic program amounting to hundreds of billions of Yuan, including significant investment in AI R&D and in digital infrastructures, intended to turn China into an AI leader by 2030²⁵, with reference to AI pushing forward robotics, next generation internet, quantum computing, and R&D in general.
- European Union published several R&D investment programs and collaborative research budgets, as part of its Horizon Europe framework. The programs include investment in computational infrastructures (HPCs) as well as support for groundbreaking research. They focus on R&D in academia and industry, and in promoting AI applications in industry and public services²⁶.

²² China's New Strategy for Waging the Microchip Tech War (csis.org)

²³ Welcome to the era of AI nationalism (economist.com)

²⁴ <u>https://2021-2025.state.gov/artificial-intelligence/</u>

²⁵ <u>https://www.globaltimes.cn/page/202401/1305114.shtml</u>

²⁶ https://www.europarl.europa.eu/RegData/etudes/ATAG/2024/760392/EPRS_ATA(2024)760392_EN.pdf

- Canada investment of \$2.4B in AI R&D and in plans for AI adoption in industry and the healthcare system, intended to improve innovation and technology and promote the digital economy, support the development of advanced technologies, reduce the gap from more technologically advanced countries, and maintain significant AI capabilities²⁷.
- Japan Japan's Ministry of Economy allocated \$740M to support its strategy for developing and using AI, intended to make Japan a gen-AI leader by investing in infrastructures and promoting collaborations with industry²⁸.
- Singapore allocated \$743M for a five-year program launched in 2024²⁹. The program focuses on developing the high-tech and startup industry and using AI in public sector and the healthcare system. It is intended to turn Singapore into a center of technology and innovation in Asia, and to expand its AI ecosystem.
- Germany will allocate EUR 1.6B via its Education and Research Ministry, to promote research and fund AI collaborations within the EU, in an attempt to minimize the gap with the US and China. The German program defines 12 areas of activity, including education, R&D, infrastructures, and others³⁰.

^{27 &}lt;u>https://alliancecan.ca/en/latest/news/digital-research-alliance-canada-applauds-24-billion-ai-investment-announced-government-canada</u>

²⁸ <u>https://techinsightzone.com/japan-is-investing-740-million-to-achieve-ai-supremacy/</u>

²⁹ <u>https://www.cnbc.com/2024/02/19/singapores-ai-ambitions-get-a-boost-with-740-million-investment-plan.html</u>

³⁰ <u>https://www.euractiv.com/section/artificial-intelligence/news/german-ai-action-plan-the-answer-to-chinese-and-us-dominance/</u>

Chapter 3: Artificial Intelligence in Israel

3.1. Global Comparative View

Various comparative reports consistently rank Israel at the top of the global AI field. The following is a brief summary of Israel's status as it is depicted in several main reports:

3.1.1. Research and Development

As mentioned in Chapter 1.5 – Israel and the Global AI Race, Israel is ranked at the top of the global ranking by the ³¹Tortoise Global AI Index and is considered one of the world's leaders in AI technology and innovation. Israel's leading status is reflected in the number of scientific publications, the scope of investment in Israeli technological companies, the number of new startup companies founded each year, and other indicators. For example, in 2022 Israel was ranked as the leader in the number of AI companies per one million citizens (84 AI companies for each million citizens, compared to 28 AI companies for each million citizens in the US, 26 in the UK, 36 in Switzerland, and 76 in Singapore), and fourth in the world in the number of AI startup companied founded in the last decade.³²In 2021, \$257 per capita were invested in AI in Israel (compared to \$163 per capita in Singapore, \$160 in the US, and \$69 in the UK).³³

According to a May 2024 analysis by RISE Institute, Israel has about 2,300 operational AI companies, constituting a quarter of the Israeli high-tech industry. 48% of all high-tech companies are software companies, and more than 60% of them are based in some way on AI technologies. In other fields, AI is slower to penetrate. For example, in the media field, less than 10% of companies are based on AI, while media constitutes about 10% of all high-tech companies.





³¹ <u>https://www.tortoisemedia.com/intelligence/global-ai/</u>

³² Stanford University database 2022

³³ Analysis of Pitchbook 2022 data by KPMG

In addition to local Israeli companies, Israel also is the home for about 100 R&D centers of multinational corporates that focus on AI., Those centers play a significant role in the Israeli AI eco-system, with considerable contributions to both development and employment. Companies such as Intel, IBM, Nvidia, Google, and Microsoft have all longestablished R&D centers in Israel, developing AI technologies and playing a significant role in encouraging AI entrepreneurship in Israel.

The number of AI companies has risen considerably in recent years, as did the ratio of AI companies among all startup companies founded in Israel. In 2023, new AI startups constituted 49% of all startups founded that year, as compared to just 34% the year before.



Number of New AI Startups and Their Share of Startups Established

Figure 11 – New artificial intelligence startup companies and their ratio among all founded startups

Source: RISE Israel analysis of IVC data

While Israel's strengths are impressive, it is important to note that its leading status is not guaranteed. With increasing global competition, Israel has gone down in ranking from fifth place in 2020 to ninth place in the Tortoise Index in just 4 years, while other countries like Singapore, which implemented significant national action, have risen (from tenth to third place during that same period). The decrease serves to emphasize Israel's need for a coherent strategic program.

3.1.2. Al Adoption in the private and public sectors

Accelerating AI adoption in the public sector and in domestic economy is a challenge for many countries. In these aspects, Israel is trailing behind, with a tremendous disparity between its scientific capabilities to develop technologies and their adoption in the market, and the public sector for improving efficiency and the level of public services. While R&D is of course completely different than adoption and usage, it would be a mistake to separate them. Both success in R&D and the ability to implement AI technology in the market will facilitate substantial streamlining and cost saving, increase the GDP, and support Israel overall AI leadership.

A McKinsey report presents the potential of generative Al's for improving technical capabilities in activities performed by professionals in various fields³⁴. Considerable improvement is evident in education, law, science, technology, etc. Productivity is considerably improved in almost every field that adopts Al.

Advances in technical capabilities could have the most impact on activities performed by educators, professionals, and creatives.



Note: Figures may not sum, because of rounding. Previous assessment of work automation before the rise of generative AL. Includes data from 47 countries, representing about 80% of employment across the world. Source: McKinsey Giobal Institute analysis

McKinsey & Company

Figure 12 – The impact of generative artificial intelligence on technical capabilities in various fields

Source: McKinsey

³⁴ Economic potential of generative AI | McKinsey

A survey by the Central Bureau of Statistics (CBS) conducted in 2021³⁵ (the most up-to-date relevant survey currently available), revealed that only 4% of Israeli businesses reported using AI, a lower rate than the EU average at 7%. The same survey describes the dynamics of technology adoption across all sections of Israeli economy, emphasizing that there is a considerable difference between technology adoption in knowledge-intensive industries and between other industries. While 34% of the information and communication sector employees (most of whom belong to the high-tech sector) reported using AI, the rate of AI usage in industries such as construction, transportation, and commerce drops to only 3%. In addition, large businesses tend to use AI more than small businesses. Without a proactive policy, this pattern will continue to limit the actualization of the vast social and economic potential this technology entails. The survey also indicates that about 33% of information and communication businesses use AI. Overall, AI technology is at a 12% usage rate, mainly in large businesses in the high-tech sector.

Another important aspect in the efforts to encourage AI adoption in the public sector pertains to the public's willingness to adopt and use these systems. A survey by the Privacy Protection Authority conducted in May 2023 reveals that about 62% of the Israeli public is concerned about the application of AI systems when receiving services from such systems. The survey was conducted by the Authority to examine public opinion on issues of information privacy protection in the digital and public spaces. Survey participants were asked about their opinion on the importance of protecting information privacy in various aspects of life, and about 86% responded rated the importance of protecting their privacy in the digital space as either "high" or "very high". The responders' main concerns about using websites, social media, or similar applications pertained to the leakage of personal information due to an information security event, and to the information being utilized for purposes other than those agreed to during usage³⁶.

Another factor contributing to under-adoption of AI technologies in Israel is the considerable gap in AI systems' ability to process input in Israel's local languages - Hebrew and Arabic. This gap stems from the high initial cost required to develop language capabilities in languages besides English, making the endeavor almost unfeasible from a financial point of view. There are about 15 million Hebrew speakers worldwide, and the cost of developing a large language model (LLM) in a local language is estimated at tens of millions of dollars. Hence, the number of Hebrew speakers is simply too small to sustain a business model that can justify the investment necessary for LLM development. The private sector therefore has no real incentive to bridge the current technological gap between English and Hebrew.

It is important to note that bridging the technological gap in language processing is required both to allow governmental AI applications for the benefit of the Israeli public,

³⁵ https://tinyurl.com/CBS-survey1

³⁶ <u>https://www.gov.il/he/pages/survey2023</u>

as well as for making Israel's unique databases, containing information in Hebrew and Arabic, accessible for use by advanced technological systems.

As part of their efforts to accelerate technology adoption and digital transformation in the public sector, In May 2024 the Ministry of Innovation, Science and Technology and the National Digital Agency published a list of government entities that received budgetary support as part of the first round of the program to implement artificial intelligence in the public sector³⁷. The program is intended to improve and develop government services for citizens, and to streamline the ministries' work. That same month, an inter-ministerial team began collaborating to formulate a multi-year plan for implementing AI in the public sector. The plan is expected to include action to improve information infrastructures in the public sector, data sharing between different entities, enhancing talent capabilities and establishing the ecosystem, improving data governance, and simplifying government procurement processes for AI-based products.

3.1.3. Talent

The quality of talent in the AI field in Israel is considered very high. According to the Stanford AI Index, Israel is ranked first globally in AI talent concentration, ninth in the growth of AI talent concentration over the past 8 years, and fifth in relative AI skill penetration in the years 2015-2023 – with a rate of more than 1.63 times the global average³⁸.

Nonetheless, considering the prominence of high-tech in Israeli economy and the increasing dominance of AI in shaping this sector and in technologically disrupting many other industries, it is unsure whether Israel has sufficient talent to support future growth and to maintain the leadership status of its AI innovation ecosystem over time. Even more so, due to the rigorous academic requirements AI experts must meet, compared to other high-tech-related disciplines.

The same is true of course for AI researchers, who must complete second and third degrees, but also for the entrepreneur population. A RISE Institute analysis indicates that the rate of academics among AI entrepreneurs is significantly higher than in the entrepreneur population in other high-tech branches – 47% of AI entrepreneurs have technological academic education, compared to 39% in other high-tech companies. This shows that academic background is meaningful in developing the field and requires maximum consideration.

³⁷ <u>The winning projects in the government's AI open call revealed – Ministry of Innovation, Science and Technology</u> (www.gov.il)

³⁸ <u>https://aiindex.stanford.edu/wp-content/uploads/2024/04/HAI_2024_AI-Index-Report.pdf</u>



Share of Founders with Academic High-Tech Training

Figure 13 – Rate of entrepreneurs with academic education in high-tech professions Source: RISE Israel analysis of LinkedIn data

The long academic education track required for AI R&D positions causes a shortage in talent and a more difficult training process in comparison to other high-tech professions. On the supply side this represents a serious problem, as growth in the number of second-and third-degree graduates in computer science, math, and statistics in Israel is on the decline, with the number of third-degree graduates almost completely stagnating in recent years.

The activity of the Council for Higher Education's Planning and Budgeting Committee in the past few years, following Government Resolution1852³⁹, significantly increased the number of BA students in high-tech disciplines. Yet increasing the number of research degree graduates (MS.c, Ph.D) is a much harder challenge, shared by other countries as well.

³⁹ <u>https://www.gov.il/he/pages/dec1852_2022</u>



A. Bachelor graduates as a share of their age cohort

B. Master graduates as a share of their age cohort



Figure 14 – graduates of academic degrees in math, statistics, physics and STEM Source: OECD Biannual Survey of Israel Economy

This insight is also reflected in the OECD Biannual Survey of Israel Economy, as seen in Figure 14. The figure clearly shows Israel's high ranking in the rate of bachelor graduates in the general population, compared with the relatively low ranking of master graduates. Beyond the global challenge shared by Israel and other countries, OECD researchers point to compulsory military service in Israel as a factor that delays entry to academic studies, increasing the pressure among bachelor graduates to assimilate in the industry without continuing their advanced studies. The researchers also point to means Israel can take to continue expanding its expert pool, including increasing the relative share of women in the relevant advanced degrees.

3.1.4. Israeli scientific publications

While Israel is responsible for 0.5% of all AI related research papers published in the years 2017-2023, it garnered 2.1% of the citations during that period. As can be seen in figure 15, the areas in which Israel is highly quoted, are NLP and computer vision, although the rate of relevant publications by Israeli researchers is under 1%.



Figure 15 – Publications and quotes of Israeli articles in artificial intelligence research fields

Source: RISE report quoted by OECD.AI

3.1.5. Summary of Israel's status

The challenges Israel faces are similar to the ones faced by other global AI leaders: shortage in skilled talent, shortage in computational infrastructure, shortage in information infrastructures and access, shortage in sandboxes and lack of a regulatory framework that can provide certainty for the market on one hand while allowing experimentation on the other.

According to international indices, Israel's is ranked high. The reviewed reports emphasize Israel's strengths in talent, R&D, and commercialization, and position Israel in the top median of ranked countries. Yet alongside the optimistic aspects, the reports also point to Israel's relative weaknesses in strategy, infrastructure, and operational environment. The Tortoise AI Index ranked countries on AI infrastructure, operational environment, and government strategy, in which Israel is ranked in the lower places (26, 65, 32 respectively). These categories are essential to Israel's continued leadership and growth, especially in relation to global competition. As specified below, these categories will feature at the center of the National Program for Artificial Intelligence.



Chapter 4: Global Regulatory Response to AI Challenges – Comparative View

4.1. Background

In 2019, the OECD published a set of Recommendations for the AI field, known as the OECD Trustworthy AI Principles. These include a series of high-level guidelines for responsible development and usage of AI systems in both the public and private sectors. The organization has later published an update to these principles in 2024, mainly focusing on an updated definition of artificial intelligence, and addressing the unique characteristics of generative AI systems. Those principles were approved by OECD countries, including Israel⁴⁰, and were even adopted by additional countries. While the principles are not legally binding, they reflect a global benchmark for AI governance policies. In 2023-2024, many countries, including the EU, published AI-related legislation and policy papers, promoted standardization, and published AI ethics guidelines. The OECD principles formed the basis for all of these publications and measures.

The principles' underlying view is that AI is expected to be integrated into many areas, generating far-reaching changes, and although this technology can be highly beneficial and contribute to economic growth, public welfare, and scientific advancement, it also entails considerable risks. The principles, which are detailed below, are intended to form a baseline framework to ensure responsible development and application of AI systems (note that the Israeli regulation paper suggested adopting these principles with certain adaptations⁴¹):

- Al for inclusive growth, sustainable development, and societal well-being stakeholders should proactively engage in promoting Al that will bear beneficial outcomes for people and the environment, such as augmenting human skills and capabilities, advancing digital inclusion of underrepresented populations, reducing ssocioeconomic disparities, protecting natural ecosystems, and more.
- 2. Respecting the rule of law, human rights, and democratic values, including fairness and privacy ensuring that AI systems adhere to equality and respect the rights to freedom, dignity, and autonomy of individuals. For that purpose, robust privacy and data protection mechanisms should be implemented. In addition, means should be taken to address AI-enabled misinformation and disinformation. To this end, AI stakeholders should implement appropriate mechanisms, such as human-in-the-loop controls, algorithmic oversight, as well as risk management, in a manner appropriate to the context and consistent with the state of the art.
- **3. Transparency and explainability** AI stakeholders should commit to transparency regarding the AI systems under their responsibility. They should provide meaningful

⁴⁰ <u>https://www.oecd.org/en/topics/sub-issues/ai-principles.html</u>

⁴¹ See page 15 of principles paper.

information that will clarify the system's manner of operation, including its logic, purpose, capabilities and limitations, make stakeholders aware of their interactions with AI systems, provide information on data sources and the logic that underly the system, and finally provide information to enable addressing the system's potential adverse impacts.

- 4. System security and safety in developing and applying AI systems, they should be made credible and safe throughout their entire lifecycle so that, in conditions of foreseeable and unforeseeable use (misuse or adverse external conditions), they function appropriately and do not pose unreasonable safety and/or security risks. Mechanisms should be placed to address risks caused by the system.
- 5. Accountability AI developers, operators, or users should be accountable for its proper functioning and for upholding the above principles, based on their roles and consistent with the state of the art. To this end, risk management mechanisms should be developed and internal conduct guidelines adopted to address risks (including social risks such as bias, privacy, labor rights and intellectual property rights, safety, and others).

4.2. Council of Europe Treaty

In May 2024, the Council of Europe's Committee on Artificial Intelligence (CAI) finalized the drafting of the first international treaty on AI, human rights, democracy, and the rule of law⁴². The treaty specifies legally enforceable norms for the development, deployment, and governance of AI systems in democratic societies, which apply across the entire AI system lifecycle. It establishes binding principles for AI applications within the public sector. It allows regulatory flexibility in implementation to align with domestic legal frameworks, but requires risk assessment and risk management tools, with signing nations undertaking to defend democratic institutions, the rule of law, and human rights. The treaty does not apply to military or national security-related AI aspects, although it does mandate upholding international law in these contexts. It was formulated in collaboration with European and other nations and was opened for signing in September 2024. The State of Israel, led by the Ministry of Innovation, Science and Technology with the support of a steering committee that included representatives from the Ministry of Foreign Affairs, Ministry of Justice, Innovation Authority, and National Digital Agency, signed the treaty at its official launch ceremony, alongside the US, the EU, the UK and the rest of the Council of Europe nations. For the treaty to become legally binding in Israel, it must be ratified.

⁴² <u>https://www.coe.int/en/web/portal/-/council-of-europe-adopts-first-international-treaty-on-artificial-intelligence#:~:text=The%20Council%20of%20Europe%20Framework,the%2046%20Council%20of%20Europe</u>

4.3. European Artificial Intelligence Law

In the first quarter of 2024, the EU completed its legislation of a comprehensive AI Act, becoming the first entity to finalize primary legislation on AI. The Act defines three risk levels for AI applications: unacceptable-risk systems, which are forbidden under EU law at all cases (such as biometric identification in the public domain); high-risk systems, which are permitted subject to strict limitations (such as applications that affect human rights), and low-risk systems, which are permitted with very little constraints, such as informing users about the use of AI within the relevant context . The act imposes special requirements for advanced AI models, such as Large Language Models and Foundation Models, and imposes fines of up to EUR 35M, or 7% of the global annual turnover in case of a breach. The Act also applies to suppliers and users outside the EU, who operate AI systems for the European market, but does not apply to developments for R&D purposes or personal use.

4.4. US Regulatory Approach

In October 2023, US President Joe Biden published an executive order specifying the responsibility of federal authorities to take steps, within their respective domains, to ensure responsible and safe AI development and use. The executive order was based on a sectoral approach to AI regulation, avoiding cross-sectoral ('horizontal') legislation. It focused on consumer protection, equality, information security, privacy, and international collaboration, referencing the OECD's risk management principles. The White House also published the AI Bill of Rights, specifying principles for developing and using AI in a way that protects human rights and the rule of law. During President Biden's presidency, the White House pressured the big corporations to adopt self-regulation mechanisms. When the new US President assumed office, the aforementioned executive order was revoked and replaced by a new executive order which instructs a line of entities to establish recommendations for an AI policy that will support the US's AI leadership status.

4.5. Regulation in the UK

The British regulatory approach to AI, based on their 2022 national strategy, aspires to promote three objectives: response to the field's long-term needs, support for an AI-driven economy, and upholding national and international law, to protect the public and encourage innovation. The UK refrains from cross-sectoral legislation, and like Israel, prefers the sectoral approach. However, the UK does emphasize the need for a set of cross-cutting national principles to ensure compatibility between different regulators. In March 2023, the UK published a policy paper draft with five guidelines: safety, transparency, fairness, accountability, and competitiveness. The paper suggests advanced tools, such as regulatory sandboxes and risk management, to develop the world's leading regulatory environment and promote innovation. The new UK government recently published an updated AI program, which states that the possibility of updating the regulatory policy is being examined.



4.6. Regulation in Israel

The Israeli regulatory approach to AI focuses on the concept of Responsible Innovation. This concept was first formally drafted in 2023 as part of a regulation policy paper⁴³. The paper, corresponding to Government Resolution 212, suggests principles for AI policy, ethics, and regulation in Israel, while taking into consideration globally accepted regulatory, legal, and other principles.

The recommended policy seeks to balance the need for clarity and certainty pertaining to AI, with public interests, human and individual rights. One of the main concerns that were addressed while forming this policy was that of excessive regulatory intervention that may detract from the potential benefits of technological innovation.

The paper reviews potential risks and challenges, and suggests a series of primary recommendations:

- 1. Sectoral regulation, refraining from general regulation at this time. Any regulation promoted to regulate the development or use of AI will be sectoral or specific to the field in which it is required, based on a concrete need and led by the relevant regulator, with the coordination necessary to ensure the issue is addressed as uniformly as possible. In this context, the paper suggests establishing coordination mechanisms between regulators through the knowledge center, particularly when regulatory guidelines may have a cross-sectoral impact.
- 2. Compatibility with regulatory regimes established in leading countries. Examining the regulations enacted by leading countries in the field, and adopted by international organizations, and aligning Israeli regulations with them to the extent possible.
- **3. Adopting a regulatory approach based on risk management**. Adopting the OECD principles, and determining that regulation of AI applications should be appropriate to the context, balancing the risks and benefits each application entails.
- 4. Incremental development of regulation and support for experimentation. Supporting incremental and measured development of regulation, in conjunction with the state of the art, while encouraging experimentation, using sandboxes, and balancing risks and benefits, to promote responsible innovation out of an evidencebased understanding of the conditions.
- 5. Collaboration with holders of knowledge, expertise, and interest. Including industry, academia, regulators, and civil society entities. Regularly convening a regulators forum and a public-engagement form.

⁴³ <u>https://tinyurl.com/ai-23policy</u>

Section B – Strategic Plan

Chapter 5: National Program for Artificial Intelligence in Israel

Program Objectives and Vision

To maintain Israel's leading status in the face of increasing competition, Israel must formulate and implement a coherent strategy encompassing all the relevant government entities, and provide an organizational, physical, human, and regulatory infrastructure for the sustainable development of technological innovation. In addition, Israel should promote and encourage the implementation of AI based solutions within its economy, society, and government. The National Program for Artificial Intelligence has five main objectives:

- Reinforcing Al infrastructure and research by means such as establishing computational infrastructures, encouraging groundbreaking basic and applied research, expanding the domestic Al talent pipeline across academia and industry, promoting data infrastructures and data accessibility, and developing natural language processing (NLP) infrastructures in Hebrew and Arabic.
- 2. Creating leaps in AI adoptions in high-tech industry by forming regulatory sandboxes in highly regulated fields that present a high financial potential, supporting pilot-stage projects, realizing the potential of Israel's unique data assets, and improving the capability of domestic industry to attract the best AI minds from around the world.
- **3.** Al in public sector implementing knowledge, capabilities, and tools in national and municipal government. Improving public service, streamlining processes, and improving decision-making processes based on data and technology.
- 4. Securing Israel's global geo-technological position in AI Preserving and expanding Israel's technological sovereignty and qualitative edge; deepening strategic partnerships—via joint research and dual-use technology development; Positioning Israel as a regional AI hub and trusted partner; Actively participating in international forums to shape global AI standards and regulatory frameworks, to influence the future of AI and maintain Israel's freedom of action.
- 5. Promoting AI at the national level Maximizing the societal and economic benefits entailed in AI, by promoting comprehensive preparation and adaptation plans by government ministries in their domains. Equipping the public and workforce with AI-relevant skills, in aspects of education, employment, regulation, Responsible and trustworthy AI, and others.

All program components converge in one unified vision:

"global AI leadership, to support an improved standard of living and to ensure Israel's national resilience and economic growth".

5.1. Introduction to the Strategic Program

Efforts to establish a national AI program in Israel began as early as 2019, as part of the National Initiative for Secured Intelligence Systems to Empower the National Security and the Techno-Scientific Resilience – a National Strategy for Israel⁴⁴. The Initiative was headed by Prof. Isaac Ben-Israel and Prof. Eviatar Matania, who stated: "the ability to position Israel as a global AI leader and to exhaust its full potential can only be realized if the Israeli Government defines it as a primary and critical field for Israel's future, allocates budgets as such, understanding that the country's future relies on it, and establishes a designated directorate to lead and integrate the national strategic program". The final report produced by this initiative was eventually submitted to the Prime Minister. It was understood even then that AI and intelligence systems are a critical infrastructure for Israel's future and should be treated as a national priority. The authors specified that a national program is required to create a comprehensive and sustainable ecosystem for AI intelligent systems based on three axes:

- Critical infrastructures axis as an essential foundation for force design, physical, human, and research infrastructures, and data accessibility.
- Enabling infrastructures axis including cyber protection and balanced regulatory framework, to allow economic growth alongside increased privacy and civil rights.
- Al implementation in national projects axis in healthcare, transportation & smart mobility, precision agriculture, digital government services, and industrial innovation, alongside national defense projects with an emphasize on emergency response.

The program's importance lies in its contribution to defining AI as a national priority, and in identifying a series of policy measures that, if adopted, can help secure Israel's leading global status. It should be noted that the initiative also included sub-committees on various issues, including a committee headed by Prof. Karine Nahon focusing on AI regulation and ethics.

In late 2020, another committee⁴⁵, commissioned by Telem and led by Dr. Orna Berry, published its program for promoting AI in Israel. Some of its recommendations were later incorporated into Government Resolution 212⁴⁶ and budgeted through the 2021-2022 biannual budget. The suggested program required a budget of NIS 5.26B over a period of five years, and included the establishment of an ad-hoc inter-ministerial task force to promote AI. Telem's program focused on four main aspects: infrastructures, talent, regulation, and data accessibility. The committee identified significant gaps in these aspects, across all R&D fields in Israel, as follows:

⁴⁴ <u>https://tinyurl.com/PMO-report</u>

⁴⁵ https://tinyurl.com/ai-report2020

⁴⁶ <u>https://www.gov.il/he/pages/most_policy20210801</u>
- Shortage in AI talent shortage in academic faculty in core AI disciplines, which is considered insufficient to maintain future talent pipeline required for both academia itself as well as for the needs of other sectors. This signifies a critical gap between supply and demand in all roles that pertain to AI.
- Lacking computational infrastructures and data accessibility the committee recognized a significant shortage in central computational infrastructures that allow acquirement of AI skills. This exacerbates the inability to educate and train talent, also making it hard to retain the best AI minds, again leading to a shortage in talent as aforesaid.
- Lacking a guiding hand and enabling regulation, AI stakeholders in Israel do not have sufficient access to data – the committee chose to analyze this issue on seven levels: infrastructure and hardware, software tools, regulation and procedures that allow data sharing, data sharing tools, platforms to test technological initiatives, implementation, and talent training. These levels were examined in relation to R&D needs and the unique characteristics of academia, industry, the public sector, and the defense sector.

Additionally, in 2022, the National Research and Development Council headed by chairman Prof. Peretz Lavie published its recommendations⁴⁷ as part of the Committee to Establish Techno-Scientific National Priorities, and recommended AI as a national priority. The Committee determined that governmental AI action should be expanded beyond the Telem program.

Following these papers, the Telem initiative was expanded into a comprehensive national program that was granted additional budgets as part of the 2023-2024 bi-annual budget plan, its recommendations included:

- 1. Promoting research, talent, and infrastructures, to secure Israel's technological leadership.
- 2. Creating a technological leap in the Israeli innovation industry.
- 3. Implementing AI in government, to improve the public sector.

The forum was later joined by the National Digital Agency, and the Program was then expanded to include tasks under the auspices of the Foreign Affairs and Justice Ministries.

5.2. Guidelines and Principals of the Strategic Program

The strategic program is based on Israel's strengths in R&D, commercialization, talent, and interdisciplinary and inter-sectoral connections, while also addressing the identified gaps such as the need to establish a long-term strategy, the need to invest in infrastructures, and the need to maintain an operational environment that encourages AI adoption in the private and public sectors.

⁴⁷ https://www.gov.il/he/pages/most formulation of national

The program creates coordination and collaboration between a broad coalition of government stakeholders through the Telem Forum, which includes all the government entities pertinent to promoting research and development in Israel. The program is headed by a central directorate and consulted by a scientific advisory committee chaired by Prof. Yoav Shoham. The committee includes AI researchers, tech industry leaders, and recipients of major scientific awards, from Israel and abroad.

So far, the multi-year program has been allocated NIS 1B, divided into two three-year phases. The program employs governance and coordination mechanisms to coordinate the work of government entities, to continue to expand AI regulation and provide the necessary regulatory toolbox, and to develop the AI field and secure Israel's attractiveness for investments and growth. It relies on a holistic view of all relevant aspects, including technological infrastructure, talent and research, encouraging innovation, and promoting the public sector.

5.3. Program Tasks

Table 1 – List of tasks in the National Program for Artificial Intelligence

Objective	Component	Main avenues of action	Assigned entity
Artificial Intelligence Infrastructures Promoting research and talent, and providing access to infrastructure	Providing access to computational infrastructure	 Establishing and ensuring access to AI-HPC infrastructure for large model training Establishing an HPC technologies lab Providing access to Scientific Computation infrastructure 	Telem Forum
	Ensuring access to data infrastructures	 Establishing disciplinary "data assets", aggregating a multitude of information sources for each sector Establishing a technological infrastructure for "virtual research-rooms" to enable research using public sector data Promoting R&D in privacy-enhancing technologies (PETs), to enable access to detailed databases without exposing sensitive information 	
	Ensuring access to language processing infrastructure	 Mapping existing and required infrastructures for Hebrew & Arabic Natural Language Processing and creating a coherent plan to bridge the gaps Developing models to process spoken and written language and providing open-code access to the R&D ecosystem Encouraging research based on Israel's existing unique databases in Hebrew 	
	Expanding basic and applied research	 Promoting applied AI research Granting scholarships for research students Enhancing the technical faculty at academic computation centers Increasing the number of AI experts in the defense organizations 	Telem Forum
		 Supporting Moonshot research projects at the forefront of global research 	Council for Higher Education / Planning and Budgeting Committee, Directorate of Defense Research & Development, Innovation Authority
		 Founding a national AI research institute 	Telem Forum

Al in high-tech	Expanding the pool of skilled AI professionals in high-tech industries Providing access to experimentation infrastructures	 Establishing career-change tracks for graduates of scientific degrees Increasing the number of AI experts from overseas in Israeli industry (returning residents, new immigrants, foreign experts) Establishing a regulatory sandbox mechanism in fields with financial potential and regulatory barriers Supporting pilot projects along with regulators 	Telem Forum
Al in public sector Enhancing public preparedness to the Al revolution	Promoting safe and trustworthy AI	 Establishing a governmental knowledge and coordination center for AI regulation and policy Establishing a regulatory coordination forum and a public-multi-stakeholder consultation forum Mapping AI applications, accompanying challenges in the regulated sectors, and relevant legal aspects 	Ministry of Innovation, Science and Technology, Ministry of Justice
	Implementing Al in national and municipal government	 Promoting and supporting projects for Al implementation in the public sector Publishing guides and legal guidelines for responsible Al usage Establishing a training scheme for public sector, to develop literacy, skills and proficiency in existing Al tools, as well as the risks they entail Developing a central platform that offers a toolbox for use by organizations, creating designated Al agents and an onboarding environment Encouraging Al adoption among government entities Establishing inter-sectoral teams specializing in specific spheres, to create designated Al-based solutions Harnessing municipal government to the national effort 	Ministry of Innovation, Science and Technology, National Digital Agency, Ministry of Justice, Ministry of Interior and Federation of Local Authorities in Israel
Securing Israel's global geo- technological status	International leadership	 Strengthening Israel's knowledge infrastructures and AI capabilities in the global race for technological leadership Influencing the international regulations being established Positioning Israel at the forefront of the global AI field Inter-Ministerial Committee – Forum for AI Collaboration 	Ministry of Innovation, Science and Technology, Ministry of Foreign Affairs, Innovation Authority

Al at the national level Preparation for the impact of Al on government ministries' domains	Integrative approach to government ministries' preparation	 Constant monitoring of government ministries' preparation for AI impacts in their domains Promoting public literacy and responsible use of AI 	Ministry of Innovation, Science and Technology
	Integrating AI in the education system	 Preparing students and teachers for an Al- intensive world Implementing AI to promote education Establishing infrastructures that support AI implementation in education Educating the future generation of AI researchers Promoting extracurricular AI education 	Ministry of Education, Ministry of Innovation, Science and Technology
	Preparation for the changes expected in the labor market	 Establishing training schemes for developing Al skills in relevant professions Establishing a program for "professions at risk", including a career-change track and other solutions for at-risk employees 	Ministry of Labor



Chapter 6: Objective I – Artificial Intelligence Infrastructures Promoting Research, Talent, and Infrastructure Accessibility

6.1. Providing Access to Computational Infrastructure

Objective: establishing and ensuring equitable access to advanced computational infrastructures that will allow development and progress in of cutting-edge AI research

Main avenues of action:

- 1. Establishing and ensuring access to AI-HPC infrastructure for large model training
- 2. Establishing an HPC technologies lab
- 3. Providing access to Scientific Computation infrastructure

Background: the volume of information generated by humanity has grown exponentially in recent years, while at the same time the computational models used to extract insight from this data have also become dramatically more complex. This advancement resulted in breakthroughs in computers' capability to analyze and predict complex phenomena, at the price of an exponential increase in the computational power required for data processing. The existence of HPC capabilities and their availability for Israel's research and development community is therefore an essential prerequisite for allowing groundbreaking research and innovation in Al.

- A lack of domestic infrastructures for training large AI models can cause a mismatch between the needs of academia/industry and global compute resource availability. R&D projects that are dependent on the availability of considerable computational power may face cost-related delays, cancellation, or offshoring.
- Computational infrastructures have become a strategic asset in the geopolitical race establishing large computational infrastructures coincides with the global chip race. Many nations are striving to secure a sufficient quantity of advanced GPUs for their domestic use, via procurement (e.g. Saudi Arabia, United Arab Emirates, EU countries), or by attempting to encourage GPU manufacturing within their borders (e.g. the US, Europe, China). Israel should secure a minimal but sufficient quantity of GPUs that are physically deployed within its borders.
- High complexity in developing infrastructural software and hardware for AI long development time and high costs are a barrier to the creation of significant startups that can produce infrastructural hardware or software for the AI ecosystem. The gap between ideation and the proof of concept (POC), especially in chip design, poses a particular difficulty



6.1.1. Establishing and Ensuring Access to AI-HPC Infrastructure for Large Model Training

The Innovation Authority is working to establish and ensure access to AI-optimized highperformance computing (AI-HPC) infrastructure to accelerate AI based R&D through the training of large-scale models. In this context, large models require substantial GPU clusters used over prolonged periods of time as part of their training phase. The established infrastructure will be used to accelerate research and development processes in AI and will provide R&D services for Israeli corporations and/or research institutes.

It will include hardware comprising thousands of modern GPU cards, with the necessary software and service components, including high-throughput networking, high-performance storage solutions, data center-grade cooling systems, workload schedulers and orchestration, observability, and access management tools.

A dedicated quota of computation resources as part of the infrastructure, will be allocated to R&D activities in Israeli academia and industry, at a considerable discount compared to prevailing commercial offerings. The remaining resources will be leased to end clients on a based-on market prices, the infrastructure operator, enabling a financially sustainable hybrid-access model.

Besides the computational resources themselves, the infrastructure supplier will be able to offer a set of value-added services, such as assistance in dataset curation and preprocessing, optimization of training processes, testing alternative approaches, etc. The foundation of this national AI compute infrastructure aims to mitigate the resource accessibility bottleneck, democratize access to frontier AI capabilities, and lower entry barriers for high-impact research, particularly for academic research and startups.

6.1.2. Establishing an HPC Technologies Lab

Computational infrastructures for data centers suffer from several failures:

- **1.** The development cost of infrastructural hardware or software solutions is extremely high, posing a significant entry barrier for deep-tech and AI-focused startups.
- **2.** There is a shortage of open and diverse lab environments that can facilitate proof of concept tests and comparative benchmarks for innovative solutions.
- **3.** The market is controlled by a small number of giant corporations, to an extent that may even suppress technological innovation.

To address these barriers and encourage innovation within the infrastructure layers of Al supporting hardware and software, the Innovation Authority is working to establish an HPC technologies R&D lab, focusing on accelerating the development of high-performance computing (HPC) technologies and infrastructural AI technologies. The R&D lab, which was founded in 2024, will serve for accelerating the development and benchmarking of innovative software and hardware solutions, which are intended for use in future AI-driven data centers. It will provide a lab environment and R&D services for

Israeli corporations and/or Israeli research institutes, and will provide access to equipment, infrastructural software, and technical staff, to enable:

- End-to-end Experimentation and testing of infrastructural technological solutions in the data center field such as – computational hardware, communication solutions, storage systems, cooling, system management, etc.
- Integration, proof of concept, and comparative benchmarking for products relevant to HPC infrastructures.
- Conducting R&D on all layers of infrastructure software and hardware, particularly R&D activity that cannot be conducted on commercial public cloud infrastructures.
- Providing a "neutral" venue for research and development collaborations between Israeli corporations, or between Israeli corporations and Israeli research institutes, and cross-stack integration between different components and data.
- Establishing a team of experts to provide professional services and serve as a source of knowledge and expertise in the field, allowing access to knowledge/provision of unique services and abilities that will be designed in the R&D lab for the benefit of Israeli hi-tech innovators, researchers, and engineers.
- Training talent for research, development, support, operations, etc. in the R&D lab's area of activity.

6.1.3. Providing Access to Scientific Computation Infrastructure

The term scientific computation infrastructure refers to HPC systems that are capable of generating complex simulations of natural processes typical to the realms of energy, biology, materials, flow, etc. Such systems are used as a digital alternative or a complementary means for real-world experiments, when conducting such an experiment is either expensive, complex, or dangerous. Traditionally, scientific computation infrastructures were used to promote groundbreaking academic research, but with the global focus on deep-tech companies in recent years, such infrastructures are increasingly sought by the high-tech industry as well, particularly startups.

Israel currently has relatively limited number of small-scale scientific computation infrastructures located in a number of research universities, yet there is no substantial computational infrastructure available for academia and the broader Israeli high-tech ecosystem.

As part of the National Program for Artificial Intelligence, the Innovation Authority will act to make advanced HPC infrastructure available for scientific computation, to support groundbreaking academic research, and to encourage the founding of deep-tech companies based on academic research in a wide range of disciplines, beyond traditional software areas. HPC resources will include tools, essential solutions and services for advanced academic and industrial research, particularly in sciences, computational engineering, and data analysis in various technologies and fields, to allow:

- Performing complex simulations and modeling that are impossible or impractical to perform on standard computers, including climate model simulations, astrophysical phenomena, and molecular dynamics.
- Conducting large-scale data analysis in scientific fields that require large data sets, such as genomic data, astronomic observations, and particle physics experiments.
- Significantly accelerating R&D processes, by reducing the time required to perform experiments and analyze results.
- Supporting multidisciplinary research, characterized by combining tools and methodologies from a wide range of scientific disciplines simultaneously, while encouraging multidisciplinary collaboration and research.
- Allowing design optimization in engineering and materials science.
- Enabling real-time processing of big data, like weather forecasting and creation of financial models.



6.2. Ensuring Access to Data Infrastructures

Objective: making Israel's unique data repositories accessible as a basis for R&D and for generating innovative solutions in academia and industry, and as part of AI adoption in the public sector.

Main avenues of action:

- 1. Establishing disciplinary "data assets", aggregating a multitude of information sources for each sector
- 2. Establishing a technological infrastructure for 'virtual research-rooms' to enable research using public sector data
- 3. Promoting R&D in privacy-enhancing technologies (PETs) to enable access to detailed databases without exposing sensitive information

Background: information and data are the basis for any AI-based research and development activity. This applies to academic research, to applied research in the industry, and to actualizing the social benefit potential of AI through implementation in the public sector. However, much of the information existing in Israel and the world is not available for R&D activities – sometimes due to practical-technological limitations, and sometimes due to legal limitations meant to protect the information subjects, and their rights and interests:

Firstly, access to information must be achieved in compliance with legal provisions pertaining to human rights and other interests, including privacy, equality, proprietary information, commercial secrets, confidentiality, etc. Moreover, in many cases a significant investment of human effort is required to prepare the information for use – pooling the relevant information from many diverse sources, optimizing it, integrating and connecting separate pieces of information, addressing gaps and errors in the raw data, adding manual classifications and tags, etc.

The strategic program includes several policy measures to allow exhausting the innovation potential and social benefits out of the various information sources that exist in Israel (whether by the public sector, academia, or the private sector). Some of these measures pertain to making information of various types available for R&D, while other measures are intended to provide privacy-preserving technological solutions for making the information available in a safe manner while protecting human rights and the interests of information subjects. Such measures will be conducted responsibly, efficiently, ethically, and appropriately, while protecting the rights and interests of information subjects, and while managing the unique risks entailed in training and using AI technologies⁴⁸

⁴⁸ Such risks include unique risks of privacy violation; cyber and information security risks; ethical and algorithmic bias risks; risks pertaining to exercising of authority and accountability for machine-based decision making, and abuse. For more information about these and other risks, which are unique to AI usage, see Policy, Regulation, and Ethics Principles in AI, Ministry of Justice (Consultation and Legislation) and Ministry of Innovation, Science and Technology, December 2023; Interim report for public comments published by the inter-ministerial team for examining AI applications in the financial sector, October 2024, <u>available here (Hebrew)</u>.

6.2.1. Establishing Disciplinary "Data Assets", Aggregating a Multitude of Information Sources for Each Sector

Al-based research and development deals with recognizing patterns in the training data, and creating models that, based on these patterns, will be able to produce recommendations, forecasts, and predictions. An essential precondition for the success of these research activities is that the information available for learning is rich, diverse, and as multidimensional as possible. However, the raw information pertaining to a certain field of research (like agriculture, transportation, energy) is often divided and split between various stakeholders – public sector, business sector, and academia. Pooling the information items that pertain to a certain field for R&D purposes can optimize pattern recognition and identification of hidden relationships between different variables, thus significantly enhancing the economic and social value of Israel's existing databases.

It is important to note that notwithstanding the depicted benefits and opportunities, the act of pooling databases from various disciplines and comprehensively processing them presents significant challenges and risks and raises complex applicative and legal questions that must be addressed in advance. These questions arise due to concerns of infringement on the rights and interests of information subjects, particularly the right to privacy⁴⁹, due to aspects of authority, and due to issues of information security and potential abuse of information⁵⁰. To this we must add the unique challenges and risks that pertain to the various uses of AI technologies as specified in Chapter **4.1**.

To maximize the value of Israel's diverse data reservoirs, the strategic program includes the establishment of disciplinary data assets – the pooling of various data sources pertaining to a specific discipline and providing R&D services based on it. This can help create infrastructural assets that can be used in research, in academia and industry, actualizing AI's economic and social potential in the relevant discipline. Data Assets will be established, of course, in compliance with all legal obligations while maintaining strict ethics and responsibility standards, to protect human rights and balance other public interests.

The Innovation Authority will be in charge of establishing these data assets, along with relevant ministries. As for data assets that contain personal information (as defined by the Privacy Protection Law), the Ministry will work to examine the applicative and legal challenges that are unique to such data assets, in collaboration with the Ministry of Justice (Consultation and Legislation Department and Privacy Protection Authority).

⁴⁹ In terms of privacy violation, it should be noted that even if the information is anonymized prior to pooling, aggregating detached databases into one super-database can significantly increase the chance that information subjects will be re-identified.

⁵⁰ This also raises questions about authority or legal sanction to transfer and process the information; unique duties that apply to the relevant government ministries, commercial secrets, informed consent by information subjects; purposes of using the information; identity of the entity that will be assigned control of the database, concerns of information abuse and of conflict of interest. Moreover, the aggregated data pool is of more value and thus faces a higher risk of information leakage and bigger information security challenges.

6.2.2. Establishing a Technological Infrastructure for 'Virtual Research-Rooms' to Enable Research Using Public Sector Data

The public sector holds a great deal of data collected by government agencies according to their lawful authority. Making this data accessible for research and development purposes offers substantial opportunities to produce valuable and nationally beneficial outcomes. However, a considerable share of the information held by public agencies and government ministries is "personal information" as defined in the Privacy Protection Law 5741-1981, and as such, certain limitations apply to it, to protect the information subjects' legal right to privacy. One such limitation is that the information cannot be used in deviation from the purpose for which it was collected (Article 2(9) of the Law), including for research purposes, unless the information subject has consented or given authorization. Nonetheless, it is often possible to use technological tools (such as anonymization), as well as procedural and legal means and controls, to significantly reduce the risk of privacy violations. This can facilitate access to the information collected by public entities, for research purposes, while balancing the rights of the information subjects. The technological process that turns a database with "personal information" into an anonymized database, and the process of making it responsibly and safely accessible to researchers, require knowledge, resources, and infrastructures that are not available to all government ministries and public sector units.

In recent years, the Israeli public healthcare sector has implemented a technological solution for this issue, referred to as 'virtual research rooms' - An isolated cloud environment, in which researchers are allowed to conduct studies based on sensitive medical information held by Israeli healthcare entities, while minimizing researcher exposure to identifiable sensitive personal information, and limiting the risk of leakage beyond the research environment. When the study is concluded, researchers can receive its results (statistical outcomes, trained models, etc.) but cannot receive or publish the raw data itself. The study process consists of several stages:

- 1. Examination and approval of the study plan based on a risk-based approach
- 2. Preparation of study environment
- 3. Anonymization of relevant information, followed by data uploading to the isolated environment
- 4. Study execution within the isolated environment
- 5. Extraction of study outcomes out of the virtual research room, following an examination that aims to prevent accidental private data leakage
- 6. Complete deletion of the virtual research environment

This model is an example of a technological solution already being used, reflecting a balance between encouraging research and innovation and the need to prevent privacy infringement. It was implemented in the healthcare system as part of the Health as

Growth Engine program, successfully running in about twenty different healthcare entities in Israel, allowing researchers from academia and industry to conduct studies on healthrelated data by using the virtual research room infrastructure. This mechanism minimizes the risk of privacy infringement, though it does not absolutely preclude the possibility of re-identification. Therefore, in general, products of research rooms must be considered "personal information" on which the requirements and limitations of the Privacy Protection Law apply.

As part of the Program, the National Digital Agency will establish a generic technological infrastructure for the creation of virtual research rooms, which will be available on the governmental cloud platform Nimbus, for use by all government ministries and agencies for R&D purposes. The purpose of this action is to unify the tools available to government ministries, removing the main technological barrier that had so far limited the use of government data for research and development, particularly in the smaller government ministries that cannot implement such an infrastructure independently. A condition for operating the research rooms based on the general technological infrastructure is the implementation of privacy principles and establishment of the required organizational and legal framework to accompany activity in the virtual research rooms, in collaboration with the Ministry of Justice (Consultation and Legislation and Privacy Protection Authority).

6.2.3. Promoting R&D in Privacy-Enhancing Technologies (PETs), to Enable Access to Detailed Databases Without Exposing Sensitive Information ⁵¹

A prerequisite to the creation of AI-based models is the existence of large and detailed databases as specified above. However, when the information held in these databases concerns people or commercially sensitive information, there is substantial concern about infringement of privacy or competition. The concern is even greater when it comes to information pertaining to health, education, welfare, and finance, all considered particularly sensitive fields. These legal and technological complexities limit various entities' ability to share their information, and consequently their ability to use AI tools within those areas of activity. Therefore, resources will be allocated to promote infrastructural R&D to support options for information sharing and model training without infringing on the rights and interests of information subjects, specifically technologies for anonymization of information before it is processed for research, and for converting information to synthetic data. These means can minimize exposure of identifying or identifiable information⁵², infringement on other basic principles in privacy law⁵³ or infringement on protected business interests.

⁵¹ Privacy Enhancing Technologies, or PETs, are a collection of approaches and digital solutions that help protect personal information. For additional information, see <u>Guide for privacy enhancing technologies (Hebrew)</u> published by the Privacy Protection Authority.

⁵² With reasonable effort, directly or indirectly.

⁵³ Such as purpose compatibility.

As part of the program, the Innovation Authority and National Digital Agency will act for the creation of a toolbox for personal information anonymization, including open-code tools made accessible for the entire R&D community. The toolbox will consist of technological solutions for the removal of personal or sensitive information items from textual, tabular, geographical, and other information. It will constitute a core component in the operation of virtual research rooms but will also be available for researchers and industry beyond.

These tools will be developed by publishing calls for proposals on R&D in privacypreserving machine learning, as well as by promoting collaborative international research in the field.

Relevant efforts will focus on **technologies that help mask the required personal information and minimize their level of detail** (including anonymization, synthetic data, and differential privacy), as well as **technologies that help minimize the exposure of personal information during use** (including cryptographic solutions, federated learning, and trusted execution environments).

6.3. Ensuring Access to Language Processing Infrastructure

Objective: reducing the technological gap between Israel's local languages (Hebrew and Arabic) and English, as it pertains to computational language processing capabilities. Creating data infrastructures, models, and methods, and making them accessible to the R&D community, to form the basis for the implementation of AI in the public and private sectors, and to leverage Israel's unique databases

Main avenues of action:

- Mapping existing and required infrastructures for Hebrew & Arabic Natural Language processing and creating a coherent plan to bridge the gaps
- Developing models to process spoken and written language and providing opencode access to the R&D ecosystem
- Encouraging research based on Israel's existing unique databases in Hebrew

Background: recent years are characterized by an unprecedented leap in machine capabilities to process and understand natural language, whether it is provided in written or spoken form. Large Language Models (LLMs) can engage in open-language dialogue, answering questions and accomplishing tasks, summarizing, and aggregating different sources, translating input from one language to another, recognizing entities, characterizing the sentiment expressed in a text, and more. This technological leap has opened the door for an immense variety of applications that require "understanding" of a textual input or drawing conclusions based on large collections of written and spoken information. Groundbreaking applications have been developed in education, health, law, finance, psychology, and many other fields.

Despite the immense potential of these new capabilities, this technological advancement was in practice limited to very few languages, mainly English and Chinese.

A shortage in designated databases and lack of commercial feasibility considerably limited the development of such capabilities in local languages used by a relatively small number of native speakers. The farther the syntactical and grammatical structure of a local language is from English, the more limited the development of these capabilities is. For the private sector, this means that it is almost impossible to provide innovative services that are based on written-language comprehension, in Semitic languages.

One example to illustrate the depth of this limitation can be drawn from Israel's healthcare system. Israel has some of the largest databases in the world for digital medical information. They contain an immense range of textual information, including hospitalization summaries, medical opinions, and summaries of appointments for different doctors. Despite their potential, the ability to leverage these databases to create innovative services and products and to mature them in the Israeli healthcare system is incredibly limited, because of existing models' inability to "comprehend" the Hebrew and Arabic languages. Similarly, in the public sector, it is difficult to implement advanced digital services in areas that require written language comprehension. Bridging the current technological gap between machines' capability to process Latin languages and Semitic languages necessitates an extremely high financial investment, as well as vast computational resources to train the required models.

A conservative estimate would put the required initial investment at tens of millions of dollars. A large population of language speakers (hundreds of millions) is necessary to justify such an investment by the private sector, accompanied by a rich eco-system of high-tech companies that are capable of leveraging language-processing services to create various products. In the case of Hebrew, the total number of native Hebrew speakers is far too low to justify such an investment, whereas in the case of Arabic, there is currently an uncertainty with regards to the number of companies that may purchase basic language-processing capabilities to create products.

6.3.1. Mapping Existing and Required Infrastructures for Hebrew & Arabic Natural Language Processing and Creating a Coherent Plan to Bridge the Gaps

As part of the Program, efforts will be made to identify all existing databases, trained models, and tools pertaining to Hebrew and Arabic NLP. The identified resources will be made available to the R&D community via a designated portal, with proactive efforts to encourage usage and regularly identify gaps.

For each identified resource, the portal will provide supporting metadata such as the scope and type of data in the case of a dataset, or the accuracy and linguistic task for which it was trained in the case of an AI model. Relevant metadata will also include indications of the licensing model used for sharing the resource with the R&D community. Following this resource mapping efforts, a list of gaps will be prepared (data gaps, algorithmic needs, and more) to guide future actions within the scope of the program.

6.3.2. Developing Models to Process Spoken and Written Language and Providing Open-Code Access to the R&D Ecosystem

To provide a solid basis for continual R&D activity, the program will support various projects for the creation of databases, models, and tools, which will be made available to the community in open-code. This support will emphasize the creation of diverse infrastructural assets, to facilitate the creation of language models of equivalent quality to English models.

Outcomes will include -

- A Large Language Model (LLM), with about 7 billion parameters for Hebrew and Arabic. The model will enable processing of Hebrew/Arabic input, alongside English input, will exhibit English-language performance that is equivalent to other models with a similar volume of parameters, and will constitute a significant improvement on current Hebrew and Arabic capabilities.
- 2. A dedicated Hebrew-Arabic-Hebrew translation model
- **3.** High-qualit transcription model for Hebrew and Arabic, including the creation of the datasets required for that purpose.
- **4.** Models for performing common language-processing tasks, such as: Named-Entity Recognition (NER), sentiment analysis, document summary, and question answering.
- **5.** Creating multi-modal databases, such as databases that match an image to a relevant descriptive text, to allow development of advanced models.
- **6.** Language-processing support tools, like benchmarking tools, tools for data preprocessing and tokenization, tools for anonymizing input data in Hebrew and Arabic, etc.

6.3.3. Encouraging Research Based on Israel's Existing Unique Databases in Hebrew

To enable and encourage research and development based on Israel's unique existing databases (such as the healthcare databases of various healthcare entities), the program will also support the creation of a second infrastructure layer, intended for specific disciplines, which will be made available as open-source to the R&D community.

- **1.** Creating language-processing infrastructures adapted for processing of medical information, or information pertaining to another specific field (law, finance, agriculture, etc.), in Hebrew and Arabic.
- **2.** Creating anonymization tools designed specifically for the processing of medical information.

3. Supporting academia-industry collaborative research about trustworthy AI and its derivative products, in the context of large models, and specifically in Hebrew and Arabic.

These infrastructures will also be made available in open code, via the designated portal, to ensure that the R&D community can continue maintaining their currentness.

6.4. Expanding Basic and Applied Research

Objective: encouraging scientific research and advanced degrees in engineering and high-tech disciplines, promoting AI curricula in research universities, encouraging publication of scientific articles on AI, and increasing the availability of skilled talent – as an essential condition to groundbreaking research and development based on artificial intelligence.

Main avenues of action:

- 1. Promoting applied AI research
- 2. Granting scholarships for research students
- 3. Enhancing the technical faculty at academic computation centers
- 4. Increasing the number of AI experts in the defense organizations
- 5. Supporting Moonshot research projects at the forefront of global research
- 6. Founding a national AI research institute

Background: Israel is consistently ranked as a world leader in categories of talent quality and concentration in the AI field. While this is of course positive, Israel's unique dependence on high-tech and the growing global competition translate into a significant shortage of AI researchers in academia and high-tech. The strategic program therefore aspires to increase the number of AI experts in Israel, both as regular academic researchers and as research-team leaders in high-tech companies.

When discussing the issue of talent and the government policies required for supporting it, one should examine the needs of academia and the needs of Israeli industry separately, while keeping note of the intersection of those two independent sets of needs. While Academic and commercial research in the AI field are highly reciprocal and interdependent, talent needs in these two sectors largely differ, and so does the challenges of increasing the appropriate talent.

In academia, the program's goal is to increase the number of active AI researchers. Such researchers fulfill a dual role in promoting AI in Israel. They stand at the forefront of new knowledge creation processes and of cementing Israel research status, and they are also responsible for training the next generation of academic researchers and of educating the talent required for high-tech. In the high-tech industry, skilled talent is required for a line of key positions that jointly participate in R&D processes. At the top of the education ladder are AI experts (sometimes referred to as data scientists), who can lead an AI research team

as part of a high-tech company. They require a lengthy academic education that includes at least a master's degree, preferably also a doctorate. They are supported by other professionals, like data engineers, who assist in the research work (ML-Ops Engineers), and specialize in operating and integrating the computer systems required to train and test the models, as well as software developers who are entrusted with incorporating the research products in the company's commercial products. These supporting professionals usually require a bachelor's degree, much like other high-tech professionals.

So, both academic researchers and AI experts in high-tech require research-degree education tracks. However, the annual number of relevant graduates is low in relation to market needs and has only grown slightly in recent years (see article **3.1.3**). With the growing demand for AI experts, the resulting shortage impacts academia's ability to continuously lead research excellence, as well as its ability to provide the required education for academia and high-tech. Therefore, the main government involvement required is increasing the talent in the high levels of expertise, whether by increasing the number of students, providing complementary education for graduates of other research degrees, or competing for a share out of the global expert pool.

6.4.1. Promoting Applied AI Research

Unlike basic research that focuses on expanding theoretical knowledge, the purpose of applied research is to address practical problems and specific needs. Applied AI research is currently one of the most influential fields in technology and science. Its main goal is to translate ideas and theories in AI into practical solutions that can impact a wide range of fields such as medicine, education, industry, and financial services. Applied research focuses on developing systems and processes that implement algorithms of computational learning, natural language processing, computer vision, and robotics, to solve real-world problems. The importance of applied AI research stems from its ability to improve processes, accelerate decision making, and provide innovative solutions for global challenges, like improving healthcare services, reducing carbon emissions, and dealing with cyber threats. Thus, applied research is expanding the limits of technology while also contributing to improving our standard of living and to creating a smarter and more efficient society.

As part of the Science and Technology Ministry's activity to promote applied research in academia and research institutes in fields of national priority, the National Fund for Scientific Applied and Engineering Research is funding studies with potential for commercialization by local tech companies, to address national scientific and technological issues.

Recognizing the extraordinary importance attributed to applied AI research, the Fund will publish a call for proposals on groundbreaking AI research in high-importance issues, such as innovative approaches to AI algorithms, AI and quantum technologies, and AI adapted to humanoid robotics.

6.4.2. Granting Scholarships for Research Students

A primary means of increasing the number of AI experts in Israel is increasing the number of students of relevant research degrees, yet the current limited amount of senior faculty poses a bottleneck as well. To address the issue, the Planning and Budgeting Committee is annually offering scholarships for master's, doctoral, and post-doctoral students. Candidates are selected competitively, based on criteria of scientific excellence. From 2019 to 2027, more than 250 scholarships will be granted, each for a period of several years (depending on the typical study period of each degree).

6.4.3. Enhancing the technical faculty at academic computation centers

Research infrastructures that will allow researchers to optimally exhaust their abilities and to conduct groundbreaking research are incredibly important, as high-quality research infrastructures are an incentive for researchers to choose a certain academic institute over another. Alternatively, a lack of adequate infrastructures can drive researchers to abandon Israeli academia for the private sector, or for foreign academic institutions. Although most Israeli universities have recently established large computation centers at substantial financial investments, the research outputs supported by these centers are often significantly lower than their potential. One of the main causes for this low utilization of research infrastructures is a shortage in skilled personnel who can operate them and connect between research teams and the required technological solutions. The shortage stems from the high demand for such workers in the private sector, and the relatively low wages offered by the universities. The Planning and Budgeting Committee therefore decided to launch a program for supporting professional technical personnel, to help operate and optimally manage the computation infrastructures required for the promotion of research and teaching in Al and data sciences.

6.4.4. Increasing the Number of AI Experts in the Defense Organizations

The IDF and Israeli defense system rely on a small number of elite programs to meet their Al talent needs. However, growing Al use in all areas of the defense system's activity is creating a demand for a much greater number of experts with advanced research degrees.

To increase the number of available AI experts, the IDF will launch an integrated program for the training of hundreds of research degree graduates, who will be incorporated into relevant units, and will even feed the high-tech industry in the future.

The program will rely on bachelor's degree graduates from the IDF's Academic Reserve and Academization programs, who have completed their degree during high school. It will include academic education during military service, followed by practical service in relevant tech units. This optimal combination of academic education along with practical apprenticeship under more experienced professionals, will create a kind of flywheel that leverages the IDF's proven ability to train unique technological talent. The purpose of this avenue of action is to achieve an annual integration of some one hundred AI experts with second and third degrees in the relevant units, who will also help meet demand for experts in the private sector upon their discharge.

6.4.5. Supporting Moonshot Research Projects at the Forefront of Global Research

The term Moonshot projects refer to broad research efforts, at the forefront of global knowledge, which require collaboration by several different research teams. Projects may differ in nature on the range between basic and applied research, but all will have a relatively broad scope of research activity and a high rate of uncertainty about whether the challenge can be solved, or the research question answered (high risk – high gain). Such research characteristics ensure that even in case of "failure" to solve the challenge, the generated intellectual property is expected to be substantial, positioning the researchers involved at the vanguard of global research. Moreover, groundbreaking, and broad-scope research projects are expected to help draw leading global researchers, and to establish Israel's research reserve.

Various projects are to be launched by different entities that take part in the program, in accordance with the research question. Projects pertaining to the foundations of AI technology will be launched by the Planning and Budgeting Committee, projects that are more applicative will be launched by the Innovation Authority, and projects pertaining to the dual needs of the defense system will be led by the Directorate of Defense Research & Development.

Each such project is expected to span several research teams from different disciplines and institutions, working together for a period of two to three years.

Subjects for challenge projects will be chosen by a combination of open calls for proposals (bottom-up approach), and general guidance towards broad and relevant spheres of interest (top-down approach). The research activity's operational mechanism will be derived from the leading entity's toolbox. Chosen projects may include a variety of research fields, combining software, hardware, robotics including humanoid robotics, and others.

6.4.6. Founding a National AI Research Institute

The purpose of a national AI institute is to strengthen Israel's status on the national frontier of basic and applied research, in core AI fields. The institute will constitute a home for groundbreaking research and will attract renowned researchers from Israel and abroad.

It will operate as an independent entity, supervised and directed by a board of directors, and co-headed by a research director and a CEO, in charge of professional and operational aspects, respectively. It will be founded as a brick-and-mortar institute, in proximity to academia and industry knowledge centers, to allow hosting experts and researchers from Israel and abroad.



Its main output will be academic publications, as well as applications in software, databases, and follow-up research infrastructures. It will aspire to academic and intellectual breakthroughs at the forefront of global research, with affiliations to hightech. The Institute may also lead research activity in affiliation with defense entities, but such activity must focus on unclassified use cases to avoid unnecessary controversy, especially abroad, and to avoid the operational complexity of dealing with classified tasks.

A board of trustees will be appointed, consisting of prominent and respected individuals from Israel and abroad. It will have a higher representation of academics to reflect its research purpose but will also include individuals from the high-tech and other sectors.

The budget will comprise an initial sum from government sources, constituting 10%-20% of the total budget, and the rest in donations.



Chapter 7: Objective II – AI in High-Tech

7.1. Expanding the pool of skilled AI professionals in high-tech industries

Objective: increasing the number of AI experts in high-tech

Main avenues of action:

- 1. Establishing Career-change tracks for graduates of scientific degrees
- 2. Increasing the number of AI experts from overseas in Israeli industry (returning residents, new immigrants, foreign experts)

Background: as described above, the current shortage in AI experts with graduate-level academic qualifications constitutes a barrier to the local high-tech industry's ability to promote AI-driven innovation. According to various estimates, some 300-400 advanced degree graduates complete their studies each year and join the high-tech industry in research roles. Yet the demand for such experts is much higher and is only expected to rise as AI is adopted in additional industry sectors.

While the efforts to increase the number of research degree graduates are expected to come to fruition in the medium and long term, the need to increase the number of experts is immediate, calling for additional policy actions.

7.1.1. Establishing Career-Change Tracks for Graduates of Scientific Degrees

The required skills for an AI researcher (data scientist) include first and foremost research skills, which is the ability to formulate research questions, plan and execute data-driven experiments, review the results, draw conclusions, and repeat the process to a satisfactory result. Knowledge and understanding of machine learning and AI are of course also necessary but must be combined with core research capabilities. One way to resolve the shortage in AI experts is to retrain graduates of research degrees in life sciences, chemistry, and physics for a career change to AI.

7.1.2. Increasing the Number of AI Experts from Overseas in Israeli Industry (Returning Residents, New Immigrants, Foreign Experts)

Considering the talent shortage in AI, countries worldwide are competing for experts. As part of a call for proposals completed in 2024, the Innovation Authority chose 3 entities to locate and bring to Israel foreign AI researchers with a relevant academic education from well-known institutions and relevant work experience overseas, who wish to work in Israeli high-tech companies as AI researchers and lead their development teams. Target audiences include immigrants who are entitled to settle in Israel, Israelis who emigrated overseas and wish to return to Israel, as well as foreign experts who wish to relocate. The chosen entities will also be responsible for the AI experts' placement and assimilation in Israel.

The purpose of government support in this case is to reduce the financial risk associated with establishing an international identification, recruitment, and selection apparatus. The ultimate goal is to allow the chosen entities, after an initial time-limited governmental

support, to continue and expand their effort to attract foreign talent organically, without the need for continuous governmental intervention.

7.2. Providing Access to Experimentation Infrastructures

Objective: generating technological leaps and encouraging disruptive innovation in Israeli high-tech, in areas with high barriers to entry, particularly regulatory barriers, by creating a collaborative experimentation environment to accelerate R&D processes, to bring technologies to maturity, and to allow collaborative learning by regulators and high-tech.

Main avenues of action:

1. Establishing a regulatory sandbox mechanism in fields with financial potential and regulatory barriers

2. Supporting pilot projects along with regulators

Background: there has always been a gap between the fast pace of global technological advancement and the adaptation rate of the relevant regulatory frameworks. The regulatory environment is inherently intended to generate long-term certainty and therefore focuses on value-based rules that are independent of any specific technological application. Technological advancement, in contrast, often occurs in leaps, with substantial achievements and capabilities developed unexpectedly, over a short period. A good example is the development of generative AI, which has radically changed the way we perceive the interface between humans and machines. This difference in the nature of technological and regulatory advancement creates a built-in tension, which is intensified in times of substantial technological revolutions. Imposing strict regulatory limitations at an early stage can repress innovation and prevent actualization of the beneficial technological potential, while belated and overly permissive regulatory adaptations can lead to infringement on public safety, basic values, and human rights.

One commonly accepted and feasible way of bridging this disparity is creating experimentation environments, to facilitate collaborative mutual learning by technology developers and regulators. Within such an environment, innovative technologies can be evaluated in a controlled, safe, and responsible manner, while ensuring that the slackening of existing regulatory requirements (temporarily and judiciously) will not endanger the public. The collaborative testing process includes regular assessment of the predicted risks and benefits of using technology, and incremental examination of these predictions in comparison to actual performance. The importance of experimentation for groundbreaking innovation is the underlying principle behind the concept of Responsible Innovation, which Israel has adopted as the cornerstone of its regulatory strategy.

Many countries and entities describe regulatory sandboxes as a necessary element of promoting innovation. However, despite using the same term, there is often a fundamental difference in the way the concept is perceived. For example, the European Artificial Intelligence Law includes articles that describe regulatory sandboxes intended to allow final

testing and certification of mature products and services in their last stages of development, before entry to market. The Israeli experimentation approach, in contrast, is intended to promote the maturation of technologies in early stages of R&D, with simultaneous regulatory learning, in an attempt to generate a competitive advantage for Israeli companies, and to provide regulators with precise tools that have been tested in practice (evidence-based regulation) to regulate these technologies when their time comes.

7.2.1. Establishing a Regulatory Sandbox Mechanism in Fields with Financial Potential and Regulatory Barriers

To encourage groundbreaking innovation, especially in areas where technological companies experience entry barriers, the Ministry of Innovation, Science and Technology, the Innovation Authority, the Consultation and Legislation Department (Financial Law), and the Regulation Authority, will act to promote experimentation sandboxes. The process for establishing experimentation environments and promoting pilots will include the following stages:

- 1. Identifying regulated areas where the following conditions apply:
 - a. The existence of a clear industry interest in the field, for instance according to the number of companies active in the field
 - b. The existence of barriers for technological advancement, such as the regulatory barriers in transportation, healthcare, food, and education. These require discussion on whether to impose alternative regulatory conditions or slacken the existing ones.
 - c. The existence of a significant financial potential for relevant technological solutions once matured.
- **2.** Preliminary research to verify the financial potential, and to identify Israel's relative advantages in the field.
- 3. Mapping the existing barriers on activity in a specific field pertaining to a specific sandbox. To illustrate, a certain sandbox will not pertain to transportation as a whole, but to a specific problem such as experiments in autonomic public transportation. Once barriers are identified, the regulatory and legal possibility of slackening the existing regulatory conditions, and on what terms, will be examined. This ensures that public and other interests are not infringed on even within the experimentation environment (for example by establishing a controlled environment).
- **4.** Harnessing all the relevant stakeholders regulators, commercial companies, the initiating entity, and the directorate that will be founded in the relevant ministry to lead large complex projects.
- **5.** Establishing an experimentation program with an incremental difficulty level over a period of approximately two years.

6. Mutual learning is expected throughout the experiment period, wherein the companies enhance their technological solutions, while the regulator studies the actual risks and benefits (as compared to those predicted at the starting point), and the probability of their actualization. The experiments also comparatively examine viable solutions for managing the identified risks, in relation to their efficacy and applicability. This process will give regulators an advantage, even on a global scale, in understanding the technology, identifying the benefits and risks entailed, allowing them to update and adapt regulation, as needed, to suit technological advancement. Companies, on their part, will be able to mature the technology and present proof of its capabilities.



Chapter 8: Objective III – AI in the Public Sector Safe AI, Implementation of AI Knowledge, Capabilities, and Tools

8.1. Promoting Safe and Trustworthy AI

Objective: Enhancing public preparedness for responsible AI usage

Main avenues of action:

- 1. Establishing a governmental knowledge and coordination center for AI regulation and policy
- 2. Establishing a regulatory coordination forum and a public-multi-stakeholder consultation forum
- 3. Mapping AI applications, accompanying challenges in the regulated sectors, and relevant legal aspects

Background: alongside many opportunities, AI adoption can present significant risks and challenges, including algorithmic biases that infringe on equality; system weaknesses and vulnerabilities to manipulation and attacks; difficulty explaining systems that operate as "black boxes"; abuse for wide-scale deep-fake, disinformation, and fraud, which may infringe on the rule of law and on democratic values, as well as on privacy and personal information; intellectual property violation; uncertainty about the entity responsible for system failure; risks to the safety of system users or of affected entities, and more. These challenges and others give rise to questions about risk-mitigating tools, the need for human oversight and full disclosure, clear responsibility for AI failures, and labor market preparation.

Chapter 4 Section A of this document reviewed developments in AI regulation in Israel and the world. The review included the Israeli regulation proposal as part of the Regulation Policy paper (Section A 4.6), based on adopting OECD principles, sectoral regulation, as much as possible, using soft regulatory tools, compatibility of Israeli regulation with common practices in leading AI countries, and collaboration with keepers of knowledge and stakeholders, including academia, high-tech, and civil-society entities.

8.1.1. Establishing a Governmental Knowledge and Coordination Center for AI Regulation and Policy

By virtue of Government Resolution 173 (Enhancing Israel's Technological Leadership⁵⁴), in early 2024 the Ministry of Innovation, Science and Technology founded the Governmental Knowledge and Coordination Center, dealing with issues of regulation, information and data policy, ethics, civil international collaboration, and adoption in the civil-public sector. The Center is advised by the Ministry of Justice's Consultation and Legislation Department (Financial Law) and works in coordination and collaboration with the National Digital

⁵⁴ <u>https://www.gov.il/he/pages/dec173-2023</u>

Agency, Regulation Authority, Ministry of Foreign Affairs, Ministry of Economy, and other government entities.

The Knowledge Center now needs to be reinforced, with additional public servants with relevant expertise recruited to provide an effective response to the various challenges of AI regulation. The Center will work with the support of government ministries and will act to promote development and use of AI-based systems, out of a comprehensive view that aims to promote technological innovation, to protect rights and interests, and to achieve governmental goals.

The Knowledge Center is proposed to serve as a professional and knowledgeable inner-governmental entity with the following responsibilities:

- **1.** Assisting sectoral regulators to examine the need for AI-related regulation in the sector under their responsibility, and to design and promote such regulation, as necessary.
- **2.** Promoting planning, coordination, and collaboration between AI regulators, to minimize redundancies and contradictions between regulations imposed by different regulators, increasing certainty and uniformity.
- **3.** Leading coordinated and cross-sectoral initiatives for implementing the government's AI policy, particularly the policy suggested herein.
- **4.** Consulting the government on AI regulation and regulation policy, including issues pertaining to designing, updating, and developing the policy discussed herein, and supervising its implementation.
- **5.** Leading Israel's representation and involvement in developing regulation and standardization in international forums.
- **6.** Developing and providing access to information and tools for responsible AI use, for regulators and the public.
- **7.** Establishing relevant forums for discourse and knowledge sharing with elements in high-tech, academia, third sector, and government, as specified below.

8.1.2. Establishing a regulatory coordination forum and a public-multistakeholder consultation forum

To promote sectoral AI regulation in a coordinated and coherent manner, with collaboration and mutual learning and in accordance with the regulators' independent authorities in their own sectors, a professional inner-governmental forum will be established, to be led by the Knowledge Center, and to include representatives of regulators and government ministries, as well as experts on technology, policy, and law.

The regulatory coordination forum will promote round tables discussions, particularly focusing on friction-heavy fields, to examine the need for updating the AI regulatory

policy. The forum will adopt a 'wide-lens view' and discuss topics arising from the day-today challenges of the involved regulators. It will also engage in peer learning about the relevant technological advancement, innovation approaches to regulation, and insight from the field. The forum will thus assist in establishing uniformity in the implementation of a regulatory and ethical policy. Moreover, the forum will regularly discuss aspects pertaining to the rapid development of technology, necessitating periodic re-examination of policy recommendations.

A public multi-stakeholder consultation forum will also be established, consisting of representatives from high-tech, academia, civil-society organizations, and the public, to discuss issues of AI regulation. The forum will identify the primary areas in which the regulations or regulatory policy on AI needs to be adapted. Its purposes include examining barriers for efficient and regular social or financial activity and suggesting appropriate responses. The forum will also serve for in-depth consultation with the public before examining sectoral or cross-sectoral governmental and regulatory changes, in collaboration with the relevant regulators.

As the AI field consists of and is led by both high-tech and academia, it is of the utmost importance to maintain regular discourse and updates between these elements and government entities. The forum will allow discussions on technological advancements, on whether certain regulatory tools are appropriate for the various challenges and principles specified above, and on other questions. It will also allow the public to regularly air out its opinions, helping the government and regulators to establish their policies and reexamine them from time to time. Another advantage to maintaining open and attentive discourse in this forum is increasing transparency, helping to enhance public trust and regulatory certainty. Establishing a permanent forum for these purposes also coincides with OECD recommendations.

8.1.3. Mapping AI Applications, Accompanying Challenges in the Regulated Sectors, and Relevant Legal Aspects

Considering the diverse range of AI applications in different fields and sectors, and in light of rapid technological advancement in the field, Israel has adopted sectoral regulation as its preferred regulatory strategy.

In recent years, the scope of AI-based systems has grown considerably to the point that they are implemented in almost every branch of the market, with developments in generative AI accelerating this process. For a decision about required or appropriate regulation to be made based on a sufficient factual basis, government entities and the relevant regulators will act to identify and map individual applications of AI-based system, as made by the stakeholders in the regulated sector they are in charge of, including the challenges, concerns, and risks entailed, and the possible solutions.

The Governmental Knowledge Center at the Ministry of Innovation, Science and Technology will assist the government entities and regulators in this task. The Center will work in collaboration with the Ministry of Justice to help examine sectoral regulatory needs, accompanying the relevant government ministries and regulators in each field. Needs will be examined according to the priorities and work plan determined for the Knowledge Center, in accordance with the needs expressed by the regulators and ministries and in coordination with them.

8.2. Implementing AI in National and Municipal Government

Objective: implementing AI applications in accordance with data and AI strategy for the public sector.

Main avenues of action:

- 1. Promoting and supporting projects for AI implementation in the public sector
- 2. Publishing guides and legal guidelines for responsible AI usage
- 3. Establishing a training scheme for public servants, to develop literacy, skills, and proficiency in existing AI tools, as well as the risks they entail
- 4. Developing a central platform that offers a toolbox for organizations, creating designated AI agents and an onboarding environment
- 5. Encouraging Al adoption among government entities
- 6. Establishing inter-sectoral teams specializing in specific spheres, to create designated AI-based solutions
- 7. Harnessing municipal government to the national effort

Background: Harnessing AI technology, including generative AI, holds an immense potential for basing government work processes on technology, while developing new and existing services, reducing procurement and operational costs, significantly improving policy and its implementation by creating new knowledge, and generating predictive capabilities. This entails potential for major advancements in improving work processes in the public sector, as well as the quality, speed, efficiency, and adaptability of responses to the public. AI is also expected to curtail bureaucratic processes and shorten handling times for residents and public sector employees, thus increasing the productivity of public work, and optimizing and developing new public services and products.

The rapidity of changes in the field and their vast impact on society and on commercial and public organizations requires public entities to recognize these changes and respond accordingly. Al can be integrated into various actions and work processes in the public sector: from routine administrative work such as preparing meeting summaries, formulating internal documents, and conducting qualitative and quantitative analyses on various issues; through using Al for the provision of services and benefits, including decision making about provision of permits and licenses, actualization of rights, and execution of forward-looking planning and control and enforcement actions; to establishing policy in various fields such as regulation or taxation. Implementing AI tools in the public sector will garner many benefits, including:

- 1. Improving public service and increasing trust in government: curtailing the bureaucratic burden and improving service so that it is simple, uniform, credible, proactive, individually tailored, and accessible to all. All in keeping with Government Resolution 1366 dated 04/10/2022.
- 2. Enhancing the living standard by promoting social and economic growth: improving policy and decision making, improving process effectiveness, promoting high-quality digital services and products for the public in education, welfare, transportation, healthcare, real estate, and more, and promoting open government for research and innovation.
- **3. Streamlining work processes in the public sector:** improving policy, decision making, and process effectiveness, e.g., by implementing "green" tracks for actualizing rights, managing priorities, etc.

Realizing these benefits means addressing several challenges that are unique to the public sector:

- 1. Knowledge gaps among managers and employees: on the potential of AI tools and the accompanying risks. To help identify places where AI tools can be incorporated, needs among the various public sector entities must be well defined, including scopes of activity, and the design, development, and implementation processes must be supported and accompanied.
- 2. Difficulty in recruiting and preserving skilled and professional data science and Al personnel: competition with the private sector on skilled personnel in these fields is fierce, and government ministries and their auxiliary units therefore face difficulty in recruiting and preserving talented employees.
- 3. The need to ensure protection of basic rights and compliance with legal and other duties that apply to the public sector: addressing AI risks is a necessity across the board, in both private sector and government applications (specifically in its public-facing actions). Nonetheless, we must acknowledge that governmental applications entail additional challenges, particularly compliance with the duties that apply to the state as an administrative entity, given the government's comprehensive authorities over its citizens. AI adoption in government must therefore be accomplished with the necessary caution, addressing all the relevant legal aspects and providing responses to the possible risks.



8.2.1. Promoting and Supporting Projects for AI Implementation in the Public Sector

To accelerate the adoption of AI tools in government ministries, auxiliary units, statutory entities, municipal authorities, and the entire public sector, the program will promote national projects, meaning projects budgeted jointly by the relevant government ministry/auxiliary unit and by the National Program for Artificial Intelligence, in fields with a potential for substantial improvement.

By using AI-driven technology, national projects have the potential to affect a material change in the level of public sector service and in the quality of citizens' lives.

The projects are intended to bring about the desired change, yet the National Program also aspires to generate positive feedback that will accelerate the pace of AI adoption among government entities. The success of every national AI project will help to reinforce the government ministries' trust in AI capabilities, to map legal and regulatory issues, and to identify the required balance between risks and benefits.

The national projects for AI adoption in the public sector will be led by the Ministry of Innovation, Science and Technology in collaboration with the National Digital Agency.

A steering committee will be established to lead this activity, participated by the Ministry of Innovation, Science and Technology, National Digital Agency, Governance and Society Branch in the Prime Minister's Office, Innovation Authority, Ministry of Finance, and Ministry of Justice's Consultation and Legislation Department. Relevant professional representatives will join the committee's discussions as needed – from the Privacy Protection Authority, National Cyber Directorate, Directorate of Defense Research & Development, and others.

Project selection will rely on the publication of competitive calls for proposals, with chosen projects budgeted jointly by the National Program for Artificial Intelligence and the executing governmental entity. Besides budgetary support, chosen projects will also receive close professional support on technology, risk management, and project management, as specified below. The calls for proposals will be open to government entities, municipal government entities, and other entities as defined by the steering committee, and will take into account the unique characteristics of each. The projects will be chosen by a selection committee comprising representatives from the Ministry of Innovation, Science and Technology, National Digital Agency, Ministry of Justice's Consultation and Legislation Department, Budgets Department, Ministry of Finance's Accountant General Department, as well as the director of the National Program for Artificial Intelligence, all in accordance with Government Resolution 173.

The selection committee will rely on a professional opinion encompassing all the technological and organizational issues entailed in implementing the proposed projects. The professional review process will be conducted by the Ministry of Innovation, Science and Technology in collaboration with the National Digital Agency and the Innovation Authority. The projects budgeted as part of these calls for proposals will be flagship

projects of substantial size, which success will lead to a meaningful impact on the level of public service and/or on work processes in the public sector. National projects can also include pilot projects, which may be budgeted if they constitute the initial stage of a full project plan.

The winning entity will bear responsibility for implementing the national project. The projects are intended to facilitate a leap in the relevant ministry's capabilities and/or in its realms of responsibility, and it is therefore imperative that the ministry conducting the project will be solely responsible for establishing and maintaining the project (and all that entails), even if the ministry receives external support and assistance in that endeavor.

Assistance and support in the establishment and execution of the national project will be provided jointly by the Ministry of Innovation, Science and Technology and the National Digital Agency, using the existing platforms and the relevant officers (Chief Information Officer, Chief Digital Officer, etc.), as well as other entities that deal in actualizing digital projects and data initiatives.

From time to time, the steering committee will oversee the progress of approved projects and will initiate knowledge sharing endeavors between the entities responsible for the projects, based on existing knowledge sharing platforms, and in coordination with the National Digital Agency's knowledge communities' activity.

The steering committee will choose the projects based on a range of criteria, including:

- Commitment by management of the proposing entity to promote the project and allocate the necessary resources (budget and human resources).
- Technological maturity and capacity of the proposing entity, including technological abilities, existence of the necessary databases, and adequate project management abilities.
- Existence of mature AI technologies in the field, recognizing that public sector entities cannot conduct groundbreaking research and development, and must adapt existing technologies and implement them into complete information systems.
- Level of impact on the public, economy, and government, and scalability potential in case of success.
- Existence of coherent mechanisms in the proposing entity, intended to assess and manage the potential risks arising from implementation of the AI solution, as well as to analyze the legal issues entailed (such as safety, privacy, bias, and discrimination, explainability, human control, etc.).
- Quality and maturity of project plan.

The first call for proposals for AI adoption in the public sector⁵⁵ was successfully completed in early 2024. Nine projects were chosen out of 33 different proposals. The first

⁵⁵ https://www.gov.il/he/pages/most ai government agencies open call winners

open call facilitated learning and finalization of the various operating mechanisms, and two additional annual calls are planned based on its model.

8.2.2. Publishing Guides and Legal Guidelines for Responsible AI Usage

As part of the effort to accelerate adoption of AI-driven solutions and digital transformation processes in the public sector, guides will be written for various government users (the "potential consumers" of AI in the government), to support and facilitate safe, responsible, and lawful use, including:

- **1.** Basic guide for Al users in government to be written by the National Digital Agency in collaboration with other relevant entities.
- Guide for responsible AI use in the public sector to be written jointly by the Ministry of Innovation, Science and Technology, Consultation and Legislation Department, and National Digital Agency.
- Guide for AI procurement to be written jointly by the Procurement Administration, Ministry of Innovation, Science and Technology, Consultation and Legislation Department, and National Digital Agency.
- **4.** Guide for AI as a facilitator for regulators to be written jointly by the Ministry of Innovation, Science and Technology, Consultation and Legislation Department, and Regulation Authority.

8.2.3. Establishing a Training Scheme for Public Servants to Develop Literacy, Skills and Proficiency in Existing AI Tools, as well as the Risks They Entail

The Ministry of Innovation, Science and Technology, in collaboration with the National Digital Agency, will establish designated training programs for various public service officers, to enhance their literacy and skills regarding the potential of AI tools and the means of coping with the risks entailed in their adoption. The program will rely, as much as possible, on the existing training apparatus, and will develop additional guides and tools on demand.

8.2.4. Developing a Central Platform that Offers a Toolbox for Use by Organizations, Creating Designated AI Agents and an Onboarding Environment

The National Digital Agency, in collaboration with the Ministry of Finance, will act to offer common "generic" Al components to be used by a variety of government entities and ministries through the governmental cloud infrastructure Nimbus. These components will rely on the existing cyber security protections within the Nimbus cloud and will be available for implementation in the information systems developed by various government entities.

8.2.5. Encouraging AI Adoption Among Government Entities

Public sector entities will be encouraged to use the AI tools available through the Nimbus platform, including adaptation of generative AI tools to train on inner-organizational information.

In addition, the National Digital Agency and the Ministry of Finance will act to promote central procurement of off-the-shelf AI-driven tools for end users. Onboarding environments will be established to facilitate quick, available, and easy use, and "living labs" will be developed to allow discrete, focused, and quick implementation, to help demonstrate the benefits of public sector adoption.

8.2.6. Establishing Inter-Sectoral Teams Specializing in Specific Spheres, to Create Designated AI-Based Solutions

Cross-sectoral teams that specialize in specific spheres will be established to formulate work plans for adoption of AI, while considering new paradigms that can be established and examined by leveraging AI capabilities in their specific system. The teams will also be entrusted with promoting pilots for innovative applications of emerging technology.

8.2.7. Harnessing Municipal Government to the National Effort

Municipal government is a main component of the public sector, impacting many aspects of individual life, community, and society. Integrating artificial intelligence into municipal services has considerable potential to promote education, employment, transportation, planning, maintenance, and operation of public services. The national effort to promote Al should therefore be expanded to municipal government as well.

To promote such efforts, the Ministry of Innovation, Science and Technology, in collaboration with the National Digital Agency, Ministry of Interior, and Federation of Local Authorities in Israel, will establish a multi-year plan to promote AI in municipal authorities. The plan will initially engage in promoting AI in several representative municipal authorities and will later be expanded to other authorities.



Chapter 9: Objective IV – Establishing Israel's Global Geo-Technological Status in Al

9.1. International Leadership

Objective: leveraging Israel's capabilities to enhance its technological independence and preserve its freedom to act, using international collaborations.

Main avenues of action:

- 1. Strengthening Israel's knowledge infrastructures and AI capabilities in the global race for technological leadership
- 2. Influencing the international regulations being established
- 3. Positioning Israel at the forefront of the global AI field
- 4. The inter-ministerial committee a forum for AI collaboration

Background: the AI field has grown unprecedentedly in recent years. AI's financial, research, and practical potential has led many governments to formulate national AI programs to actualize this potential and reap the social and financial fruit. Additionally, many international organizations (e.g., UNESCO, OECD, ITU, Council of Europe) are promoting cross-border policy endeavors, and leading standardization organizations (IEC, IEEE, NIST, ISO, CEN/CENELEC etc.) publishing designated standards for enabling and safe AI.

While the field continues to advance rapidly, international collaborations are increasing between nations that wish to deepen their knowledge of AI, to encourage cross-border developments and research, and to influence the regulation established.

9.1.1. Strengthening Israel's Knowledge Infrastructures and AI Capabilities in the Global Race for Technological Leadership

Alongside the direct contribution of developing the R&D infrastructures that was reviewed in earlier chapters (e.g., computation, data, language processing, talent, and support for basic and applied research), such infrastructures also influence Israel's position as a world leader in AI.

The existence of such infrastructures considerably influences the perceived international status of the Israeli R&D eco system, as does the existence of a comprehensive government policy for identifying infrastructural gaps and creating suitable solutions. Therefore, government activity to ensure the existence of advanced R&D infrastructures in Israel directly impacts Israel's global leadership position as it is reflected through the various international indices. This opens the door for collaborations between Israeli researchers and companies and foreign countries.

To leverage Israel's investments in R&D infrastructures at the international level as well, the Ministry of Innovation, Science and Technology, Innovation Authority, and Ministry of Foreign Affairs will act to form new and specific bilateral agreements, to deepen the knowledge of Israeli researchers. They will also strengthen scientific ties between countries, in academia, high-tech, and in G2G R&D projects.

9.1.2. Influencing the International Regulations Being Established

As was surveyed in chapter 4 above, international organizations as well as individual countries currently invest considerable resources and attention to the forming of a domestic and international AI regulation regime. International standardization organizations such as ISO and CEN/CENELEC are also working rigorously to develop standards for responsible AI. The work products generated by these organizations and by the leading countries have, as a rule, a global impact, which also affects Israel.

Israel is an active, well-respected, and influential participant in most relevant international forums, including the OECD, the Council of Europe's CAI committee, the UN, the AI Safety Institutes, and other organizations. Its participation helps integrate the Israeli inputs into global regulatory policy and ensures that Israeli regulation remains compatible with global regulation.

In view of this, and in conjunction with Government Resolution 212, the Ministry of Innovation, Science and Technology and the Ministry of Foreign Affairs, in collaboration with the relevant government entities, will continue to proactively engage in various international forums to promote a balanced and coordinated regulation and ethics policy in the AI field, in accordance with Israeli policy and governmental goals. Participation in these forums will also serve as a central means of learning from the experience of other countries, to deepen Israel's knowledge in these fields, and to understand the emerging international trends.

9.1.3. Positioning Israel at the Forefront of the Global AI Field

Besides promoting Israel's AI capabilities, it is also incredibly important to expose these capabilities internationally, and to strengthen the Israeli "brand." Technological, research, and business development activity will therefore be conducted to increase global awareness of Israeli AI prowess. Activities will focus on emphasizing Israel's relative advantages, including Israel's well-developed ecosystem, Israeli researchers' standing at the forefront of global research, accumulated experience in commercialization, and the well-developed AI data infrastructure in Israel. It will also strive to create technological, academic, and financial international collaborations.

9.1.4. The Inter-Ministerial Committee – a Forum for AI Collaborations

To promote coordination and sharing between the AI endeavors promoted by government ministries in the international arena, the Ministry of Innovation, Science and Technology is leading quarterly discussions by an inter-ministerial steering team. The team comprises representatives from several government ministries, including the Ministry of Foreign Affairs, Ministry of Justice, National Digital Agency, Ministry of Economy, Foreign Trade Administration, National Cyber Directorate, Prime Minister's Office, National Security Council, and others. The forum surveys the efforts of Israel's representatives in the international arena to promote policy issues the government deems relevant. Its purpose is to coordinate AI-related efforts between the various entities, in order to promote a unified view in international forums.
Chapter 10: Objective V – AI at the National Level Preparation for the Impact of AI on Government Ministries' Domains

10.1. Integrative Approach to Government Ministries' Preparation

Objective: constantly examining the impact of AI on the domains of government ministries, creating appropriate strategic plans.

Main avenues of action:

1. Constant monitoring of government ministries' preparation for AI impacts in their domains

2. Promoting public literacy and responsible use of AI

Background: introductory chapters to this Program reviewed the significant changes in all spheres of life, driven by artificial intelligence. Government ministries are therefore required to constantly monitor these impacts, generate work plans adapted to the changes predicted in their domains, and coherently monitor the progress of these plans. Aside from the regulatory issues arising from integrating AI tools in the ministries' domains, the government must also examine the technology's impact on the labor market, the training processes required for different domains, the social impacts, the potential stemming from technological advancements to reduce social inequality and increase productivity, potential impacts on supply chains, etc.

The examination of AI technologies' impact on government ministries' domains is still in its infancy and is in dire need of acceleration. So far, a complete action plan has been developed for education, and initial efforts have begun to examine AI impacts on employment. It is recommended to also prioritize the creation of comprehensive plans for healthcare, transportation, energy, agriculture, and finance.

To facilitate the creation and promotion of such action plans, a coherent process of examining Al's impacts on the domains of the various ministries is necessary, with professional support and a planning and control framework.

10.1.1. Constant Monitoring of Government Ministries' Preparation for Al Impacts in Their Domains

To ensure the readiness of Israeli society and economy to the changes currently taking shape, the National Program for Artificial Intelligence will promote the formulation of ministerial action plans. Each plan will be based on in-depth research, reviewing the current and predicted impacts on the relevant ministry's domain, and will provide a comprehensive and exhaustive response to technological impacts in these fields. Action plans will be formulated systematically, with 2-3 plans developed each year, while the previous plans move on to the execution, monitoring, and control phase.

The formulation process will be accompanied by professional support, tools, and knowledge, in connection with entities from high-tech, academia, and civil society. The

various plans will aspire to leverage the strengths of Israeli society and economy on one hand, and to rely on AI on the other hand, to achieve the relevant ministry's main objectives – minimizing gaps, increasing productivity, etc.

10.1.2. Promoting Public Literacy and Responsible Use of AI

Promoting public digital literacy is becoming a central tenet in the age of the Al revolution, which is changing the characteristics of the labor market, the workplace, learning environments, and everyday life. The more advanced and complex the technology, the more important it is for the public to be educated about it and about means of coping with its impacts. One of the ways to increase literacy is to expose the public to new tools in a practical and accessible manner, and to make them accessible to all groups and populations. Action to minimize sectoral and geographic disparities in access to knowledge and tools are especially important. The Ministry of Innovation, Science and Technology is acting to promote extracurricular education initiatives that will ensure equal access to technology and learning for all population groups. Such actions help develop audiences that can conduct themselves independently and judiciously in a changing technological environment, making them active partners in shaping Israel's socioeconomic future.

10.2. Integrating AI into the Education System

Objective: cultivating students' and teachers' capabilities in an Al-intensive world, creating tailored tools and teaching strategies, and improving the effectiveness and efficiency of the education system using Al.

Main avenues of action:

- 1. Preparing students and teachers for an Al-intensive world
- 2. Implementing AI to promote education
- 3. Establishing infrastructures that support AI implementation in education
- 4. Educating the future generation of AI researchers

5. Promoting AI in extracurricular education

Background: The education system is facing a significant challenge in its bid to prepare both students and teachers for an Al-intensive world. In the same breath, Al's advanced capabilities present a unique opportunity to promote education by developing individually tailored, highly relevant processes and learning experiences. The education system's success in tackling this challenge and seizing the opportunity is of national importance, as by training the future generation, the education system constitutes Israel's main growth engine.

The Ministry of Education is strategically preparing for this challenge and these opportunities, by defining and implementing a national strategic program for implementing AI in education, led by the Ministry's Innovation and Technology

Administration. The program centers around a vision for a groundbreaking education environment, positioning the Israeli education system as a global leader in incorporating AI in education.

10.2.1. Preparing Students and Teachers for an AI-Intensive World

The program includes an outline for AI competence among teachers and students, alongside designated teaching strategies for developing such competence. These include knowledge, skills, approaches, and values. During the 2025-2026 school year, a system-wide implementation effort will be conducted to induce AI competency among all teachers and students in the education system. This effort will make use of advanced pedagogy, reflected in updated curricula and processes of teaching, learning, and evaluating, to instill practical and comprehensive AI capabilities.

10.2.2. Implementing AI to Promote Education

One of the National Program's main avenues of action is implementing AI capabilities to promote innovative and improved pedagogical and organizational processes in the education system, gradually integrating AI in all disciplines. This includes incorporating AI applications in the strategic 'Education 720' project, promoting a transformation into individually tailored education processes, throughout the public K-12 education system. Incorporating AI capabilities in the digital platform will help to effectively and efficiently implement capabilities of building individually tailored curricula and processes of teaching, learning, and evaluating, so that each student can actualize the full potential of his or her abilities and aspirations. Additionally, the National Program is promoting various AI applications to promote mental and emotional wellbeing in students and teachers, to improve teacher efficiency and to optimize organizational processes in the education system.

It should be noted that incorporating individually tailored learning at the national level, implemented in all disciplines and schools, is innovative even on a global level. Globally, there are only a few nascent attempts to create a wide-scale individually tailored learning system, and so, aside from the obvious educational benefits, this vision can also position Israel at the forefront of the global EdTech industry.

The program also includes action to promote supporting infrastructures in human capital, pedagogy, technology, regulation, and innovation. From the human capital aspect, efforts are made to provide training and professional development for educators in all roles, for informed and responsible AI use in education.

In terms of technology and pedagogy, efforts are made to establish, operate, and make accessible technological infrastructures, such as end terminals, networks, and AI tools, as well as pedagogic infrastructures such as content and practices in all disciplines.

10.2.3. Establishing Infrastructures that Support AI Implementation in Education

In terms of regulation, it should be noted that education is one of the most sensitive and supervised fields in the Israeli and global social spheres. Therefore, any integration of AI

technologies in the education system must be accomplished cautiously, thoughtfully, and responsibly. The National Program for Artificial Intelligence is developing and implementing a scheme of regulatory tools and rules to allow responsible and ethical AI use, in concurrence with age groups and with special populations. The scheme includes implementing policy principles pertaining to responsible innovation, regulatory mechanisms for AI tools, regulatory sandboxes, pilots, and dissemination of usage instructions for educators and students.

In education innovation, efforts are made to establish an ecosystem for managing constant AI innovation. The ecosystem will encompass the activity of the Institute for Applied Research of AI in Education, collaborative networks between government, industry, and civil society to promote applied R&D of AI in education, early-adoption schools, and more.

The program for AI adoption in education can also accelerate the development of the Israeli educational technology industry, deepening its collaboration with the education system. Such collaboration will facilitate comprehensive integration of pedagogical knowledge held by the education system with EdTech knowledge, provide the EdTech industry with a diverse and effective experimentation environment, and offer students and teachers early and unique access to newly developed technologies.

In the past two years, the Ministry of Innovation has been leading an effort to ensure a sustainable talent pipeline for the tech industry, as part of an inter-ministerial committee. The committee focuses on establishing measurable goals and practical recommendations for government about talent development starting at the K-12 education system and following to the role of the defense and academic sectors. The Ministry of Education is a central partner in the committee, leading the program for high-tech in education, intended to substantially increase the number of high school graduates who meet the thresholds for high-tech professions in the IDF, academia, and high-tech.

Moreover, an inter-ministerial team has recently been established, comprising representatives from the Ministry of Education, Ministry of Innovation, Science and Technology, and other ministries. The team addresses the integration of AI in the education system for two purposes: to deepen all students' acquaintance with and understanding of AI, so that they can become skilled consumers and users who can recognize the technology's potential, characteristics, and risks; to nurture the future creators of AI, as part of developing talent for high-tech. As of this paper's date of publication, collaborative work is underway, with conclusions to be published upon completion of the inter-ministerial process.

10.2.4. Educating the Future Generation of AI Researchers

One of the core responsibilities of the public education system is educating the future generation of technological professionals, and specifically the future researchers of AI. Aside from using AI as an education tool and educating teachers and students for AI competency, Israel's education system is entrusted with preserving the high-tech

industry's relative advantage by training the future generation of AI researchers, similarly to the current situation in various other fields of high-tech like computer science and electronics.

The Ministry of Education therefore intends to establish a dedicated high-school curriculum program that focuses on providing students with the foundations needed to allow them to continue and pursue an advanced AI academic track. Given the rapid technological turmoil of modern AI, the curriculum will emphasize self-learning competencies, side-by-side with up-to-date theoretical knowledge in areas of math, machine learning theory, big data processing, research planning, and experiment design.

In the future, this new track will be integrated into the High School Faculty concept, which will allow students to engage in multidisciplinary study programs as part of their high-school education phase.

10.2.5. Promoting Extracurricular AI Education

The Ministry of Innovation, Science and Technology takes part in the preparations of the Israeli education system to the AI age, particularly by partnering with the Ministry of Education and the public education system to create a continuum of solutions for in school and extracurricular education. The goal of this joint effort is to provide the most comprehensive and exhaustive response possible to Israeli students, generating a substantial national impact in AI learning.

As part of this effort, various initiatives are promoted to ensure equal access to Al technology and open access to Al learning for the entire population. This will allow various groups of the Israeli public to conduct themselves independently and judiciously in a changing technological environment, and to strengthen the participation and involvement of these groups in shaping Israel's socioeconomic future.

Action in extracurricular education frameworks is particularly significant when it comes to population groups that cannot access AI studies as part of the formal education system, like the Haredi society, the students of which can be exposed to appropriate and safe AI content within complementary school programs.

As a first step in complementary education, the Ministry of Innovation, Science and Technology will therefore offer an 'AI for Every Child' course, which will be available in all municipal authorities throughout Israel as of 2025. Participation in those courses will be fully subsidized by the Ministry of Innovation, Science and Technology in order to increase their accessibility to all groups of Israeli society.

To make AI accessible for older population groups as well, the Ministry is partnering with Campus IL and the National Digital Agency to offer basic online AI literacy courses for the entire population. Tailored self-learning courses will be created to promote learning in multiple languages and by different sub-groups of the Israeli society. Additionally, the Ministry makes efforts to make AI knowledge and tools accessible to teachers and educators within the education community it fosters as part of its innovation communities project, alongside considerable activity by the AI innovation community, comprising high-tech professionals, academics, and representatives of the business and governmental sectors, and by the government regulators forums.

10.3. Preparation for the Changes Expected in the Labor Market

Objective: preparing the labor market for the AI revolution

Main avenues of action:

- 1. Establishing training schemes for developing AI skills in relevant professions
- 2. Establishing a program for "professions at risk," including a career-change track and other solutions for at-risk employees

Background: much like the previous technological revolutions, such as the industrial revolution and the rise of the internet - the AI revolution is poised to profoundly reshape the labor market. The full extent of AI's disruption remains debated: will AI integration displace large segments of the workforce, or will it boost productivity, elevate job quality, and create demand for high-skilled, tech-oriented roles? Numerous global studies suggest that over the coming decade, many current jobs will be significantly redefined or phased out, while new AI-driven roles will emerge. Accordingly, the skills landscape will shift, necessitating updates in education systems, professional training, and workforce policy.

A report by the International Monetary Fund (IMF)⁵⁶ published in early 2024 alerted about the economy's level of preparedness for AI implementation, stating that "given the labor market's high level of AI exposure, with its level of preparedness to adoption still insufficient, it is necessary to regulate the field and promote integration". The World Bank states that AI may reshape the global economy, particularly as it pertains to the labor market, and that about 40% of workers worldwide are in high-exposure occupations. The report further claims that AI can exacerbate wage disparity and increase inequality between nations, with some workers able to harness the technology to increase productivity while those who cannot fall behind. "This is a troubling trend policymakers must proactively address to prevent the technology from further stoking social tensions," wrote IMF chairwoman Kristalina Georgieva in a blog post on the IMF website. "It is crucial for countries to establish comprehensive social safety nets and offer retraining programs for vulnerable workers. IN doing so, we can make the AI transition more inclusive, protecting livelihoods and curbing inequality. The need for government intervention and regulation has become immediate".

Another report, published in Israel by the Knesset's Research and Information Center for a Science and Technology Committee discussion on "Artificial Intelligence: Opportunities,

⁵⁶ Gen-AI: Artificial Intelligence and the Future of Work (imf.org)

Risks, and Regulation^{"57}, addressed the impacts of AI on the labor market. The authors stated that "contrary to the common assumption that automation trends will affect mainly manual labor or "blue collar" jobs, the latest trends in AI indicate potential impacts on other occupations such as writers, graphic designers, programmers, translators, and others." Moreover, according to a study draft dated March 2023, attempting to assess the impacts of gen-AI and LLM technologies on the US labor market, it is actually high-wage professions that are more exposed to the effect of AI penetration, rather than low-wage occupations.

The study describes a scenario in which, following AI penetration into the workplace, we can expect an impact on about 50% of the tasks performed by human workers in about 19% of the jobs, and an impact on about 10% of the tasks in 80% of the jobs.

In mid-May 2024, the Knesset's Science Committee held another discussion titled "Artificial Intelligence – Key to Productivity or Mass Unemployment?" Experts who took part in the discussion disagreed about the future of the labor market with the development of AI. The Committee was convened due to an actual threat on the labor market, particularly in service-oriented professions such as law, insurance, finance, and technological customer service. Discussion participants included senior managers from the fields of banking, law, and technology, who described the emerging improvement in productivity due to AI integration. The discussion indicated that there is a substantial need to adapt worker skills in a variety of occupations to an AI-integrated labor market.

Discourse about the impacts of AI adoption and the technology's ability to transform the market has increased since generative AI emerged, and the great big challenge is predicting AI impacts on economies, companies, and the labor market. For instance, despite positive predictions about labor market productivity, the risks threatening the occupations themselves and the future changes in employment are still unclear, even following a recent report about the future of the labor market⁵⁸.

The immense impact of AI on employment is driving many governments to formulate specific actions in the AI context. Similarly, Israel's National Program for Artificial Intelligence seeks to provide a targeted response for the predicted impacts of AI on the Israeli labor market, establishing a governmental preparation plan to address them.

To promote such an effort, the Civil Service Commission and the Ministry of Innovation, Science and Technology, in collaboration with the Ministry of Labor, Ministry of Economy, Ministry of Education, Ministry of Welfare and Social Services, Ministry of Finance, and other relevant entities, will establish a multi-year program for preparing for and addressing the future impact of AI on the labor market. The program will address training, career changes, adaptations to existing professions, etc. It will also define priorities, according to its assessment of the sectors and professions in which the most extensive and earliest impact is predicted.

⁵⁷ <u>https://fs.knesset.gov.il/globaldocs/MMM/11189446-7fc1-ed11-8159-005056aa4246/2_11189446-7fc1-ed11-8159-005056aa4246_11_20161.pdf</u>

⁵⁸ <u>https://www.developmentaid.org/api/frontend/cms/file/2024/01/SDNEA2024001-1.pdf</u>

Appendix – Performance Indicators

Objective	Chapter	Goals	Indicator	Target Date
Artificial Intelligence Infrastructures – Promoting research and talent, and providing access to infrastructure	Providing access to computational infrastructure	Establishing an HPC technologies lab	Establishing a lab to serve the high-tech industry	2024
		Establishing a computational infrastructure for large model training	An infrastructure with thousands of GPUs	2025
		Providing access to scientific HPC infrastructure, generating a local expertise center in Israel	Establishing an expertise center to provide services	2025
	Ensuring access to data infrastructures	Launching and operating disciplinary data asset infrastructures	Operating 1-3 data assets	2027
		Establishing generic infrastructures for virtual research rooms, to provide access to government data for R&D		2027
	Ensuring access to language processing infrastructure	Creating and providing public access to LLMs in Hebrew and Arabic	A separate designated model for each language	2025
		Creating and providing public access to models for common linguistic use cases – transcription / translation / named-entity recognition / abstracting etc.	A separate designated model for each use case	2025
		Creating and providing access to databases and open-code components	Dozens of projects	2023
		Online index to pool linguistic resources in Hebrew and Arabic	Building an accessible website	2024
	Expanding basic and applied research	Increasing the number of AI research degree graduates, using a scholarship program	Over 7 years: about 260 scholarships	
		Enhancing technical faculty at academic computation centers	5 employees for 5 universities	2024
		Training AI experts in the defense system	100 per year, fully matured	2027
		Operating moonshot projects in academia, high-tech, and defense system	3 projects	2025
		Founding a national AI institute		2027

Al in high-tech	Increasing skilled talent	Increasing the number of Al experts in high-tech	Hundreds of experts, accumulatively	2027
	Providing access to experimentation infrastructures	Operating coordinated pilots (e.g. "reality-changing initiatives") – experimentation sandboxes	1-2 initiatives	2026
		Encouraging the submission of portfolios in all Innovation Authority tracks, which use scientific HPC resources	5 applications per year	2027
Artificial Intelligence in public sector– Implementation of AI knowledge, capabilities, and tools	Al adoption in national and municipal government	Launching calls for proposals for Al adoption among government entities	Completing 3 annual calls for proposals	2026
		Publishing instructions and guidelines for AI adoption in the public sector		2025
		Establishing a multi-year strategic program paper for data and AI adoption in the public sector		2025



Artificial Intelligence at the national level – Enhancing public preparedness to the AI Revolution	Promoting Safe AI	Establishing a cross-government regulatory knowledge center	Active center	2024
		Establishing a regulators forum and a public-engagement forum	Active involvement by all relevant ministries; conducting 4 meetings a year	Regularly
		Establishing an advisory expert group to advise the government on AI policy and regulation	Diverse and high-level representation from high-tech, academia, and civil society; conducting 4 meetings a year	2025
		Publishing an AI ethics and regulation policy principles paper		2023
		Active involvement in international Al forums, and promotion of collaborations with leading countries	Participation in discussions of all leading frameworks, strengthening bilateral collaboration with 3 leading countries every year	2025
	International leadership	Inter-ministerial committee – a forum for AI collaborations	Quarterly meeting	2025
		Preserving Israel's position in the top ten, in various indices		Regularly















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