

Israel National Technological Innovation Report



THE
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Israel National Technological Innovation Report



2018



PREFACE

For more than a decade, the Luzzatto Group has produced national status reports on the subjects of intellectual property, high-tech, and technology innovation. These reports are submitted to relevant government ministers and to select groups of decision makers and stakeholders.

As a group, we are situated at the strategic crossroads where entrepreneurs and investors meet and examine many new technologies before they enter the market. We have set our goal for this report to reflect the entirety of the data and insights about technological innovation in Israel. This is part of our public service commitment, which is one of the ethical foundations of our firm and comes out of our recognition that technological innovation is the central growth engine of the contemporary Israeli economy.

We are therefore pleased to present to you the new updated and expanded edition of the National Report on Technology Innovation for 2017-2018, including discussion of various aspects of technology innovation, high-tech and intellectual property and their impact on the Israeli economy.

The report integrates data from multiple, diverse sources including: the World Economic Forum, the U.S. based Bloomberg News company, the Annual Report of the IMD Research Institute, the Annual Statistical Report of the World Intellectual Property Organization (WIPO), the Martin Prosperity Institute at the University of Toronto, the economic newspapers the Wall Street Journal and the Economist, and in Israel - data from the Israel Patent Office, the Israeli research company ICV, the economic consulting company Financial Immunities, the Israel Export and International Cooperation Institute, and the Central Bureau of Statistics (Israel).

The implicit assumption of this report is that intellectual property and technological innovation are two sides of the same coin. Intellectual property predicts technological innovation and at the same time reflects it. Furthermore, intellectual property is a kind of mirror image of the global economy and constitutes a prism through which macro-economic trends and processes are reflected. Thus, for example, the accelerated growth of China, turning it into the second economic superpower in the world, is well-reflected in the scope of patents registered there.

As for Israel, the aggregate data shows a mixed picture - on the one hand, Israeli high-tech continues to

demonstrate strength while positioning itself as a very important global player. In certain fields, such as medical devices, cyber, autonomous cars, cognitive computing, and artificial intelligence, Israel is at the forefront of worldwide innovation and its position as the innovation nation is stronger and more robust than ever. But in the background, there are signs of some difficult challenges, among them a serious shortage of technological human resources, with a dramatic increase in the salaries of high-tech employees, challenges in technology education and more, alongside a certain decline in national allocations for research and development. An additional challenge is inherent in President Trump's tax reform plan, which threatens to make the United States more attractive than Israel for entrepreneurs and startup companies.

For Israel, whose relative advantage relies on human capital and the spirit of innovation, intellectual property is a strategic resource. Therefore, developing, preserving and leveraging it are clearly in the national interest. In the same measure, creating a climate that supports innovation, while removing regulatory barriers, both for local inventors and entrepreneurs and for multinational companies that establish development centers in Israel, is an important need.

Therefore, it is desirable that the government of Israel learn from the technology superpowers - like the United States and Japan - who have established special task forces to advance the field of intellectual property, under the authority of the President and Prime Minister respectively, out of recognition of its importance and contribution to economic growth.

I hope that this detailed report, prepared by the research unit of the Luzzatto Group, will assist decision-makers in focusing their efforts in the field of technological innovation and intellectual property that they may successfully bear fruit for the Israeli economy.

My sincere thanks to the authors of the report including: Dr. Esther Luzzatto, Attorney Amir Palmieri, Attorney Niv Moran, Attorney Michal Luzzatto, Attorney Boaz Croitoro and editor-in-chief Joel Tsafir. May their efforts be blessed.



Best regards,
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INTRODUCTION

On intellectual property, technological innovation, and everything in between

Intellectual property and copyright are playing an increasingly prominent role in today's economic environment, which is growing to rely less on raw materials, and more on knowledge and technology. In effect, intellectual property is currently considered the most important asset held by corporations, companies, and countries. Not only does it express technological innovation; it reflects the core of the economic activity of developed, post-industrial countries that rely on intellectual assets (innovation and R&D, patents, trademarks, copyright, samples, knowledge, reputation, consumer loyalty, and other assets).

Several studies indicate that in developed countries, intellectual property plays a key role in the production of national wealth. In these countries, intellectual property is valued at 354 thousand dollars per capita, in contrast with 76 thousand dollars per capita from manufacturing, and only 9,500 dollars per capita from natural resources. In other words, the rate of technological development has made the comparative advantage of intellectual property a key component in the economy. Today, 80% of the aggregate value of public companies across the globe is derived from intellectual property.

The world has long recognized the significance of intellectual property and its impact on the product. In recent years, both the US and Israel have added data on investments in various types of intellectual property to the model for calculating economic output. In Israel, this is of utmost importance, because Israel's investment in R&D is high in comparison to the rest of the world, and the change in the calculation model should increase economic output by 2% per year on average for all subsequent years.

Rapid technological developments place the intellectual products at the upper tier of human wealth, and organizations are investing a great deal of time and money in the development and the preservation of intellectual property. With all new technologies – from IoT to robotics, from cloud computing through cyber to fintech, from autonomous vehicles to smart homes and smart cities, not to mention digital medicine that incorporates several specialties – intellectual property plays a critical role, where patent protection of inventions encourages and fosters entrepreneurship, R&D, and commercial leverage.

Globalization, trade wars, and intellectual property

The recently abandoned trade war between the US and China is primarily centered on intellectual property. This serves as additional evidence of the present-day gravitas of intellectual property. According to the US government, there is an unusual instance of theft of intellectual property by China, as described by the US president. An investigation team appointed by Trump about one year ago assessed that Chinese government activity in the field of intellectual property has cost American companies about a trillion dollars.

According to the US government, China is breaching US intellectual property in several ways. First, China is restricting foreign holdings in order to force American companies to forward technologies to Chinese companies. For example, American companies operating in China are required to participate in joint initiatives and are forced to share technology that requires an investment of tremendous monetary resources and efforts. Second, the Chinese government is instructing companies in China to invest in American companies in order to transfer technologies to China that the Chinese government deems to be strategic. Third, there is evidence that China supports cyber-attacks launched against American companies in order to obtain trade secrets.

In recent years, China has been taking a series of steps to curb the phenomenon and to create an intellectual property regime that allows foreign investors to share technology without fear of duplication or counterfeits. However, China has a long way to go when it comes to enforcing laws and preventing piracy and counterfeits, which cause extensive economic damage to multinational companies and to countries that export to China.

Israel's intellectual property regime

These developments and changes are particularly apparent in Israel, which has become a focal point for global innovation in a multitude of fields. Israel considers the preservation and cultivation of intellectual property to be crucial, which alongside human capital, they constitute two sides of the coin of innovation.

In recent years, Israel has been narrowing its disparity with developed countries in terms of its intellectual property regime. Over the course of these years, it has

been adapting its legal, regulatory and bureaucratic work environment with world standards in the field. This modification has addressed both the preservation of intellectual property and copyright, and work processes and methods, with full adaptation of domestic intellectual property law and international intellectual property law.

This effort became necessary when Israel conformed to a series of international conventions, especially after joining the OECD. This process is continually evolving, and the direction Israel is heading is clear - expanding the protection and enforcement of the intellectual property rights of inventors and of technological innovation developers.

According to this report, what is still missing from this report is an active, more aggressive approach for the protection of intellectual property assets. This is the case when it comes to vigorously enforcing intellectual property assets such as copyright, preventing brand name counterfeits, or leveraging intellectual property assets between government and public organizations including universities, hospitals, the security apparatus, etc.

Israel could learn from the experience of their peers on these matters. The leading economies of the West, such as the US and Japan, have adopted extensive reform. This reform was directly managed and promoted by the heads of these states, in an effort to overcome onerous red-tape while leveraging their intellectual property assets. At the time, in the US, President George W. Bush established a taskforce to examine the issue of intellectual property, and in Japan, the task was tackled directly by the prime minister. The EU and its members also realized the importance of enforcing intellectual property rights, and a directive offering guidelines to member states for advancing enforcement was published in 2004.

In light of this, the next phase that Israel should reach, upon adopting all relevant obligatory international conventions, is actively leveraging its intellectual property assets. A key recommendation emerging from the following report is the establishment of a national taskforce for examining and establishing a comprehensive policy on intellectual property rights that will allow Israel to come together with developed countries and to enthusiastically advance intangible assets at the its disposal. Down the line, it is worth

considering the establishment of a state authority, under the jurisdiction of Ministry of Justice and the Ministry of Economy, with the objective of instituting and promoting a comprehensive policy on intellectual property. This national taskforce, with authorities and budgets, could consolidate all of the work required for preserving intellectual property assets, both in the government and the private sector. The taskforce would advance and foster this objective, and would vigorously enact enforcements against the infringement of intellectual property rights.

Intellectual property as leverage for basic growth

This report is designed to present an updated situation report on the national approach towards intellectual property concerns, improvement processes, and important changes that have been made in recent years. It also offers a review of matters that require ongoing attention and change, while endeavoring to complete the important measure of adapting Israel's legal and practical environment to that of the developed world. As mentioned, it also points to the potential of leveraging intellectual property assets in the public, government sector.

We believe that fostering intellectual property in Israel is a top national priority. As a world leader in technology and science, which exports information technology in giant transactions with leading international companies as well as developing countries, Israel should give intellectual property matters the attention it deserves as a top national priority. Giving appropriate attention to intellectual assets produced in the business and public sectors is a key engine of growth in our present-day economy. It would lead to an increase in state income, to the prevention of export of brainpower, to more employment opportunities, stronger foreign ties, and a better global reputation.



Best regards,
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CHAPTER 01

TECHNOLOGICAL INNOVATION - ISRAEL'S PRIMARY GROWTH ENGINE



Technological innovation is the lifeblood of the Israeli high-tech industry, which is currently the country's leading industry. In effect, technological innovation has become the Israeli economy's primary engine of growth, as indicated by the country's macroeconomic performance and by its position on the world stage.

There is a close cause and effect relationship between a country's development of technological innovation and its economic performance. However, innovation is not created ex nihilo. Innovation is made possible by a country's investment in R&D infrastructure, the cultivation of personal capital, the promotion of the financial system and of venture capital, and a long list of additional parameters. This investment yields welcome results, and consequently, countries that invest in the development of innovation enjoy growth and profitability that are not typical of countries that still operate on the old economy of raw materials and traditional industry.

This can clearly be seen in global intellectual property data, where there is an explicit correlation between a country's economic growth and a spike in its registered patents, and vice versa (as will be demonstrated in the upcoming chapters). In this respect, intellectual property data serves as a mirror image projecting economic performance in various countries.

Moreover, innovation is the lifeblood of the high-tech industry. It is the element that makes investing in technological developments worthwhile, while it streamlines existing industries. Disruptive innovation is its most interesting form. Not only does it change the existing industry; it seizes it, dusts it off, and revolutionizes it. This is what Uber did to the taxi and transportation industry, as Airbnb did to the hotel industry, and as WeWork did to workspaces.

Disruptive technology of the high-tech and startup industry will extend to an increasing number of disciplines in the upcoming years, from insurance and banking, which are at the cusp of a revolution, to industries that we have not even thought of yet. The main obstacle impeding this innovation is not combative entrepreneurs; rather, in many instances, it is investors who lack the vision and the courage to go all-out with the entrepreneur.

And in Israel?

In Israel, these characteristics are particularly significant due to the Israeli economy's explicitly technological orientation, and due to it being an export-driven economy, with half of its exports comprised of technological services and products.

In Israel, maybe more than anywhere in the world excluding China, there is a clear, definitive, direct correlation between economic growth and technological innovation, as we will discuss later in our report. In effect, it is technological innovation that has thrust Israel from being a second world country to becoming a first world country, establishing and cementing its status as a world leader. It is also the factor that has raised Israel's GDP per capita to roughly 40 thousand dollars, surpassing that of France and Italy, and approaching that of Britain and Germany – all unequivocal industry superpowers.

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Three decades of dramatic improvement in economic performance

According to the OECD report from 2017, Israel has been showcasing impressive economic data for 15 years in a row. Almost no other country out of the 33 OECD member countries has demonstrated such impressive growth over this number of consecutive years. While the report criticizes the underdeveloped state of public transportation and infrastructure for roads and trains alongside a plethora of social issues (such as poverty measured at higher than acceptable rates, and the low level of education of some Israelis), it underlines that Israel's economic data is very positive: high growth, low inflation, the lowest unemployment rate among member countries, high-tech at its best, reforms enacted by governments in recent years

GRAPH 01

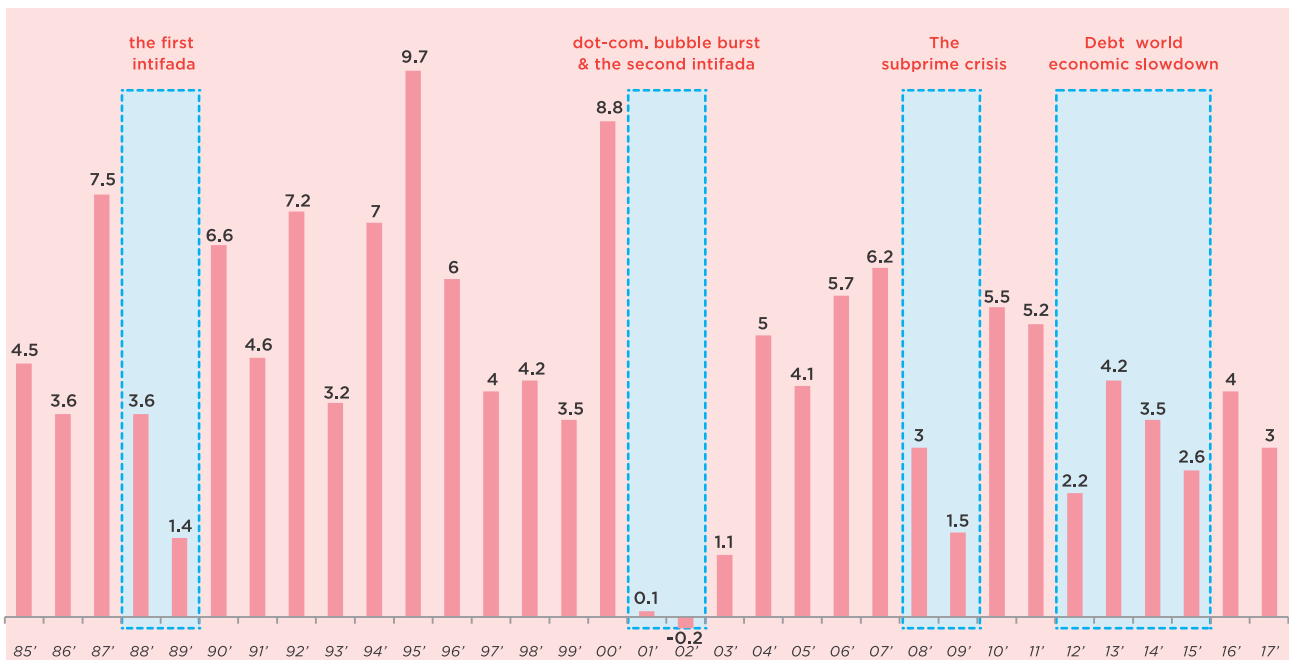
ISRAEL ECONOMY - PAST & PRESENT

	1985	2017
GDP per capita (US, current prices)	6,171 \$	40,146 \$
Inflation rate (year end)	470%	0.3%
current account balance (% of GDP)	-5.8%	3.1%
Budget Balance (% of GDP)	-14.4%	-1.3%
Public Debt (% of GDP)	159.5%	58.7%
Foreign Currency Reserves	3.7 B\$	113.0 B\$
External Assets	10.8 B\$	378.7 B\$

Source: EIU, CBS, Bank of Israel

GRAPH 02

ISRAEL GDP GROWTH



Source: IMF

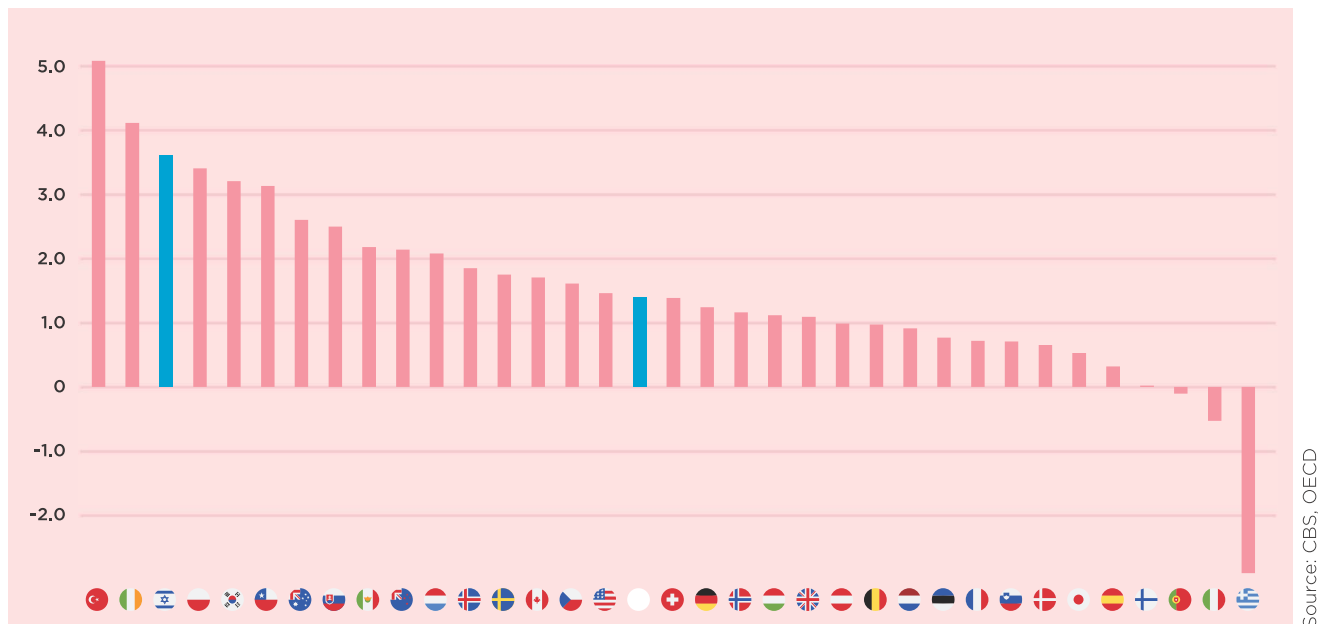
GRAPH 03

ISRAEL'S GROWTH RATE VS ADVANCED ECONOMIES



GRAPH 04

AV. GROWTH RATE, 2008-2017



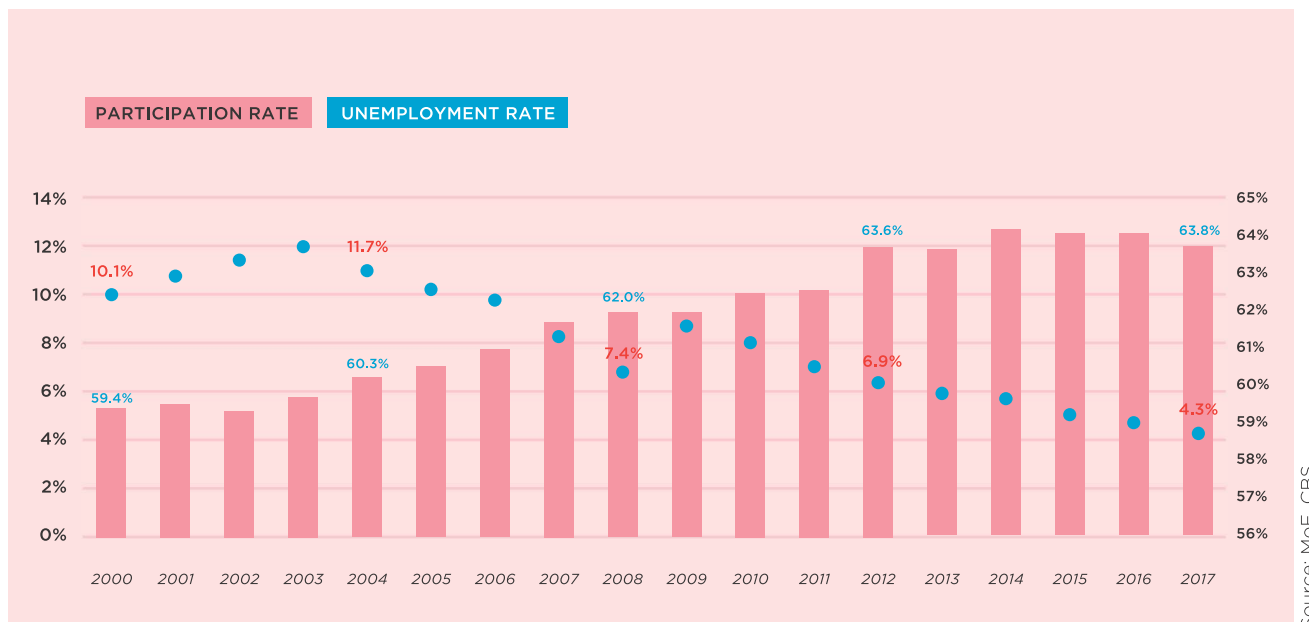
have significantly advanced the country, and Israeli citizens are content with their lives. Indeed, over the past three decades, Israel has been undergoing an unprecedented economic transformation both in scope and in substance. The core of this transformation has been changing from a closed, centralized economy with a large public sector and a heavy tax burden, into an open, competitive market economy attracting foreign investments, and successfully integrating globalization processes of financial markets. Concurrently, it has transformed the construct of its economy, redirecting its center of gravity from an economy of industrial manufacturing, with an abundance of working hands, to a knowledge-based economy based on the development of technological innovation. This has led to the creation of a flourishing high-tech industry, especially in life sciences, communications, software, internet, and cyber.

The combination of tireless entrepreneurship, groundbreaking invention capabilities, impressive fundraising abilities, and a fierce drive for success, has appealed to many multinational companies that have established over 300 international development centers in Israel, which play a crucial role in innovation development.

Indeed, in a series of indicative economic indices and important business parameters, Israel has dramatically improved its performance over the course of the three decades between 1984 and 2014. For example, Israel's population grew by 100% in this time period (from 4.1 million to 8.2 million), its GDP grew by 920%, its GDP per capita grew by 414%, its foreign-exchange reserves grew by 2,866%, while it has also been able to shrink its government debt (as a percentage of its GDP) by 76%. The government deficit, as a percentage of its GDP, also declined in this period: from 17% in 1984 to 3% in 2014. Security expenses, as a percentage of its GDP, also dropped by 75%, the government deficit dropped by 82%, the tax burden dropped by 30%, and US aid (as a percentage of its GDP) dropped by 90%. These are unprecedented accomplishments in comparison to other Western countries and to fellow OECD member countries.

This depiction is also applicable to a series of other economic parameters. The weight of the government sector on the overall economy has declined in these past three decades by 42% (from 75% in 1984 to 43% in 2014), inflation has declined from 450% to 1% (a 99% drop), annual bank interest rates have also dropped by 99% (from 770% to 5%), and government control

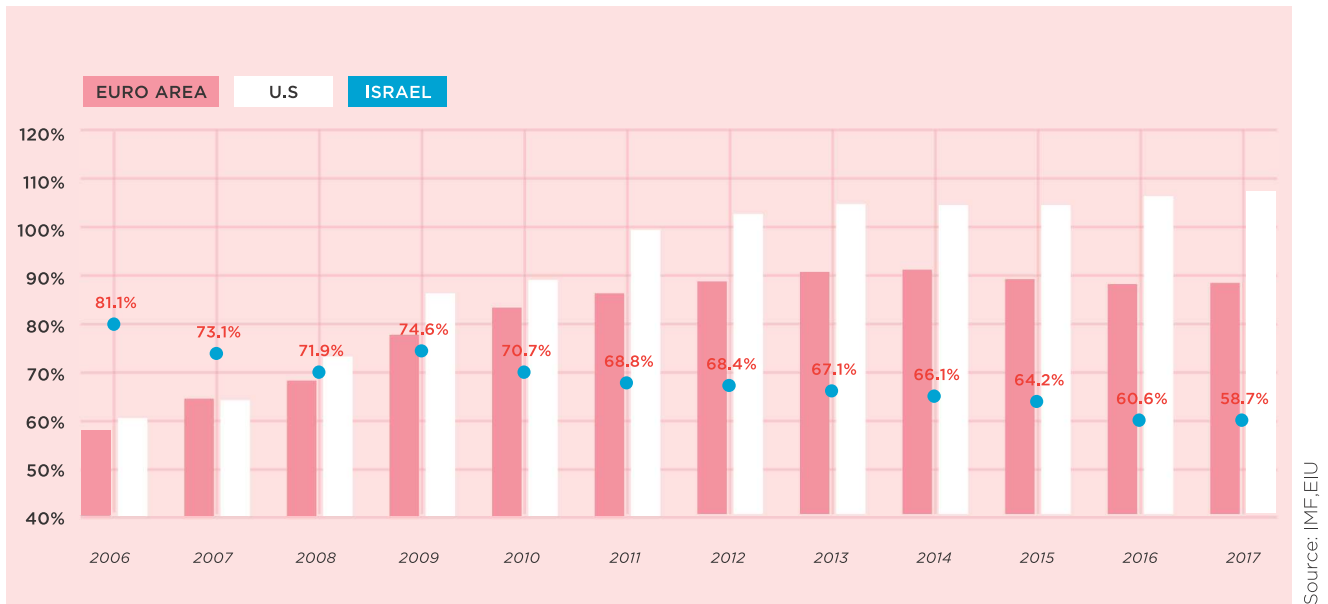
GRAPH 05 EMPLOYMENT RATE



Source: MoF, CBS

GRAPH 06

GOVERNMENT DEBT



of the capital market has dropped by 68%. These all result from the 1985 Economic Stabilization Plan that put Israel on the right track for growth, low inflation, and a shrinking deficit.

The surge in Israel's GDP since the beginning of the century has been nothing less than remarkable – from 500 billion shekels to over one trillion shekels. Incidentally, in 2000, the Bank of Israel forecast that by 2015, Israel would only reach a GDP of 750 billion shekels. This impressive growth can be explained, at least in part, by the accomplishments and output of the tech industry, which has yielded a long series of momentous exits and a stream of foreign investments for Israel's economy.

Moreover, total exports have increased in the past three decades by 860%, with the export of high-tech growing at a remarkable rate of 3,700%. In this period, Israel was even able to develop independent energy sources valued at 38% of its energy basket (in contrast with 0% in 1984), thus moving towards energy independence. Israel has demonstrated impressive achievements in the water industry as well, with water derived from desalination of seawater reaching about 41% of Israel's total water sources over the course of three decades.

In several social and research parameters, which are affiliated with tech development, Israel has reached considerable achievements as well. For example, the

number of students enrolled in universities and colleges has increased by 378% in the past three decades, and the national expenditure on R&D, as a percentage of its GDP, has increased by 223%.

In light of this, in 2015, the British magazine Economist disclosed that "Since joining the OECD in 2010, Israel has outperformed the rest of the rich-country club on many measures." Legendary investor Warren Buffett declared that "Israel has an extraordinary amount of sharp minds and energy." These statements correlate with important data demonstrating that Israel ranks 19th place in the world in the UN's HDI (Human Development Index), ahead of countries like Belgium, Austria, France and Finland. This index is an adjusted calculation of life expectancy, education level, and income level, and it is a standard means for evaluating welfare. A 2015 analysis of financial data indicates that over the course of five years, Israel's rate of growth reached an accumulative 21%, the second highest of all 34 OECD member countries. In effect, Israel emerged from the 2008 financial crisis in better shape than any other OECD member country in terms of all important parameters: debt-to-GDP ratio, budget deficit, balance of payments deficit, GDP growth, as well as other parameters.

Furthermore, the flexibility of Israeli exports, which are comprised of thousands of companies that primarily specialize in niche fields, and both branch and inter-branch diversification, allow the economy to better cope

with global deceleration. Israel's trade-to-GDP ratio is among the highest in the Western world (over 30% of its GDP), and is not based on commodity exports, which can be risky in times of crisis. Israeli high-tech and entrepreneurship are heading this phenomenon.

The combination of tireless entrepreneurship, groundbreaking invention capabilities, impressive fundraising abilities and a fierce drive for success, has appealed to many multinational companies that have established over 300 international R&D centers in Israel, which play a crucial role in innovation development

The positive trend continues

The positive data on the Israeli economy continued over the course of 2015-2017 as well with impressive growth, historically low unemployment, and higher wages.

Data on 2015 showed a 2.6% growth in GDP, with per-capita income growth of only 0.5%. Data on 2016 indicated an almost fourfold increase, demonstrating another encouraging improvement in all indices on the Israeli economy – strong growth, higher wages, more investments, a drop in the debt-to-GDP ratio, alongside a reinforcement of the robust high-tech sector, historically low unemployment, and a continual drop in poverty rates. Economic growth (GDP) for 2016 was roughly 4%, and per-capita GDP grew by approximately 1.9%. These data are some of the highest among all OECD member countries.

In 2017, the growth rate of the Israeli economy was 3%, but this is lower than 2016, when the growth rate was 4%. Israel's population grew by 1.9% in 2017, so that the GDP per capita grew by 1% following an increase of 1.9% in 2016. Likewise, in 2017, the GDP per capita was 40.1 thousand dollars in current prices (144.5 thousand shekels). An additional improvement could be seen in indices examining social issues. Israel's inequality index, for example, (the Gini coefficient for measuring income inequality) showed a continual decline over the course of these years, reaching the same rate in 2017 that had been recorded twenty years ago. Alongside optimistic data, the familiar maladies of the

Israeli economy continued to present themselves in 2015-2017. The main problem exhibited was productivity. In 2016, productivity per worker grew at a relatively disappointing rate of 0.4% in comparison to 2015. This rate could not allow Israel to catch up to stronger OECD member countries. Productivity is low due to import barriers, competition, bureaucracy in the economy, as well as relatively low capital per worker. Furthermore, the population is aging. These are the factors that will ultimately determine Israel's ability to catch up to Western countries. The good news is that there is a demonstrable positive trend in all these aspects; however, there is still a great deal of work ahead in order to narrow the gap.

Israel on the world stage - The race to innovation

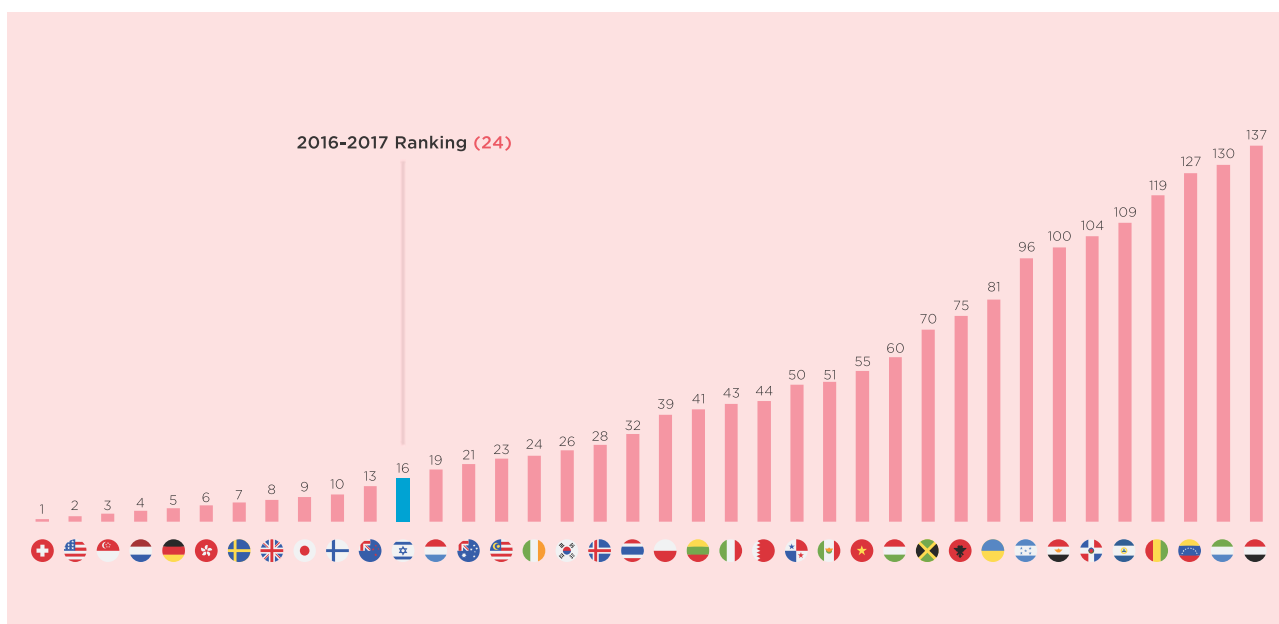
In order to learn about Israel's competitive status on the world stage, it is important to examine several relevant global indices. One well-known index is the GCI (Global Competitiveness Index) by the WEF (World Economic Forum). The report released by the forum measures the competitiveness of 137 countries. Economic capabilities and policies, which determine productivity, are assessed. Over the course of most of the past decade, Israel has been 'stuck' in the middle of the table of developed countries, ranking closer to 30th place than to 20th place on the GCI. However, in the past two years (2015-2017), Israel's ranking in the index spiked by 11 places, from 27th place in 2015 to 16th place in the most recent report from 2017. This was the first time that Israel was ranked in the top twenty of the GCI, making it the first new country to break through to be counted among the twenty leading economies in the world.

In addition, the report indicates that Israel has managed to maintain its position in the top three in the innovation ranking. According to the report, "The startup nation is famous due to the remarkable number of inventions and innovations it has developed since the establishment of the state, despite all the challenges it faces."

Moreover, 2017 was the first year that Israel made it into the top twenty countries in human capital quality, according to the human capital report published annually by the WEF. One key factor in Israel's high ranking is its ability to reap economic value in the workplace from personnel's knowledge. Israel was ranked 18th out of 130 countries – demonstrating a leap of 11 places within two years, from 29th place in 2015 and 23rd place in 2016. These findings position human capital quality in Israel ahead of human

GRAPH 07

THE GLOBAL COMPETITIVENESS INDEX, 2017-2018



Source: The Global Competitiveness Index, 2017-2018

GRAPH 08

12TH PILLAR: INNOVATION

RANK/137	COUNTRY/ECONOMY	SCORE	TREND	DISTANCE FROM BEST
1	SWITZERLAND	5.8		
2	UNITED STATES	5.8		
3	ISRAEL	5.8		
4	FINLAND	5.7		
5	GERMANY	5.6		
6	NETHERLANDS	5.6		
7	SWEDEN	5.5		
8	JAPAN	5.4		
9	SINGAPORE	5.3		
10	DENMARK	5.1		

Source: The Global Competitiveness Index, 2017-2018

capital quality in England, France, Ireland, Australia, Luxembourg, and Italy.

Israel's high ranking is also the result of its extraordinary leap in the TRI (Technology Readiness Index), a GCI index comprised of several subindices. Israel has a high ranking in financial market development, technology readiness, and innovation. It also demonstrated an improvement in fields where it had previously shown weakness: institutional quality, which showed an improvement over the past two years, and goods market efficiency. However, according to the report, the two factors that are hindering growth in Israel's economy are government bureaucracy and high tax rates. As a result, Israel ranks very low in these fields. Israel's ranking in government bureaucracy dropped to 21.6 from last year's ranking of 18.6. In this context, the World Bank's publication analyzes ease of doing business in roughly 190 countries, with Israel ranked at an unflattering 54th place.

Technological innovation and global breakthrough

All of these indices have had a substantial impact on the composition of the high-tech industry, while correspondingly reflecting it.

If we are to point to one representative detail, in 2015, Israel had 86 companies trading on the NASDAQ, making it the third country in the world in terms of the quantity of its publicly traded companies, trailing the US and China. Also, over 300 leading multinational, leading companies have chosen Israel as their destination of choice for establishing their R&D centers. In 2015, The Wall Street Journal, one of the most prominent financial newspapers in the world, stated that Tel Aviv-Yafo ranks 3rd out of the 12 most important cities worldwide in the field of high-tech, after Austin and San Francisco, and ahead of New York, Stockholm, London, Singapore, and others. The newspaper also claimed that Israel has the second most educated population in the world, after Canada and ahead of Japan. Brandeis University rated another Israeli city, Be'er Sheva, which in recent years has become a focal point for multinational tech companies, primarily cyber companies, as one of seven up-and-coming high-tech cities.

All of this led the accounting and consulting firm Deloitte, one of the four largest accounting firms in the world, to announce that it ranks Israel as the 4th top destination in the world for attracting foreign investors.

Furthermore, Israel is ranked 5th in the world in the amount of its patents per capita. It is a world leader in its relative number of R&D personnel: 140 per 10,000, with the US coming in at 2nd place with 85 per 10,000. Israel also produces more science-related jobs per capita than any other country in the world. It is one of the mere eight countries in the world that can launch satellites into space.

Strong tech infrastructure, with gaps in infrastructure and education

According to data released by the IMD Research Institute, which analyzes the economies of 63 countries across the globe, Israel is a leader in all critical parameters important for building and running a tech industry that develops innovation: technological and scientific infrastructure, a sophisticated capital market, flexibility, an attitude that lends itself to globalization, developed venture capital, a skilled workforce, a daring business sector, and extensive scientific research.

In this report, which has been in publication for over 25 years, the significant scale that runs as a common thread throughout the report, is the manner in which countries nurture their competitive skills on their path towards sustainable growth. The competitiveness expressed by these countries today is perhaps one of the most critical factors in an era of global competition for foreign investments.

The macroeconomic factors examined in the report are: government effectiveness, the effectiveness of business operations, infrastructure, and economic performance. According to recent IMD reports, Israel has bolstered its general competitive edge over the years. In 2015-2016, it ranked 21st place (in contrast with 24th place in 2014), and in 2017, it ranked 22nd place out of the 63 countries included in the research; in other words, among the top three participating countries. However, this information is general. The weaknesses and strengths of the Israeli economy should be viewed through the lens of more specific indices, which the report measures, analyzes, and details. When comparing Israel to European countries, the Middle East, and Africa using the same index, Israel ranks 14th out of 40 countries. When compared to countries with populations under 20 million, Israel ranks 15th out of 34 countries – a solid middle position.

Israel's strengths can be seen in parameters such as: technological infrastructure (ranking 4th in the world, a significant improvement after ranking 12th place in 2014), scientific infrastructure, investment incentives

GRAPH 09

QUALITY OF SCIENTIFIC RESEARCH INSTITUTIONS

RANK/137	COUNTRY/ECONOMY	SCORE	TREND	DISTANCE FROM BEST
1	SWITZERLAND	6.6		
2	UNITED KINGDOM	6.3		
3	ISRAEL	6.3		
4	NETHERLANDS	6.1		
5	UNITED STATES	6.0		
6	BELGIUM	5.8		
7	FRANCE	5.8		
8	FINLAND	5.8		
9	CANADA	5.7		
10	AUSTRALIA	5.7		

Source: The Global Competitiveness Index, 2017-2018

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(especially in high-tech), raising capital for venture capital funds, entrepreneurship, R&D expenditure in relation to GDP, technological innovation, technological collaboration, scientific research, collaboration between academia and industry, as well as other parameters. In all of these fields, Israel is ranked among the top four countries in the world. In 2017, the institute also began to publish an index examining the extent of these countries' competitiveness in the field of digital. The index includes three elements: know-how (knowledge essential for discovering, understanding, and building digital technology), technology (a comprehensive infrastructure that facilitates the development of digital technologies), and future preparedness (for making use of the digital transformation).

While Israel is ranked in 7th place in the field of science and 11th in the field of future preparedness, it only

ranks 27th among the participating countries in the field of technology.

According to this index, Israel ranks 13th place out of the 63 countries included in the index. It comes in at 9th place out of the 34 countries whose population is below 20 million. When compared to countries whose GDP per capita is over 20 thousand dollars per capita, Israel ranks 13th out of 31 countries. According to this index, in the geographical region of Europe-Middle East-Africa, Israel ranks 8th place out of 40 countries.

A discrepancy between technological capability and physical infrastructure

Nonetheless, according to the report, there is a substantial gap between Israel's scientific, technological, and research capabilities, which position it at the top of the table, and capabilities in other disciplines, such as physical infrastructure, productivity, and cost of living, where Israel is situated towards the bottom of the table. In terms of physical infrastructure, for example, Israel comes in at 44th place, in the very bottom section of the table. Educational and health infrastructure receive moderate marks, 28th and 24th place respectively, but Israel comes in at 46th place when it comes to cost of living.

These gaps are evident in other fields as well. In terms of its economy, for example, Israel was graded quite favorably for its economic performance, with its domestic economy receiving relatively high marks (21st place in contrast with 33rd place in 2016!), scope of employment (28th place),

GRAPH 10

UNIVERSITY-INDUSTRY COLLABORATION IN R&D

RANK/137	COUNTRY/ECONOMY	SCORE	TREND	DISTANCE FROM BEST
1	SWITZERLAND	5.8		
2	UNITED STATES	5.7		
3	ISRAEL	5.7		
4	FINLAND	5.6		
5	NETHERLANDS	5.6		
6	UNITED KINGDOM	5.4		
7	GERMANY	5.4		
8	SINGAPORE	5.3		
9	BELGIUM	5.3		
10	SWEDEN	5.2		

Source: The Global Competitiveness Index, 2017-2018

and foreign investments (28th place). However, it received relatively low marks in fields such as international trade (38th). In terms of its overall economic performance, Israel demonstrated impressive growth, coming in at 21st place in contrast with 31st place last year.

When it comes to the effectiveness of its government sector, Israel received mediocre marks. A particularly negative segment in this context is public funding, where Israel received a low grade of 31st place. The effectiveness of its business sector received higher marks, excluding the issue of work productivity. A positive point in the report underlines the practical and value-based approach of Israel's business sector towards its competition, where it received very high marks in the global competitiveness index (9th place). Nonetheless, there is a discrepancy between Israel's tendency for competition in the government sector and its tendency characterized by its business sector, with a preference for the latter.

According to the report, the fields in which Israel showed an improvement in contrast with previous reports were an increase in GDP and in GDP per capita, student mobility, internet speed, and high-tech exports.

The annual report concludes that Israel's key challenges today are alleviating the bureaucratic burden placed on the business sector, increasing the export of goods and services, decreasing the reach of the public sector, increasing investments in education and infrastructure in the periphery, and building a long-term strategy to change the economic and political landscape in order to adapt it to the global arena.

Narrowing gaps both within Israel and with the rest of the world

The simple conclusion that can be deduced from the data is that Israel cannot rest on its technological laurels, and that it must narrow gaps. It should start with the domestic gaps between the center and the periphery. Next, it should narrow the gaps between excelling in tech fields and grappling with its sluggish infrastructure and social issues, as well as gaps between the business sector's capabilities and the government sector's capabilities.

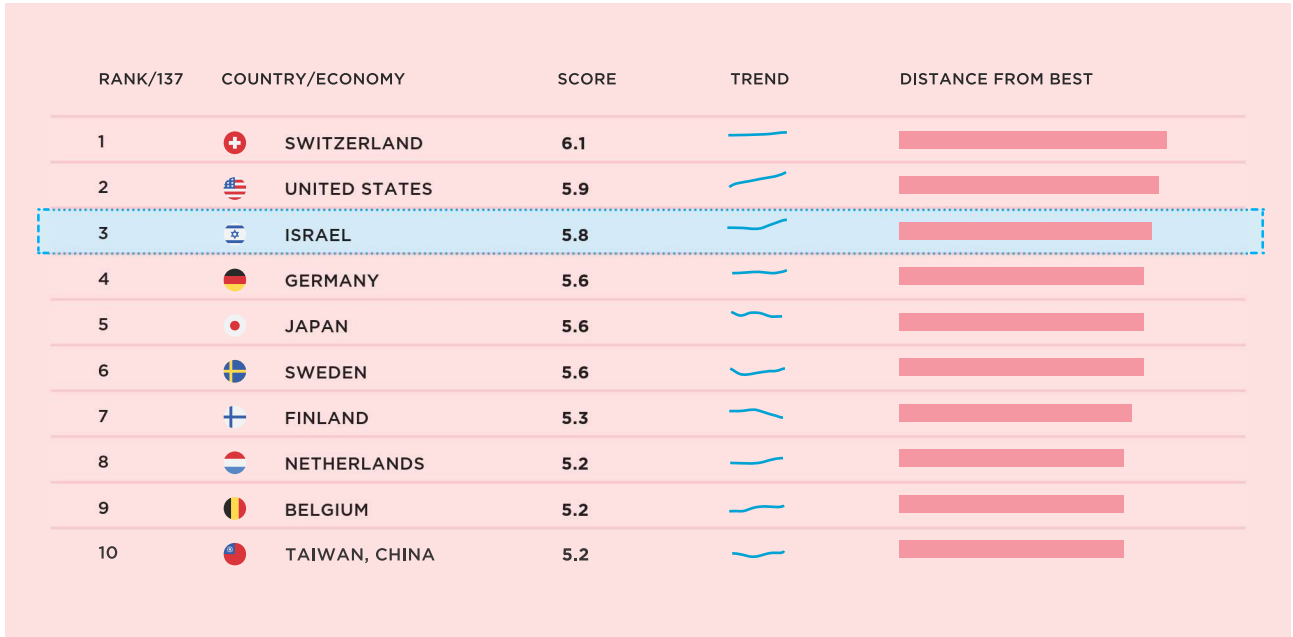
Furthermore, Israel should – or more accurately, must – narrow its gaps with the rest of the world, mostly in terms of attracting foreign investments, its business climate, and its productivity.

Nevertheless, it is important to remember that technological innovation in Israel is not a transient thing. As stated by Pro. Avi Simchon, head of the National Economic Council, the high-tech revolution does not exist in a bubble, and it is not a passing phase. He believes that the high-tech revolution is here to stay, and that it has made Israel's economy particularly stable and robust. One explanation for this is the connection between Israel's military R&D system and its varied technological knowledge.

In conclusion, it is no surprise that at the end of the day, Israelis are happy. The happiness index survey found that Israelis are happier than their counterparts in most of the Western world, ranking 6th place among OECD member countries, and 11th place out of the 156 countries across the globe that were included in the index.

GRAPH 11

COMPANY SPENDING ON R&D



Source: The Global Competitiveness Index, 2017-2018

GRAPH 12

EXPENDITURE ON R&D



Source: The Global Competitiveness Index, 2017-2018

THE PROMISE OF THE NEGEV



In recent years we have witnessed a turning point in the development of the Negev. The essence of the change is to replicate Israel's successful high-tech model, which operates almost entirely in the center of the country, to the developing periphery

Although the Negev (the southern part of Israel) controls 60% of the country's territory, its economic activity is low compared to the center of the country. In this sense, the Negev is no different from other parts of the country that are defined as "peripheral", all of which are inferior to the center of the country, and especially the city of Tel-Aviv, which serves as the center for most of the country's economic, technological and technological activities.

It should be noted that a study conducted in the past showed that per capita, GDP in Tel-Aviv is three times higher than the average GDP in the entire country. Although only 5.2% of the country's population lives in the city, 15.2% of the employees are employed in Tel-Aviv, and 16.7% of the Israeli GDP comes from it.

One cannot, of course, be indifferent to these figures, since in many ways Tel-Aviv derives its power from Israel, and if we treat the economic resources of Israeli society as a zero-sum game, strengthening the Israeli economy involves shifting economic power from Tel Aviv. To this we must add the vision of the flowering of the Negev that was outlined by the first prime minister, David Ben-Gurion, who saw the Negev as the focus of Israel's future industrial-scientific development.

In recent years, however, we have witnessed a turning point in the development of the Negev. One of the most important decisions made by the government in this context was the decision to relocate IDF bases to the Negev, with an emphasis on the IDF's elite technological units.

The rationale behind the project, which is one of the most important ever for the future of the Negev, is twofold: to transform the entire Negev region into an attractive area and to contribute to the building of the IDF's strength.

The assumption is that the moving of units and bases to the Negev will lead to tremendous regional development – it will expand infrastructure build-up, railway lines and roads will be paved, and new education and health institutions will be built.

Above all, the relocation of the IDF's high-tech technological units is of great importance to the continued consolidation of the technological ecosystem that has been created in the Negev. Such ecosystem combines military-civilian R & D, advanced industry and human capital with a synergetic connection to the research and teaching infrastructure of Ben-Gurion University and the high-tech centers that are developing in high-tech parks in Be'er Sheva and Omer, all of which are supposed to bring about dramatic change in the Negev and create a tremendous momentum for attracting capital investments to the Negev.

In fact, the Negev is facing one of the most significant periods in its history since the establishment of the State of Israel. The transfer of IDF bases to the south creates unprecedented economic, social and environmental opportunities for the region, and has never invested so much in infrastructure in the Negev.

The Negev - The New Tiger

The relocation of the IDF bases to the Negev includes a number of moves, some of which have already been implemented and the others are in the process of being implemented: the transfer of the Air Force's transport base from Lod to the new Nevatim base in the Negev, the establishment of the IDF Training Base near Yeruham, the construction of the intelligence center (near Omer), the construction of the telecommunication center (near the high-tech park in Be'er Sheva) and the relocation of the headquarters of the Southern Command (also to a high-tech park in Be'er Sheva).

The telecommunication center, for example, whose construction will begin soon, is no less than a mega project. In the area of the high-tech park in Be'er Sheva, 140,000 square meters will be built on an area of 180 dunams, which will serve more than 5,000 soldiers, of whom 1,200 will be permanent soldiers. The base will be built in eight-story buildings and will operate in the form of a "Smart City" that creates its own power and energy.

The momentum given by these projects to the Negev is felt in full force. A large portion of the work was done by local contractors and most of the equipment

was supplied by local suppliers. The IDF's move to the Negev is expected to increase the economic activity in the Negev by a rate of one and a half billion shekels per year and the growth potential in the second decade can reach up to NIS 2.3 billion. Moreover, in the coming decade more than NIS 48 billion will be invested in a variety of infrastructures in the Negev. Apart from the IDF bases, there are roads, railroads, interchanges and industrial parks, and the 8,000 people in the Negev are expected to settle in the Negev within a decade.

The center of regional development is the city of Be'er Sheva and her satellite cities in the Negev, which change the region beyond recognition and enjoy unprecedented building momentum, along with the establishment of many cultural, educational and entertainment centers.

It is important to emphasize that this development relies almost exclusively on high technology, with the aim of establishing long-term sustainable growth anchors in the Negev. This is a dramatic change in the area that until a few years ago was outside the investment and development map in Israel, certainly in terms of venture capital investments (only 4% of hi-tech companies were in the south).

In fact, Israeli high-tech is characterized by a clear geographical-demographic concentration. Within a radius of 20-30 km in the center of the country, most of the Israeli technological industry is concentrated, about 73%, including all its auxiliary interfaces - venture capital funds, law firms and accountants, consultants, economists, etc. About the luxury restaurants.

The data are instructive - 51% of the companies operate in Greater Tel- Aviv, 22% of the companies operate in the central region, including Herzliya Pituah, and the remainder is divided between Jerusalem, the northern region and the southern region.

To strengthen the technological ecosystem in the Negev

As mentioned above, the change taking place in the Negev today is anchored in a strategic vision according to which the development of the region will be based on the security-technological-industrial synergy. This change is already taking place before our eyes. Take for example the new high-tech park in Be'er Sheva and the existing park in Omer (a nearby settlement). Side by side are high-tech companies that are connected to Ben-Gurion University's research institutes and to the Sammy Shimon Technology College. Together,

they meet the technological needs of the army, which simultaneously consumes technologies and sources of technologies and technological human capital.

In fact, high-tech parks, both in Omer and Be'er Sheva, were set up deliberately near the university, in order to strengthen the technological ecosystem in the Negev. This is based on a strong links between industry and academia, on the way to commercial R & D applications, and the connection between the IDF and academia, all of which attracts local and multinational high-tech companies to the Negev, while creating quality sources of employment, and more.

Already with the establishment of the National Cyber Center in the Negev and the entry into the park of multi-national technology companies such as Ness, RAD and EMC, Be'er Sheva is a magnet for leading high-tech and biotech companies from Israel and around the world, as well as many start-ups.

Here, too, the government played an important role. The government decided to grant companies operating from the Cyber Campus a tax benefit of 20% of the salaries of their employees.

There are already results on the ground. About 3 years ago, the Brandeis International Business School and the consulting firm T3 published a study that gained considerable exposure in the foreign media, and in which Be'er Sheva was ranked first among the seven cities evaluated by the organizations as the most important high-tech cities in the world.

This is the essence of the change - to replicate Israel's successful high-tech model, which operates almost entirely in the center of the country, to the developing periphery.

In the last 25 years, the Israeli high-tech industry has become a leading innovation center around the world, preventing the economy from growing. Israel is considered a fertile ground for the growth of start-ups and the development of innovative technologies. The high-tech industry has a significant contribution to the Israeli economy: it employs about 9% of all employees, produces 16% of the total business product, and exports about 43% of total manufacturing exports. This industry is based on technological innovation and is the main engine for growth, economic prosperity and productivity growth in all sectors of the economy. But this prosperity is the property of the central

region only and now it is time to reproduce it to the periphery as well.

Encouraging high-tech companies to move to the Negev will achieve several goals at the same time: it will create new economic anchors in the south (each high-tech job means 2.5 additional workers in auxiliary industries and auxiliary services) is a qualitative population flow and purchasing power to the Negev, will encourage further growth, and it will increase the receipts of cities and local authorities in the area from the payment of municipal taxes and various local taxes.

Most important of all is the new spirit that will follow these companies to the Negev - a new spirit of entrepreneurship, innovation and momentum - which will meet in the cities and communities a young and educated population that is eager to integrate into the cyber industry.

Despite the concern about the use of recycled clichés, the Negev has all the elements needed to imitate not only the center of the country but the Silicon Valley model. California's Silicon Valley has developed thanks to the infrastructure laid down by the US military and NASA, which has been involved in research development at Stanford University. All these were the nucleus attracted by thousands of large high-tech companies that nurtured the creation of a unique eco-system.

A critical mass in the development of the Negev

The Israeli technological ecosystem, nurtured by the unique connection between academia, industry and the army, which has succeeded in bringing about the relative advantages of the Israeli economy, can flourish in the Negev. The successful combination of the army's human and technological capital infrastructures, outstanding academia, international companies and Israeli start-ups make the Negev a tiger that races ahead and joins global markets.

The relocation of the IDF bases to the south has already created a critical mass in the development of the Negev, and it is now left to hope that, as a result of economic development, new populations will flow here, which will bring new blood to the region. In the center and in Sharon, with an emphasis on the future triangle - Rothschild-Herzliya - and now also get used to a new center - the Negev.

However, in order to complete the historic process, more investment is needed in improving the social systems

in the region - education, health and employment - in order to create a suitable living and living environment for the benefit of the residents of the region.

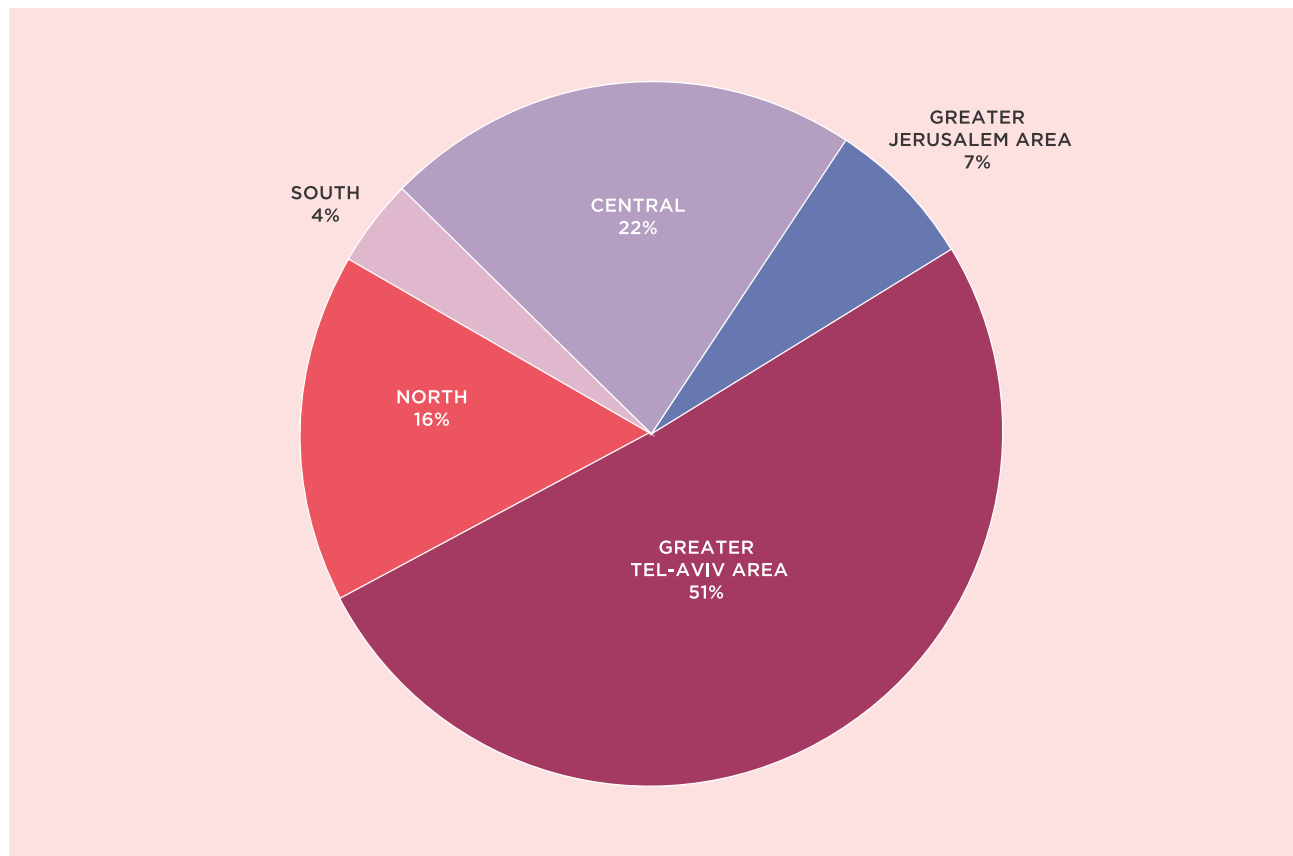
Special emphasis should be placed on solving the Bedouin problem in the Negev. The solutions exist, reports have been written and plans have been created and now the application is left to access. This should be done in cooperation with representatives of the Diaspora and beautiful one hour earlier. It's a social time bomb that, if not dealt with, will explode all of us inside.

This is one of the greatest challenges we have ever known, but also a tremendous opportunity to bring about appropriate social change and to shift the Israeli

center of gravity from the crowded Dan region to the periphery. The social protest emphasizes the need for housing solutions and the creation of new economic opportunities for the younger generation. The Negev can provide a good answer to these needs and become the focus of Israel's new development.

The road to narrowing the gaps between the center and the periphery is still far away. The timing is crucial in view of the transfer of IDF camps to the Negev, which can serve as a lever for a dramatic change in the economy of the region. The concentration of technological power in Greater Tel Aviv intensifies existing socio-economic gaps in Israeli society, and therefore the government must act actively to decentralize the industry in other areas outside the "State of Tel Aviv".

GRAPH 13
ACTIVE ISRAELI HIGH TECH BY REGION - 2017



Source: IVC Research Center

CHAPTER 02

THE DIRECTION - ASIA AND AFRICA



The shift of global economic power to giants in Asia and to awakening African countries is transforming Israel's map of foreign trade, which has traditionally relied on two key trade blocs: the US and the EU. Israel is investing a great deal of resources as well as diplomatic and business efforts to establish trade and investments with Asian and African countries, which on their part, are expressing a great deal of interest in acquiring technologies and knowledge from Israel

Recent decades have seen an increasing recognition that the focal point of the global economy is gradually shifting to the East, and that Asia possesses, and will continue to possess, a key role in the global economy in lieu of American and European economies. At the same time, after years of civil unrest, famine and hardship, Africa appears to be on the path to growth as well. These two centers of commerce are in Israel's sights, with Israel striving to gradually decentralize its foreign trade and redirect a growing segment of its exports to these regions.

With China and India, this is a dramatic shift in the distribution of global power. China is already ranked as the second largest economic superpower in the world, and according to one assessment, it is projected to surpass the US in 2030. India is undergoing significant economic reform under the leadership of Prime Minister Modi, and it, too, is contending for the position of a global economic superpower. African countries are still recovering from years of political and

economic stagnation. They are undergoing substantial reforms and are hungry for investments.

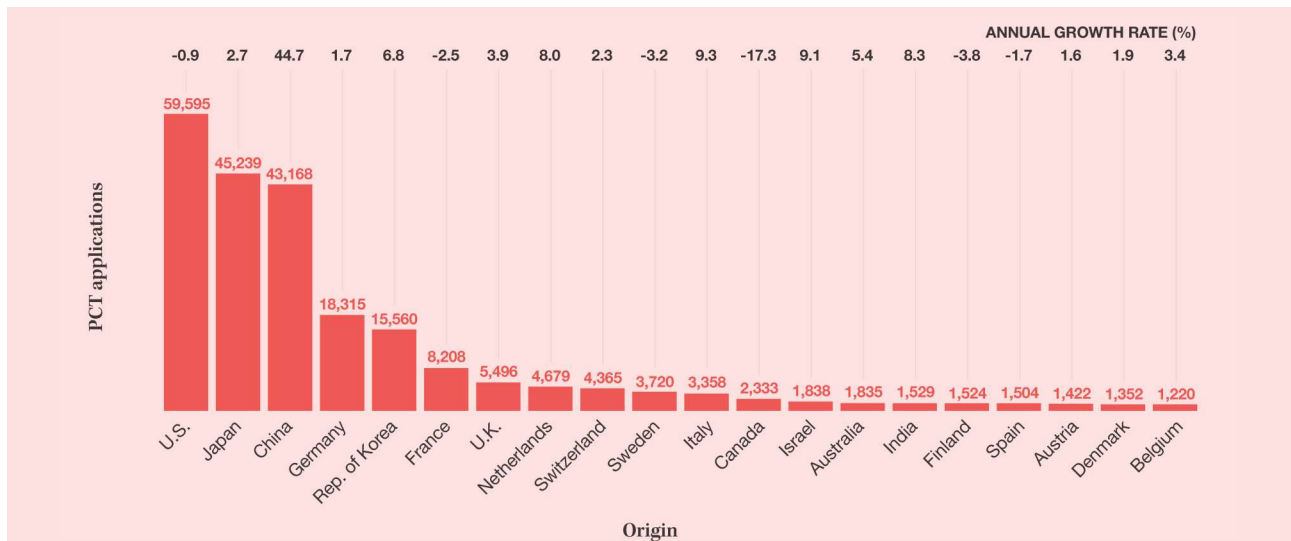
Intellectual property as an economic indicator

We can also learn a great deal about the power of Asian countries, spearheaded by China, by examining a global cross section of intellectual property data. As we will demonstrate in several upcoming chapters, intellectual property serves both as a reflection of a country's economic performance, and as a solid predictor of its future performance. According to the 2017 report by WIPO (World Intellectual Property Organization), Asia controls a substantial segment of global operations in the field of intellectual property. An analysis of requests for the protection of intellectual property assets indicates that in 2015, Asia controlled 61.9% of patent requests, 55.3% of trademark requests, and 68% of industrial design requests.

In 2014, China registered a record number of international patent requests, reaching almost 800,000 requests – four times the number of international patent requests made in the US. In effect, China was responsible for 89% of global growth in the number of international patent requests between 2013-2014. In 2015, the number of patent requests registered in China reached 1.1 million, deeming it the first country in the world whose patent requests exceeded one million in a single year. The number of patent requests in China surpassed the number of patent requests in the US, Japan and South Korea combined.

GRAPH 01

TOP 20 ORIGINS BY INCOME GROUP, 2016

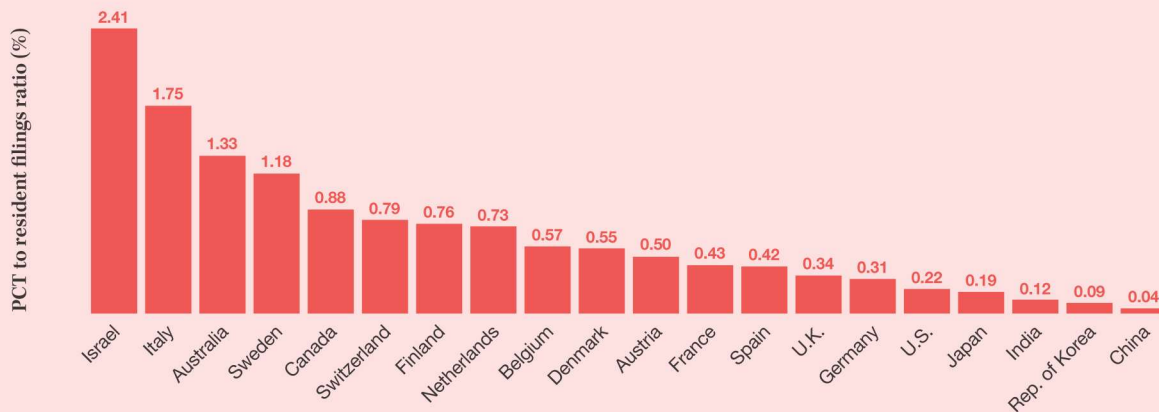


Source: WIPO statistics database, April 2017

GRAPH 02

PCT PATENT APPLICATIONS BY ORIGIN, 2016

China, India and the Republic of Korea have low conversion rates of national/regional patent applications to PCT applications compared to European origins.



Source: WIPO Statistics Database, April 2017

Moreover, South Korea, Japan and China top the chart in global innovation according to an index examining the number of intellectual property requests in relation to GDP.

Other Asian countries have also contributed to Asian prominence. In recent years, countries such as Malaysia, Vietnam, Thailand, Singapore and Indonesia have cited impressive growth rates of accumulated intellectual property.

Asia's power is more apparent when examining data over the course of a decade. In 2004, 50% of international patent requests came from Asian countries, while in 2014, 60% of requests came from the largest continent in the world. In contrast, in that same decade, Europe saw a drop of almost 8% in its number of patent requests, and North America saw a slight drop of 2%. All of these are further reverberations from the financial crisis of 2008, which are still being felt to this day in the West.

China's ascent is impressive, especially in light of the fact that in terms of its economic and technological development, it lagged behind the West for years. In the 1980s, almost no patents were registered in China. In the 1990s, it began its gradual integration into the global intellectual property market. It has been skyrocketing since 2000. Among other causes, this transformation reflects the country's heavy investment in R&D.

New Israeli preparation

This shift of economic power from the West to East Asia and the prosperity of African countries necessitates

fresh preparation on Israel's part. Israel has traditionally relied on two key trade blocs: the US and the EU. These two blocs have suffered from very slow growth since the financial crisis of 2008. Only in the past 2-3 years have they begun to experience more substantial growth, although this growth is still far more subdued than that of Asia and Africa.

In essence, this preparation has been ongoing for a decade by foreign trade authorities in Israel, and trade with Asia has indeed seen an increase in recent years. However, the potential is still far from being realized. On the backdrop of the fragility of Western markets, it is becoming crucial to find alternative markets. The Asian market is proving itself a leader among these alternative markets, and this is also case with Africa, which still has meager trade with Israel.

It is astonishing that as early as 1950, Israel's first prime minister, David Ben-Gurion, foresaw these trends in his speech at the Knesset, "The status quo, by which the US and the USSR direct and lead the world, will not last long, and there is no doubt... the two Asian countries - China and India - will be the mightiest superpowers in the world."

For years, Israel pursued Asian countries, primarily China and India, but was rebuffed. It was only after the fall of the iron curtain that the situation began to change. Over the past three decades, with the renewal of ties between the two countries, trade, investments, and economic ties

between Israel, China, India, and other Asian countries are becoming stronger.

As for trade between Israel and East Asia, consumer products that Asians manufacture better, faster, and most importantly, cheaper than we do, are now being exported to Israel. On the other hand, Israel traditionally export large quantities of fertilizer and diamonds, but these industries are not moving forward. Concurrently, technological exports to the East are booming: communications products, software, hardware, medication, medical devices, agricultural products, and technologies created by Israeli companies are being sold and assimilated in South Korean, Japanese, and Chinese manufacturing companies in a process called technology transfer.

An increasing number of Asian countries are recognizing the comparative advantage in having ties with Israel: South Korea is establishing the Koril Fund, which connects Israeli development companies with South Korean manufacturing companies. India is sending delegations to bring technologies from Israel to the developed regions of Gujarat and Maharashtra. China is trying to appeal to Israeli entrepreneurs to develop products in China's resource-rich high-tech incubators. Even wavering Japan has joined forces with an initiative for Israeli start-ups in the outskirts of Tokyo. Bilateral R&D agreements between Israel, China and India constitute an important component in the advancement of the field. Dozens of R&D projects are already operating in

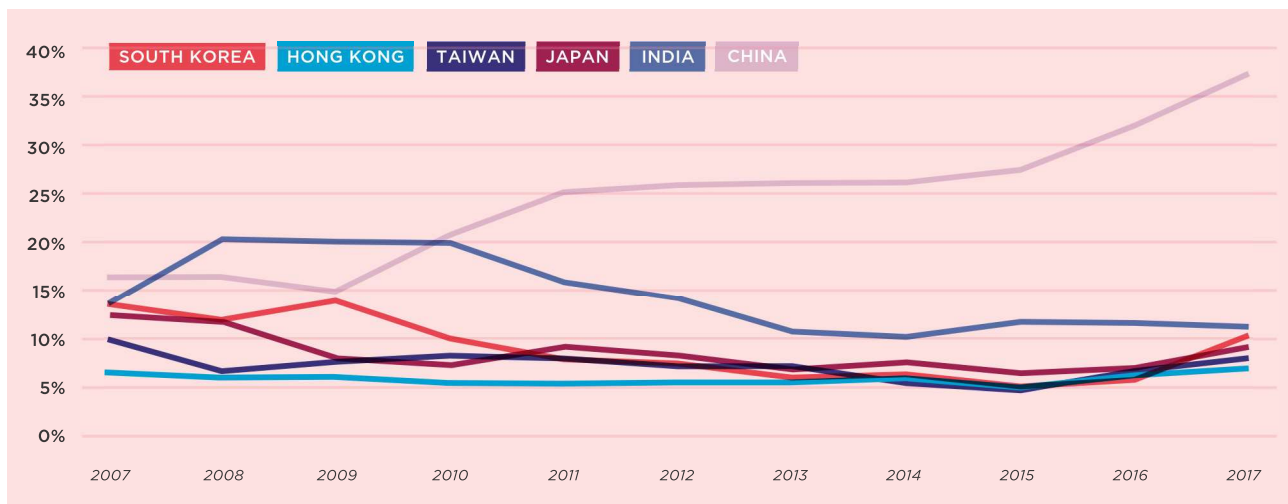
the Israel-China network, and similar development is also projected to take place in the Indian network.

East Asia will continue to flourish when many other countries, such as Vietnam, Indonesia, Sri Lanka and Myanmar, thrive together with key players. An increasing number of Asian players will need a comparative advantage in the manufacturing of tech products and will search for breakthroughs in the field. Growing Asian companies will need tools for organization, information, communications, and computing. Asian industry, with increasing energy needs, will seek wind energy, solar energy, and ocean wave power. They will all be searching for the next brilliant idea that could make headlines in the consumer press to fill supermarket shelves. All of this can be found in Israel.

As for Africa, in the 1950s and 1960s, Israel and African countries were enamored with one another. This romance was evidenced by the aid Israel was providing to the continent in a variety of fields such as agriculture and irrigation, regional planning, and health. The Foreign Ministry of Israel sent experts on agriculture, irrigation, and education to Africa. Throngs of interns attended courses in Israel, Foreign Minister Golda Meir was filmed dancing the Hora when visiting Africa, and Israel received high accolades by the continent. However, these ties took a turn for the worse after the Yom Kippur War, and in response to pressure from Arab countries, most African countries severed ties with Israel. Only in recent years have we begun to see a thawing of ties between Israel and African countries.

GRAPH 03

ISRAEL EXPORT TO ASIA 2007-2017



Source: Israel Export Institute

GRAPH 04

THE DEVELOPMENT OF TRADE: ISRAEL-CHINA EXCLUDING DIAMONDS



China: Synergy in the making

China is continuously evolving, but to the outside observer, it takes time to internalize this change. In the 1980s, when China began to open itself up to foreign companies and began exporting cheap products to global markets, many still considered the country a communist dictatorship offering no more than tea, rice, blue uniforms, and communist hats. It took us time to internalize that the once faltering country was becoming a superpower. Today, as China is transitioning into a manufacturer of advanced technological products, many still view it as a manufacturer of cheap, counterfeit products that break easily. Predetermined beliefs do not follow changes in reality, and the ones who succeed are those who make necessary changes every step of the way.

While China is making great strides towards becoming the largest economy in the world, it is accordingly making far-reaching acquisitions, with an emphasis on importing new developments and technologies. China breaking out of its shell and connecting with the rest of the world has translated into a revolutionary transformation, allowing it to evolve in a multitude of trajectories. Against this

backdrop, the synergy between Israel, the 'start-up nation,' and China, the 'acquisition nation,' was only a matter of time. Indeed, China is gradually gaining a foothold in the land of the forefathers.

Deals signed in recent years in Israel, transactions that are unfolding, and economic collaborations and shared initiatives have an estimated value of 3-5 billion dollars a year. The first large deal was signed in October 2011, with ChemChina's acquisition of 60% of the Israeli firm "Adama" (formerly known as Machtshim-Agan) from the IDB Group for approximately 1.4 billion shekels. ChemChina later acquired the remaining stake, thus becoming its sole

The increasing interest of Chinese companies and investments in Israel is a fact. China's shopping list in Israel is diverse: agrochemical companies, medical services, and cosmetics companies; in high-tech, start-ups and venture capital funds; and food, insurance, and infrastructure companies

shareholder. The second largest deal was signed in May 2014, when Bright Food Group acquired a 77% stake in Tnuva for approximately 6.5 billion shekels.

Chinese investments in the high-tech industry tripled in 2012-2014. According to one estimate, 15% of investments in Israeli high-tech in 2015 are sourced in China. That same year, investments by Chinese companies in Israel through venture capital funds reached about half a billion dollars. In recent years, several Chinese entities have demonstrated an increasing interest in the local high-tech scene, and according to reports, Alibaba and Baidu are considering the establishment of development centers in Israel.

The Chinese government later announced that it is planning to invest over a billion dollars in Israeli tech companies through three funds, while Chinese companies are concurrently redirecting tech investments from the US to Israel. The first fund in the series, the China Israel Technology Fund, will be valued at three billion yuan, which comes to 440 million dollars. It is the largest fund established in China thus far with the objective of investing in Israeli technology. The Chinese government has already issued all the required certification for its launch. The fund is projected to focus on investments in domestic security, robotics, vehicle, and cyber technologies. The investment model will be based on each step of company acquisitions.

An explanation for China's increasing interest in Israel could lie in their perception of Jews. The Chinese hold Jews in high regard, and the most revered man in China is Albert Einstein. In China, Israel is viewed as the start-up nation, and Jews are seen as creative. The Chinese also identify a shared fate between the two peoples, after having suffered under fascist rule. The Chinese are fond of Israelis, who in contrast with Americans or Europeans, do not pose a threat in terms of foreign subjugation or competition with huge economies.

In recent years, China has been preparing to implement new economic reform. The underlying theme of this reform is creating an economic framework that operates in accordance with regulations rather than decisions made by stakeholders, while decreasing government interference in the economy. China is becoming progressively closer to global market standards with more transparency, more possibilities for outside investors and entrepreneurs, less bureaucracy, and less

control over processes from above. These reforms will be gradually implemented by the year 2020.

As part of the concentrated effort led by China, and with the support of the government and of very large investments, efforts have been made to enhance local R&D and technological capabilities (under the name Innovated in China). The economic institution and Chinese companies are striving to expand accessibility to technology and collaboration with foreign companies that have advanced, innovative technology. The Israeli industry can contribute a great deal in this field. Furthermore, the Chinese rate of growth has decelerated in recent years, and they are seeking new opportunities for growth. This growth would rely upon technological innovation that could support improved productivity and manufacturing. From their point of view, Israel is a natural venue for achieving these new technologies, with an emphasis on solutions for advanced manufacturing.

Israeli efforts with China include the distribution of commercial attaches throughout the country. China currently occupies the largest volume in the network of attaches with roughly six such attaches, including Hong Kong.

The most relevant fields for Israeli industry are: environmental technology, which can provide a solution for energy and environmental problems that weigh heavily on China; vehicle technologies, with an emphasis on smart transportation, vehicle sharing, and alternative fuels – issues that are of utmost concern to the Chinese government and that Israel excels in; and cyber and Fintech technologies.

Agriculture and water are a top priority for the Chinese government. They are closely tied to the issue of food safety, which has always been a concern for China, a country tasked with feeding 1.4 billion people a day, and with guaranteeing water across wide expanses of arid terrain. Israel has a great deal to offer in these fields, and China considers it a global leader with an edge in the application of these technologies. The Chinese are in need of desalination facilities and drip irrigation technologies, and they are willing to pay premium for the established Israeli reputation.

The number of Israeli exporters to China is growing, but there is still a long road ahead. We have not yet reached the flat of the curve. Consequently, the government is encouraging Israeli companies

to establish themselves in China and to create solid business and marketing platforms. This year, Israel will be accelerating the process of creating a free trade agreement between the two countries, which is projected to further advance reciprocal trade and investments between Israel and China.

Israel-India:

A substantial warming of bilateral ties

Former Indian Ambassador to Israel Jaideep Sarkar once stated that India was planning on doubling its investment in R&D and in scientific research, and to verge upon China and South Korea in its national R&D spending. One reason why this is possible is falling crude oil prices across the globe, which is allowing India to redirect its resources to R&D. The drop in crude oil prices is also providing India with an opportunity for comprehensive economic reform, since the country relies upon crude oil imports.

According to the ambassador, India produces 250,000 engineers a year, and is consistently improving the quality of academic training. He added that within twenty years, India would have the highest economic growth rate in the world – more than China. In the past two years, India has been benefiting from foreign investments valued at 150 billion dollars. In 2030, India will have a population of 1.5 billion with an average age of 29, thus surpassing China's population. Like other countries, Israel cannot ignore the engine of growth that is India.

If until recently the relationship was based on security acquisitions from Israel, India is planning on expanding trade and its relationship with Israel from trade alone, to full collaboration including the acquisition of technologies, shared development, and other interests

Furthermore, last year, India's growth rate exceeded 7%, and this rate could continue for at least another decade. There are 29 states in India, six of which are propelling the country forward: Maharashtra, Tamil Nadu, Uttar Pradesh, Bengal, Gujarat and Karnataka. Each of these states has a GDP of over 100 billion

dollars. Within the span of a few years, other states that have not yet realized their potential growth will join their ranks, with a wave of less developed states following suit.

The Indian economy is on a steady trend of growth spearheaded by a growing middle class. This class, which currently consists of roughly 400 million people, is serving as a catalyst for internal growth and a focal point for the import of products and services from overseas. One hundred smart cities throughout India are in need of water technologies, renewable energy, and security. 250 new airports are projected to be built, and over 100 million housing units are slated to be built through the Housing for All program. India is lacking power sources to the tune of 100 gigawatts, and 42 mega food parks are being built as well.

All of this serves as fertile ground for advancing efforts to boost trade with India.

The relationship between India and Israel was taken up a notch in recent years, and was further advanced when Narendra Modi, a strong supporter of Israel, was elected prime minister of India. In 2017, Modi conducted a historical visit to Israel, the first of its kind for an Indian prime minister. Prime Minister Benjamin Netanyahu reciprocated in kind on his visit to India in early 2018. For all parties involved in fostering ties between the two countries, the results of these visits even exceeded their high expectations.

The economic fields in which India is providing business opportunities are vast, and include cleantech (such as the prime minister of India's Clean India initiative, where Israeli companies are already taking part in cleaning up the Ganges), agriculture and food, water and energy, domestic security, and life sciences and high-tech. All of these economic industries have high demand in India, and correspond with the characteristics of Israeli export and with our comparative advantage.

India's size and the economic opportunities it offers Israelis are promising, but this issue requires serious attention, appropriate preparedness, and a prioritization of ties with India.

Israel-South Korea:

a natural trade partnership

South Korea is viewed as a determined, evolving country that is taking over Israel and the world with

the quality products it offers at a reasonable price. Israel, on the other hand, is the start-up nation that arouses the admiration of South Koreans due to its capabilities in the fields of technological innovation and entrepreneurship, to the extent that former South Korean President Park Geun-hye called for her people to learn from the Israelis.

South Korea is facing an existential economic challenge – maintaining its technological edge in relation to countries like China, while narrowing its technological gap in relation to countries such as Japan and Germany. While South Koreans excel at transforming technologies into products through mass production, even South Korean engineers sometimes admit that their true ability lies in ‘innovation by imitation.’ Core technologies are necessary in order to preserve the technological gap. Groundbreaking technologies, Israel possesses an abundance of these, and they are up for sale. It is convenient for South Koreans to achieve a comparative advantage in Israel, which it views as a natural partner and not as a competing economy.

After years of contact, it can be stated definitively: The South Koreans are coming. Drawn-out negotiations between the countries over the free trade agreement recently matured into an agreement that could be signed as early as this year. The emerging agreement will bring about an import tax exemption on many products such as vehicles, electronics, and many consumer goods, and will lower the cost of these products. The hope is that the agreement will serve as an opening for things to come, and that other countries will want to get in on the act and close similar deals with Israel. This will benefit the Israeli consumer, and will lower their costs.

There are several surprising points of similarity between Israel and South Korea. First, while they are situated on opposite sides of the planet, the two countries are densely populated, they are both surrounded by bitter enemies (North Korea, in South Korea’s case), and they are both located in regions where superpowers like to stir the pot – here in Israel it’s Russia and the US, and in South Korea, it’s China and the US.

There are also economic similarities between the two countries. A comparison can be made between the Histadrut labor federation’s control of the Israeli market and the chaebol involved in South Korea. The two countries also lack natural resources, requiring them to turn to other countries and to respect international trade laws.

The emerging trade agreement between Israel and South Korea carries immense potential for the State of Israel. South Korea is the fifth biggest exporter in the world (about 537 billion dollars as of 2014). China is headlining South Korea’s main export locations, with exports valued at 131 billion dollars. Next in line is the US with exports valued at 72 billion dollars, Vietnam with exports valued at 26.6 billion dollars, Hong Kong with exports valued at 26.3 billion dollars, and Japan with exports valued at 25.5 billion dollars.

South Korea has the fourth largest economy in Asia. It is the fourth largest car manufacturer in the world, it owns giant shipyards that produce over a third of the ships in the world, and it is the world’s second largest computer and cellphone manufacturer, mostly thanks to technology giant Samsung. In comparison, Israel’s exports are valued at roughly 70 billion dollars a year, ranking 42nd in the world in terms of absolute export value. It is easy to recognize the benefit that the two countries can reap from a trade deal. Israel exports a substantial portion of its products to Asia – the second largest market after the US. In its balance of trade with Korea, in 2015, Israel recorded exports valued at 870 million dollars, but recorded imports valued at 1.14 billion dollars. In 2016, there was an increase in exports of goods of about 1%, and a 16% increase in imports of goods from South Korea. In comparison, in 2015, Israel recorded exports to Japan valued at 1.5 billion dollars, and imports valued at 1.2 billion dollars. With China and Hong Kong, Israel recorded exports valued at 6.15 billion dollars and imports valued at 7.9 billion dollars. In other words, there is a lot of room to expand imports and exports with South Korea.

Israel-Japan: **Great potential for economic collaboration**

Israel and Japan both have technology-driven economies. Combining Israeli technologies and innovation with the multitude of products manufactured and developed in Japan can potentially reap great benefits for the two partners.

Since his election (to his second term) in 2012, Prime Minister of Japan Shinzō Abe, who even visited Israel in 2015, has been striving to strengthen economic ties between the two countries. This objective is based on a broad economic outlook. The present Japanese government has dusted off the prior status quo of government ministries, removed obstacles from business development, initiated sweeping changes in reciprocal terms

between the government and the business sector, and is making tremendous efforts to advance the Japanese economy, which had been in a lull for over two decades. The government, under Abe's leadership, has decided to go 'all in,' and to extricate Japan from its many years of stagnation. Anyone visiting Japan can feel the winds of change, in its attitude towards Israel and its trade with the country, as well.

The Japanese prime minister's visit to Israel and the Israeli prime minister's reciprocal visit to Japan accelerated a trend of reciprocal visits between the two countries. Over the course of a single week in May 2017, three senior Japanese ministers visited Israel – the minister of economy, the minister of technology, science and space, and the minister of sport (regarding the upcoming Olympics in Japan in 2020). Prior to this visit, Israeli ministers, including the minister of finance (who signed a treaty in Japan to secure investments between the two countries), the minister of science and technology, and the minister of culture and sport visited Japan. Soon, Israel's minister of transportation, and later Israeli Minister of Economy and Industry Eli Cohen will be visiting Japan.

During the Japanese minister of economy's visit to Israel, a treaty was signed for collaboration between the two governments on cyber concerns, setting mechanisms to increase collaborative investments and activity in the field. Likewise, the two countries' governments and key economic entities, including the Israel-Japan Chamber of Commerce, established JIIN, the Japan-Israel Innovation Network. JIIN's role is described in its establishment document as having the purpose of accelerating B2B communications between Japanese and Israeli companies, of hosting and initiating joint delegations, of supporting collaborations between companies, and of proposing government assistance programs for joint operations.

During the Israeli minister of finance's visit to Japan, a treaty was signed to protect investments between Israel and Japan. The treaty addresses the liberalization, promotion, and joint protection of Israeli and Japanese investors. It provides a binding legal framework aimed at creating a comfortable investment climate encouraging reciprocal economic activity by providing investors with tools and regulations.

All of these are an expression of the dramatic development of economic ties between Israel and Japan. Japan has the world's third largest economy.

According to projections, trade between Israel and Japan, which was valued at 3 billion dollars, will increase by another 1.2 billion dollars. Moreover, the trade value only takes the transfer of physical goods and products into account, and disregards investments and trade in services, which is where a large segment of Japan's activity in Israel can be seen.

The importance of the agreements signed under the government umbrella stems from the fact that in Japan, there is a close relationship between the government and economic organizations and the business community. Japanese government involvement, encouraged by collaborations with Israel, is a compelling sign for Japanese companies to examine possibilities for partnerships and investments in Israeli companies. Geopolitical, economic considerations that caused multinational Japanese companies concern regarding joint operations with Israel have now made way for unprecedented enthusiasm. When the Japanese government's green light is also accompanied by Israeli innovation, Israeli projects in the fields of infrastructure, transportation and energy, the stability of the Israeli market, and the ability to be granted credit by international and local banks in order to operate (in contrast with the instability of our neighbors' far less stable, large markets), these all cause Japanese companies to flock to Israel both in delegations and as individuals in order to seek strategic partnerships. Of course, all these coincide with the involvement of their Eastern neighbors – China, India, and South Korea – whose operations in Israel are apparent, and troubling, to their Japanese competitors.

A brief review of Japanese investments in Israel and of Japanese collaborations with Israeli companies over the past year points to the diversity of the Japanese economy that is seeking and finding innovation in a variety of fields. Companies, such as NTT DoCoMo, are investing in Israeli companies that are developing communications solutions; SoftBank is investing in Israeli cyber companies; Sony is purchasing a company and turning it into an R&D center; Ajinomoto, Japan's largest food company, is investing in an Israeli start-up that is developing algae with high nutritional value; NEC is opening an R&D center in Israel; ORIX is acquiring an ownership stake in Ormat; an international Japanese textile manufacturer is launching manufacturing operations in Israel; the Weizmann Institute is signing an agreement with the University of Tokyo; Japanese companies are investing in Israeli venture capital funds, while others are signing Israeli software distribution

agreements in Japan; large Japanese trade companies (sogo shosha) are expanding their activity; giant Japanese electronics companies are bringing Japanese engineers to Israel and are hiring them along with the Israeli engineers they recruited; Toyota's venture capital fund is investing in Israeli companies that are developing technologies for autonomous vehicles; and Laline cosmetics' distribution rights in Japan were acquired by a giant Japanese fashion company. These are just a few examples of the connections being forged between the Japanese and Israeli business communities and of the potential that lies in trade relations between the two countries. As stated by a senior official in the Japanese business community who is closely familiar with the two economies: "Japanese companies have barely scratched the surface of the underlying business potential."

Israel-Africa:

Israel's return to the continent

In June 2016, the Israeli government decided to strengthen its economic ties and collaborations with African countries, due to a policy for encouraging diversification of Israeli trade destinations and for cementing Israel's economic ties with other markets. Consequently, Africa's ministry of economy and industry, in collaboration with the World Bank, is operating three agreements in Africa to promote projects and to address development challenges in the water, agriculture and cyber industries. Two new economic attaches will soon be opening. They will be incorporated into existing embassies, and the Israel Innovation Authority has asked to extend company assistance programs to the continent in order to adapt export products to target markets.

In July 2016, Prime Minister Benjamin Netanyahu embarked on a historical visit to four East African countries together with a delegation of 80 business professionals from 50 companies. The visit featured a summit in Entebbe, Uganda, with the leaders of seven African nations, which also sent the clear message that Israel is returning to Africa. During the trip, the Kenyan president stated that it is important to form partnerships in this changing world, and that integrating Israel in the African continent would be good for Kenya, for Africa, and for world peace. Directly resulting from this visit, the prime minister returned to Africa in June of that same year, this time to Liberia, as the chief guest and the first non-African leader to have participated in the Summit of Economic Community West African States. He gave a speech at the summit and had personal meetings

with ten heads of state including the president of Mali, a country that does not have diplomatic ties with Israel.

The strengthening of these ties peaked in the most important stage, which took place in Togo in West Africa in October of that same year: the Africa-Israel summit that had invited African leaders. The summit was a historic, unprecedented event, helping Israel present its many facets in a variety of fields, with its economic facet taking center stage. Approximately one hundred Israeli companies in the industries relevant to African nations took part in the summit and introduced themselves, their technologies, and their products to heads of state and policy makers from across the continent. This was the pinnacle of Israel's return to Africa and of the collaboration between the government and private sectors in their African context.

Nonetheless, there is still a long way to go. In 2016, the total sum of exports of Israeli goods to Africa was only 2% of the total sum of Israeli exports. However, this only demonstrates that there is great potential that has not yet been tapped into. Israeli companies, whose name precedes them as suppliers of solutions and technologies in fields that are relevant to Africa, must leverage the strengthening of diplomatic ties into including economic, business ties. These companies specialize in fields such as agricultural technologies, water use and treatment, medical technologies, cyber security, national security, the development of renewable energy, and sustainable development as a whole – fields that are of great interest to Africans.

Israel's flourishing economy, its prospering industry and innovation, company accomplishments, the basic fondness that many countries feel towards Israel, the acknowledgement of Israeli assistance over the course of many years, and the lack of colonialist tradition, all contribute to the reputation of Israeli companies in Africa, and the prominence of these companies on the continent is increasing. Likewise, the number of official African visitors to Israel is also growing, with most of these visits including significant economic content. Israel should mature from its romanticized views of Africa as a little sister in need of aid, and should set its hopes on the economy as a foundation for reinforcing its ties with Africa. A closer relationship with Africa would contribute to long-term political accomplishments, while concurrently bolstering export, aiding Israeli companies, and of course, advancing sustainable development in Africa itself.

CHAPTER 03

INTELLECTUAL PROPERTY IN ISRAEL: LEGISLATION, WORK ENVIRONMENT AND OUTPUTS



In this era of technology and innovation, intellectual property is considered one of the most influential areas for economic growth of corporations and countries. Intellectual property law has become a central branch in the world of modern law and its contribution to the development of the society and economy is growing. Correct and intelligent management of intellectual property rights, among them patent, trademark and design rights, strengthens the array of incentives for inventors and producers and constitutes a significant growth engine in the country's economy. This field has special importance in the Israeli economy which has a technological orientation and in which nearly half of exports depend on technology products and services.

No less important, in recent decades the field of intellectual property has been undergoing intensive processes of globalization and as always is very much influenced by technological and legal changes. The penetration of the internet and social media into every aspect of our lives has made intellectual property more economically important than ever, but also presents intense challenges, such as protecting copyright on the internet and monitoring enforcement.

Moreover, countries and governments are more and more coming to understand the economic importance of intellectual property and adjusting their methods for calculating GDP accordingly. Thus, for example, in 2013 the U.S. government made a radical methodological change, that takes place on average once every five years and earned the nickname, "the Olympics of economic numbers". The main goal of the new calculation was to provide a more accurate reflection of the modern economy, which relies more and more on distribution, consumption and production of intangible products. The U.S. is the first country to implement the new international standard.

The most significant change is increasing the weight given in the index to innovation and different kinds of intellectual property. This change was implemented because to date, the GDP index has not sufficiently expressed the trend of transition to a knowledge-based economy in developed countries. Thus, the new formula counts spending

on research and development as investment, and likewise the creation of intellectual property assets such as books, films, television programs, music, etc.

Legal and Regulatory Infrastructure in Israel

In light of the unique characteristics of intellectual property, its growing importance in international trade, processes of globalization and technological development, there is great importance to the legal framework that constitutes the legislative and regulatory infrastructure for protecting intellectual property rights.

Israel, as a significant, quality player in the global technology arena, has taken upon itself in recent years to adjust its norms of conduct in all matters related to intellectual property – including its local laws, regulation, and its enforcement regime – to conform with those accepted in the developed world. This followed a period of many years in which Israel was relatively backward in contrast to developed countries and was even placed on an uncomplimentary list of countries under strict surveillance for violation of intellectual property rights.

In recent years Israel implemented the following steps:

- Changes and reforms in the Patent Authority, including turning the Authority into an executive agency and a significant increase in personnel to handle applications for patent registration, with significant professionalization of the work force;
- Amending local law to conform with binding international conventions such as the Madrid protocol and the Global PPH;
- Joining the OECD and making amendments to intellectual property law;
- Strengthening the enforcement regime against counterfeiting and smuggling counterfeit merchandise.

One of the positive results of the efforts Israel has undertaken was expressed in its international rating in the field of intellectual property. In framework of the special report called the Special 301 Report prepared by the Office of the United States Trade Representative from 2016, Israel

was taken off the Watch List of countries under special surveillance. This status was maintained in the 2017 report. We note that in prior years Israel was not only placed on the list of countries “under surveillance”, but also on the uncomplimentary list of countries under strict surveillance (the Priority Watch List).

We will discuss below in detail the main changes and improvements that Israel has conducted in the field of intellectual property:

Upgrading the Intellectual Property Registration Function

The first, most basic contact of entrepreneurs, inventors, companies and corporations when they come to seek legal protection for their inventions is with the government body in each country responsible for registration of patents, designs and trademarks. The quality of the work of this body significantly and clearly impacts the willingness of these entities, including outside investors, to operate in each country and clearly impacts the scope of industrial and technological development in the country.

Up until about a decade ago, the process of registering patents in Israel suffered from unwieldiness and bureaucratic delays. While the length of time required in Israel to register a trademark or design (model) was reasonable (usually between one year and eighteen months), the length of time required for registering a patent was long (more than four years on average, while registering certain patents took even longer). When we take into account the life of a patent (20 years), it can be understood that the delay caused material damage to the rights of patent applicants in Israel.

The delay in the work of the Patent Authority stemmed in essence from a shortage in personnel to perform the job of examining patents. Training patent examiners is a task that indeed takes a great deal of time and requires resources; however, different countries have taken very decisive steps to strengthen their patent authorities. Thus, for example, the European Union established the European Patent Office, which is an external organization that is not supported with funds from the countries but rather is self-funding, through fees paid by patent registration applicants. The organization even recruited hundreds of patent

examiners and trained them for the job in an organized work plan that took several years.

Israel was required, therefore, both because of its objective situation and because of the commitment it took upon itself on the international legal and commercial plane, to advance a significant reform in the Patent Authority, organized by the Ministry of Justice, which is responsible for registering intellectual property.

Indeed, in 2006 the government decided that the Patent Authority would operate as an independent executive agency headed by the Patent Registrar. In 2011, this status of the Authority was first anchored in legislation. The significance of this move was that it provided the Authority with administrative, budgetary and organizational independence, both in areas under its specific authority and also in areas of finance, budget and human resources.

During 2014, the Patent Authority first began to serve as an authority for international search and examination for Israeli and foreign patent seekers. At the beginning of 2014 an agreement was signed with the U.S. Patent and Trademark Office according to which, beginning in October 2014, the Israeli Patent Authority began to operate as a search and examination authority for international patent applications that were submitted to the U.S. Patent Office. In this agreement, patent applicants from the United States were given the option to choose the Israeli Patent Authority to conduct searches for them as one of the certified International Search Authorities.

In accordance with the agreement and so as not to harm the queue for examination of national applications from the United States, in the first stage it was agreed that the Israeli Patent Authority would examine up to 75 American applications per quarter in order not to become overloaded. In addition, since in Israel it is not possible to examine applications in the field of business methods according to the definition of the G06Q classification of international patent classifications, it was agreed that at this stage this type of applications would not be examined. Through the end of December 2014, nine international search requests were received from patent applicants from the U.S.

Advanced Accessible Services

As the regulator of the field of industrial intellectual property, the Israeli Patent Authority is responsible for promoting laws and regulations in its field. Over a five-year period, there has been an increase in the Authority's activities. Thus, for example, a new design law was advanced that is expected to bring about a significant change in the field of design in Israel. The Authority expects that through advanced and accessible services it can contribute to the formation of a strong, valuable design registration right from which designers and the general public can benefit.

The Patent Authority has leading international status derived from increased use of the international tools that the Authority makes available by Israeli registration applicants. The Authority has wide-ranging connections with leading patent offices around the world. In recent years, a number of new cooperation agreements have been signed on the topic of arrangements for expediting the PPH examination (see below) as well as agreements for Patent Authority operations as an International Search and Examination Authority for American and Georgian patent applicants. In addition to these agreements, a memorandum of understanding was signed for cooperation with the National Institute of Patents and Information in Tajikistan, initiating the first ever cooperation between the two offices.

Over the past two years, the Authority has hosted many delegations, among them a senior delegation from the Chinese Ministry of Commerce, with whom the Ministry of Justice signed a memorandum of understanding; representatives from the French Patent Office for a discussion of future cooperation, including in the field of designations of origin and geographical indications; a delegation from the United States Patent and Trademark Office in the framework of training on the CPC system; representatives from the Denmark Patent Office who took part in a forum on intellectual property of the Department of Justice, hosted by Patent Authority; as well as a senior delegation led by the Deputy Mayor of Shanghai who is responsible for intellectual property in the region.

The Authority also has influential status in the World Intellectual Property Organization (WIPO) and organizes many activities with the WIPO

throughout the year, such as events to raise awareness about employment opportunities for Israelis within the WIPO that have taken place in academic institutions, and the Israeli Conference on Intellectual Property hosted together with the AIPPI organization, in the framework of which the CEO of the organization visited Israel. For five years the Authority has organized a prestigious course, together with the WIPO, for patent examination in the field of pharmaceuticals. Examiners from leading patent offices are invited to this course each year.

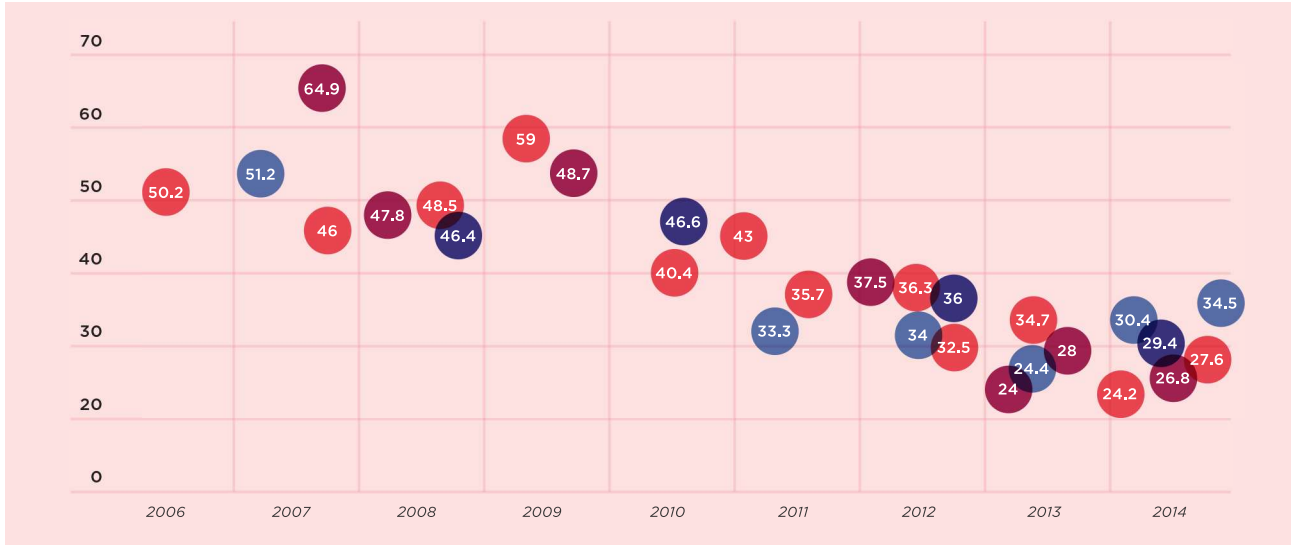
Increasing Efficiency and Output

As a regulator, the Authority is constantly in a process of self-examination. It is no coincidence that the Authority asked to be appointed among the leading units in the regulatory reform process led by the Prime Minister. Indeed, recent years have been characterized by a great deal of activity, shortened wait times and an increase in output in all Authority departments. A key step in increasing efficiency, experienced by the Authority and by the public who use their services, is completion of the transition to full online work in every department of the Authority. In June 2015, the online work system went live for the trademarks department, in December 2015 for patents, in July 2016 for the PCT department, and in December 2016 for the designs department. Each of these systems enables the public to work fully online in all matters related to legal processes dealing with the Patent Registrar in each of these areas.

Indeed, following the steps taken to increase efficiency and output, average wait times for initial examination have decreased. Thus, Israel has joined the worldwide trend of decreased wait times for patent application examination. The data show that the average wait time for initial examination decreased dramatically between 2006 and 2014 - from 50.2 months in 2006 to 29.4 months in 2014. This trend also continued in 2015-2016. At the end of 2016, the average wait time for initial examination was 28.5 months, a decrease of approximately 8% from the average wait time in 2015. The average examination duration including patent applications in all the departments decreased significantly compared to 2015 as a result of the effort made to shorten wait times for repeat applications.

GRAPH 01

AVERAGE WAIT TIME FOR THE FIRST EXAMINATION



Source: Israel Patent Office - Annual Report 2016

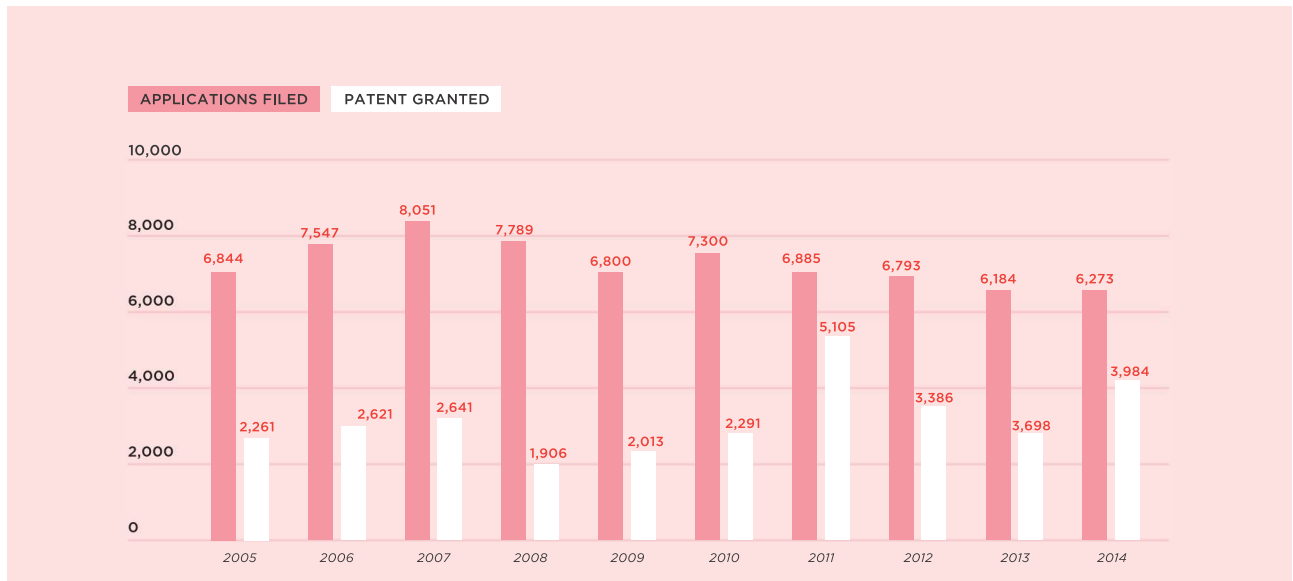
In addition, beginning in 2014, further steps were taken to increase efficiency that in addition to increasing output also improved the quality of examination. Among these steps, we note the improvement in the examination instructions as well as the operation of a new incentive salary structure in the department. These steps led to a meaningful

decrease in wait times for re-examination, as a result of which more applications arrived at the acceptance stage earlier than in prior years.

For 2016, a decrease of approximately 7% was predicted in applications for patent registration submitted in Israel, and conversely a continuing

GRAPH 02

PATENT APPLICATIONS



Source: Israel Patent Office - Annual Report 2016

trend of increase in the number of patent acceptances can be seen since 2011. The number of applications whose examination is completed through to granting of the patent has grown consistently since 2011. In 2015, an increase of 9% was predicted in the number of patents granted compared to the previous year. This increase can be attributed to the preference that was given in the past year to completion of processing of applications whose examination had begun more than five years ago. In addition, in 2016 the process continued of sending refusal notifications for applications that had gone through four rounds of examination and had not met the conditions for acceptance. As a result of this, more applications reached the acceptance process earlier than in prior years. In addition, the publication of new guidelines regarding the article in the Patent Law dealing with medical treatment of humans led to a decrease in the number of deficiencies and a decrease in the amount of correspondence that had been conducted on this issue. Likewise, the number of applications that were expedited in the framework of the PPH track increased and as a result of this, the number of patents granted also increased.

Additional Improvements

In 2014, comprehensive activity was initiated in the Patent Authority to identify professional gaps that needed bridging. In accordance with this, a multi-year training program was built, with an emphasis on building and maintaining knowledge in the patent examiners department.

- Advance Publication
The Israeli Patent Authority has adapted itself to international standards and in accordance with the Amendments to the Patent Law of July 2012, a patent application shall be open for online inspection eighteen months from the date it was submitted (or from the date from which its right of priority derives).
- Certification as an International Examination Authority
As stated, one of the prominent achievements of the Authority was achieving certification to operate as an international search and advance examination authority for international patent applications, in the framework of the Patent Cooperation Treaty (PCT). This certification – granted by a decision of the World Intellectual Property Organization (WIPO), an agency of the United Nations, in 2009, established Israel's status among nations promoting international projects in the field of intellectual property, and constitutes important international recognition of Israel's abilities in the field of technology.
- The new service operations provide a more effective and inexpensive solution for the increasing international needs of Israeli patent applicants. Prior to this change, international applications submitted by Israelis were examined by international search and examination authorities in Europe and the United States, according to the applicants choice. The change made it possible to examine applications in Israel, in a way that is comfortable, inexpensive and accessible for Israeli applicants. Simultaneously, the Authority increased personnel recruitment in preparation for the Patent Authority becoming an international authority for advance search and examination.
- Green Applications
The Israeli Patent Authority has aligned with a large number of western patent offices in the context of policies to encourage patent applications for “green” inventions that contribute to preserving and improving the environment. The examination of patent applications that meet the criteria published by the Patent Authority, and that are classified as green, will begin three months from the date of classification.
- The PPH Program
During 2012, the Patent Authority renewed its cooperation with the United States Patent and Trade Office (USPTO) in the framework of the PPH (Patent Prosecution Highway) which began as a pilot in 2011. In August of that year, the Patent Authority and the USPTO expanded their cooperation as part of this program and began the PCT PPH pilot (Illustration 3)

GRAPH 03

INTERNATIONAL COOPERATION IN THE CONTEXT OF THE PPH



Source: Israel Patent Office - Annual Report 2016

The PPH program is a campaign to expedite and improve processes of patent examination through cooperation among patent offices around the world. Under the PPH pilot, a patent applicant who has submitted applications in two countries is permitted to request a shortened queue for examination of the application in the second country after receiving a positive examination report in the first country. Thus the PPH allows patent offices that participate in the program to rely on work that has already been conducted by other patent offices and thus to reduce workload and shorten the queue for examination.

In addition to this arrangement, in 2014 the Authority promoted signing PPH agreements that take advantage of work products that have been created in the framework of the International Search Authority (PCT PPH). The Patent Authority has PPH and PCT PPH arrangements with the patent offices of the United States, Finland, Denmark and Japan, and in 2014 the Authority also began PCT PPH arrangements with the patent offices of South Korea, Spain and China. In addition, in December 2014 an agreement was signed with the European Patents Office, regarding initiating a pilot for a PCT PPH arrangement that will begin in January 2015 for a period of three years.

- International Cooperation

In recent years the Authority has continued to intensify cooperation with international offices and bodies, as stated above, as well as with academic institutions and members of the Israeli public seeking patents.

Adapting Local Legislation to International Conventions

In recent years, Israel made a series of legislative amendments in order to adapt the procedures for treatment of intellectual property to those accepted in developed countries and to international treaties and conventions to which Israel is a signatory. Among other changes, the patent regulations were amended to conform with the treaty for cooperation in patent matters, adding new methods for application submission, for example on computer storage devices (CD or DVD), or via the internet.

The amendment also addressed the PCT department's treatment of requests for right of

priority at the time of submission of international applications and established the procedure for submission of right of priority documentation through the PCT department. The amendment enables patent applicants who submit international applications electronically to also submit right of priority documentation electronically.

- The Madrid Protocol

In July 2010, Israel joined the international agreement for trademark registration in the framework of the "Madrid Protocol" and beginning September 1 of that year, the date on which the agreement became valid in Israel, Israeli applicants were able to submit international trademark registration applications and to claim trademark protection in other countries based on Israeli trademarks.

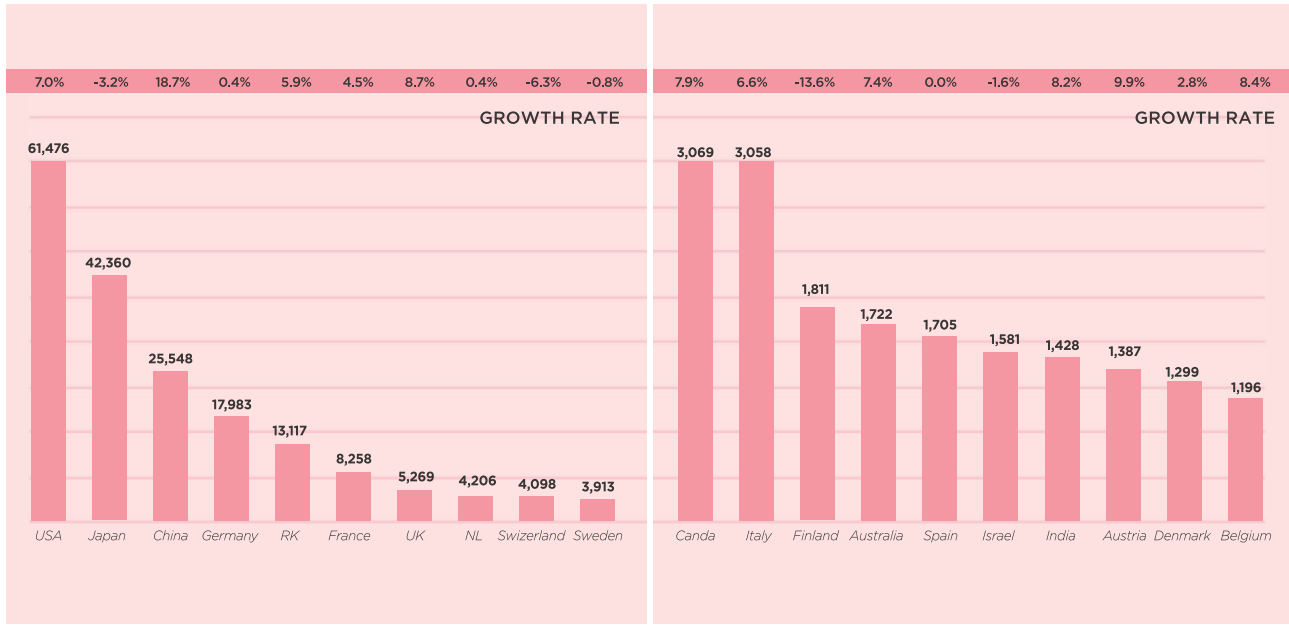
We note that a new system has not yet been established according to the Madrid Protocol. Each entity that is interested in registering its trademark in foreign countries is forced to conduct a separate, independent registration process in each country. The matter forces trademark holders to employ the services of a lawyer or local attorneys in each country and to bear the significant costs, which make it difficult to build an effective and optimal portfolio of trademarks in all the entity's target countries. In practice, the Madrid mechanism significantly shortens and simplifies the process of trademark registration in a variety of countries. In other words: the agreement has made trademark registration and protection for brands easier and cheaper.

The participation of Israel in the Madrid system aligned Israel with the other countries in the protocol, while introducing a number of changes in the practice of trademarks in Israel, of which the key changes are:

1. It is now possible to submit an application for trademark registration for several kinds of merchandise or services simultaneously (while previously separate applications were required to be submitted for each kind of product and/or service).
2. A trademark is valid for ten years, and upon expiration it is possible to renew it for additional periods of ten years each (without limitation).

GRAPH 04

INTERNATIONAL PATENT APPLICATIONS



Source: Israel Patent Office - Annual Report 2016

Israel's entry into the Madrid Protocol brought about a dramatic increase in the number of applications for trademark registration and in 2014 the trademark department in the Patent Authority was still continuing to cope with the heavy workload following the increase in the number of kinds of applications submitted in Israel for trademarks through international applications under the Madrid Protocol. Despite this, the department met the objectives that were set by the committee for setting and monitoring objectives for the Patent Authority. During 2016, the department fully implemented a new online work system that was started in 2015. Currently most of the applications and inquiries are submitted as required by trademark regulations.

In 2016, there was a decline of 11% in the number of trademark registration applications. The number of national applications declined by approximately 7.8% while the number of international applications submitted dropped by 13.6%. It is important to remember that up until September 2010, only one-type applications could be submitted. Beginning in September 2010, when Israel began operating in the framework of the Madrid Protocol for submission of international trademark registration applications, it became possible to submit multi-type applications. Therefore, this graph does not fully express the increase in the scope of the department's work. For

a more exact picture, we can look at the following graph that presents data about the amount of different types that were submitted and registered.

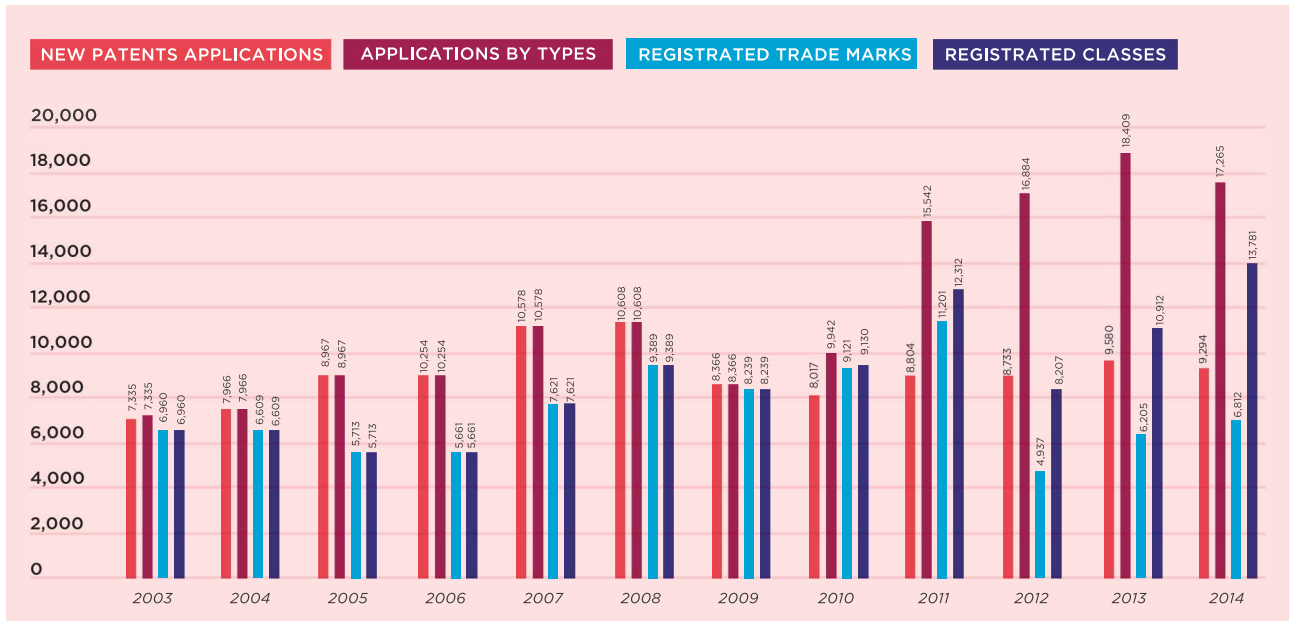
Alongside the decrease of 11% in the number of applications submitted, a sharp decline of 16% was registered in the number of types that were submitted. It is evident that after 2015, which was a record year in the scope of applications and types, the number of applications returned to the level of prior years. It is possible that this decline can be related to the comparatively long examination period in Israel.

Joining the Organization for Economic Cooperation and Development (OECD) In September 2010, after 15 years of negotiations, Israel joined the prestigious Organization for Economic Cooperation and Development. This was the climax of focused Israeli efforts, achieving a strategic objective defined by the Israeli government in 2000.

The OECD unites countries from around the world with developed economies and its goal is to increase cooperation among countries, while meeting international economic standards. This organization sets high standards in all matters concerned with preservation, supervision and oversight of intellectual property rights. In fact, one of the conditions for Israel joining the organization

GRAPH 05

NUMBER OF APPLICATIONS FILES AND DIFFERENT TYPES



Source: Israel Patent Office - Annual Report 2016

Israel, as a significant, quality player in the global technology arena, has taken upon itself in recent years to adjust its norms of conduct in all matters related to intellectual property - including its local laws, regulation, and its enforcement regime

was closing gaps in this area on the part of Israel. The Secretary General of the organization, Angel Gurría, who visited Israel in January 2010, discussed the topic of intellectual property as one of three problems that delayed Israel's acceptance into the organization.

Israel's acceptance into the Organization for Economic Cooperation and Development constitutes an important milestone in Israel's integration into the global economy, expressing Israel's commitment to maintain advanced international standards, including in the field of intellectual property.

Strengthening the Enforcement Regime Against Counterfeiting and Smuggling

Strengthening the enforcement regime against counterfeiting and smuggling of counterfeit merchandise requires granting authority in the field to customs

employees. Currently, employees of the Customs Administration enforce the legal conditions of import and export, deal with prevention of illegal activities (fraud, drugs, money laundering, intellectual property), and supervise all imports to Israel and exports from the country. One of the powers of the Customs Authority is to seize goods used in the commission of a crime, or that are suspected as such, including in crimes in the area of intellectual property.

Across the world in recent years, the penalties imposed on smugglers of intellectual property products have become more stringent. In Europe, for example, a law was enacted whose goal is to make an impact in the war against intellectual property violations. The law greatly expanded the powers of the European customs authorities and enabled them to operate independently, without a request from a company whose rights have ostensibly been violated.

In 1995, following an agreement established by the World Trade Organization and Israel's admission to it, Israel committed to adapt its laws to the requirements defined in the TRIPS agreement by the end of 1999. The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), including counterfeit goods, is an agreement that discusses aspects of intellectual property rights. Following this, the Israeli law was amended and some comprehensive changes were made to legislation

on intellectual property (but not to the Customs Directive). The rationale behind the amendment was to remove difficulties that might arise in international trade regarding intellectual property rights, through paying attention to the need to provide protection for intellectual property rights on the one hand, and on the other hand, the need to ensure that the means of enforcing protection of these rights did not harm international trade. In fact, the law implements most of the amendments required by the TRIPS

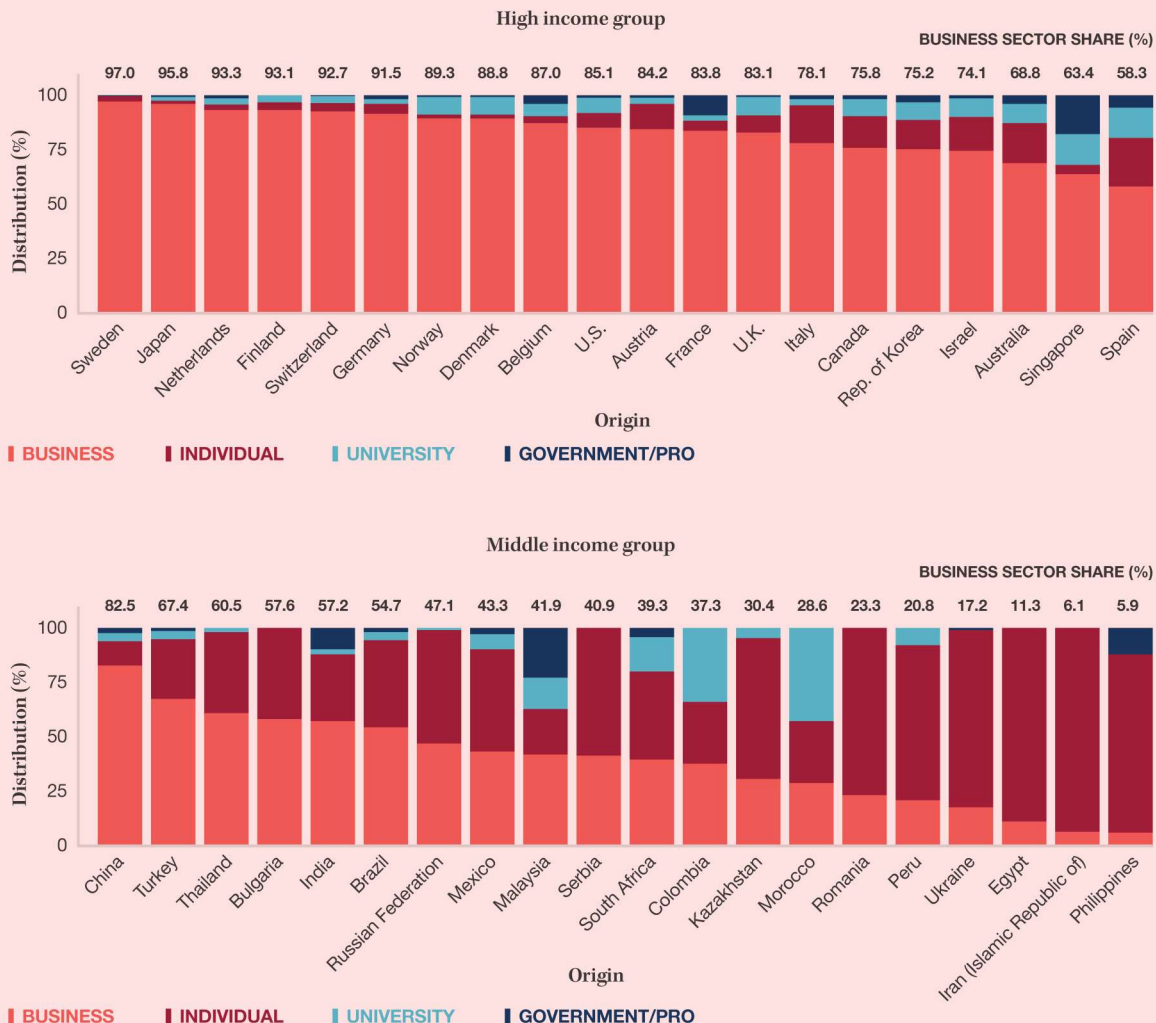
agreement and as stated, following this amendment to the law, comprehensive legislative amendments were passed dealing with intellectual property. Later there was a change to the Customs Directive that added amendments and different powers for Customs Administration employees.

The legislative changes and changes in the powers of customs officials gave intellectual property rights holders tools to contend with violators of

GRAPH 06

TABLE A12

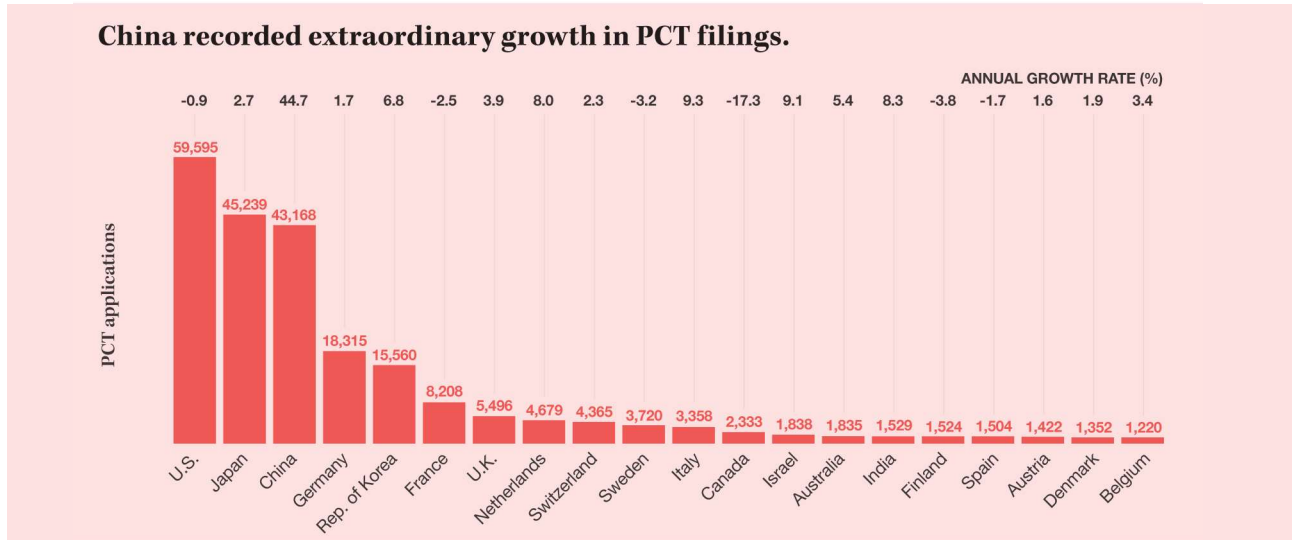
The share of the business sector in total PCT applications varies across origins.



Source: WIPO Statistics Database, April 2017

GRAPH 07

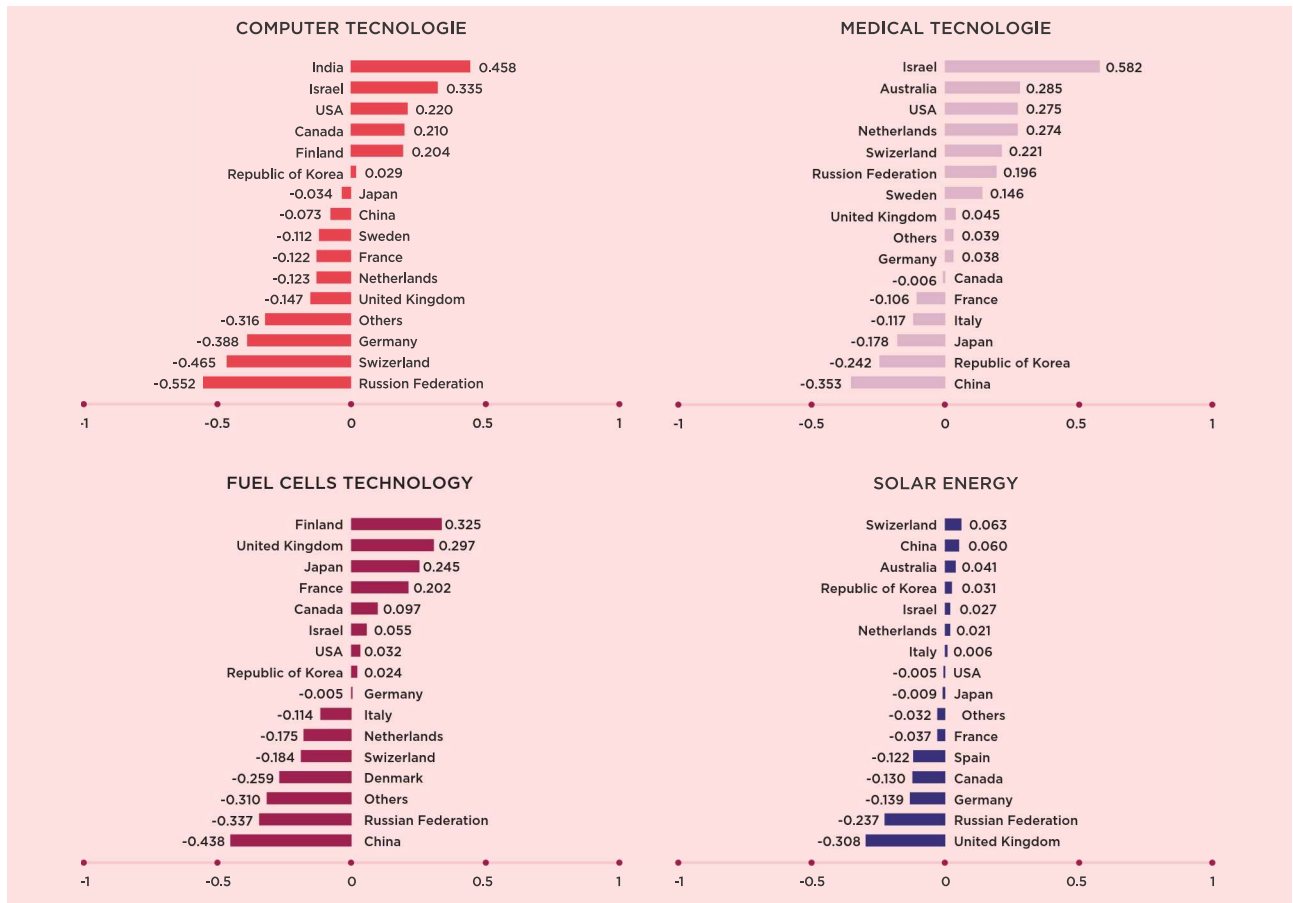
TABLE A8



Source: WIPO Statistics Database, April 2017

GRAPH 08

INTERNATIONAL PATENT APPLICATIONS



Source: WIPO Statistics Database, April 2017

Israel stands out in its ranking in the table of international patent applications in areas such as medical instrumentation (first in the world), computerization technology (second), solar energy (fifth), and fuel cell technology (sixth)

their rights. A new path was opened for them to fight rights violators. For example, they now had the option of going to the Customs Administration with notification of violations, and if the Administration was persuaded, by the proof that the rights holder provided, of the apparent existence of a violation of rights, the Administration could treat the imports as prohibited imports. The officials of the Customs Authority were given the authority to detain goods if there was an ostensible violation of copyright or trademark

Intellectual Property, Patents and Technological Innovation in Israel

Israel stands out positively in its ranking in the international table of patent applications in fields such as medical devices (ranked first in the world), pharmaceuticals (second place), computer technology (third place), and measuring instruments (sixth place).

Today technological innovation is considered a significant business growth engine.

The goal of business organizations, multi-national companies and company R & D centers – even at the macro level of national economies – is to develop new technologies that will meet the changing needs of the market and the challenges presented by industry; to create sophisticated and advanced products that are leaders in their fields; and to supply systems and products according to client demand that can help them be first in their markets.

There are many ways to measure technological innovation at the national level, such as national spending on civilian R & D, human capital in science and technology, indices of value and economic output in science and technology, scientific publications and citations, and patent registration.

In the chapter before us we examined technological innovation through the prism of creation of new intellectual property and it was measured, among other ways, through the number of international patent applications (PCT) originating in Israel. This is a strong predictor of technological innovation because patent registration precedes production of innovative products. The results of research show that the indicative trends in the field of technology in Israel and the world are reflected, to a large extent, in the data on the number of international patent applications.

We should pay special attention to the following statistic – after a number of years in which the number of international patent applications coming from Israel declined in recent years (and in contrast to the worldwide trend), there was an increase in the number of patent submissions of this kind. Since the number of patent applications constitutes an index that expresses technological innovation, the conclusion to be derived is that it seems that there has been an improvement in the rate of technological innovation creation in Israel, both compared to the past and compared to worldwide trends.

From the data it appears that for 2016 (the last year for which certified data is available), Israel registered 1,838 applications, an increase of 9.1% in the scope of international patent applications originating in Israel, in contrast to a number of years prior in which there was a decline in the scope of international patent applications. Israel has thus succeeded in arresting the downward trend, even registering a substantial increase. As usual, it is worth paying attention to the dramatic growth of China in this context.

An additional statistic worth noting is that among patent applicants in Israel there is weight to both academic and individual applicants, despite the dominance of the business sector.

Israel stands out positively in its ranking in the international table of patent applications in fields such as medical devices (ranked first in the world), pharmaceuticals (second place), computer technology (third place), and measuring instruments (sixth place).

INTERNATIONAL CONVENTIONS ON INTELLECTUAL PROPERTY

These are the details of important conventions in the field of intellectual property that are relevant to Israel:

Paris Convention

The Paris Convention deals with a number of significant aspects of intellectual property law, of which the most useful is the "right of priority". The right of priority allows an applicant making their first application for a patent, design or trademark in a country that is a member of the Paris Convention, to expose the invention, product design or logo publicly for a certain period without fear that another person will copy them and submit a prior registration request in that country or other countries overseas that are members of this convention (over 170 countries), and thus create unfair marketing, commercial or legal advantages. In accordance with the instructions of the Paris Convention, an applicant who submits the first application for a patent has the "right of priority" for 12 months to submit a parallel patent application in one of the countries in the Convention, for which the date of validity will not be the date of actual submission in that country, but rather the date of the initial application submission. This principal also applies with regard to applications for designs for a period of six months, and for trademarks, also for a period of six months.

PCT

The Patent Cooperation Treaty allows extension of the right of priority period for patents of 12 months based on the Paris Convention to 30 (and sometimes 31) months in total, for the same countries that are members of the Paris Convention and that are signatories on the PCT (more than 140 countries). During this period of about a year and a half (known as the international phase), it is possible to receive a search report and professional opinion which usually shows the strengths and weaknesses of the patent application and enables revision of the application before the end of the

international phase. The application then moves on to the national phase, which is the phase of registration of the application in the rest of the countries chosen.

Madrid Protocol

The Madrid Protocol is a convention that allows local trademark owners from member countries (more than 80-member countries) to submit applications for parallel international trademarks in all the other countries in the convention, through one application form and with reduced fees.

Nice Agreement

This agreement deals with classification of trademarks according to 34 different types of products and 11 additional types of services, a total of 45 classifications. Israel joined this agreement in 1961.

Berne Convention

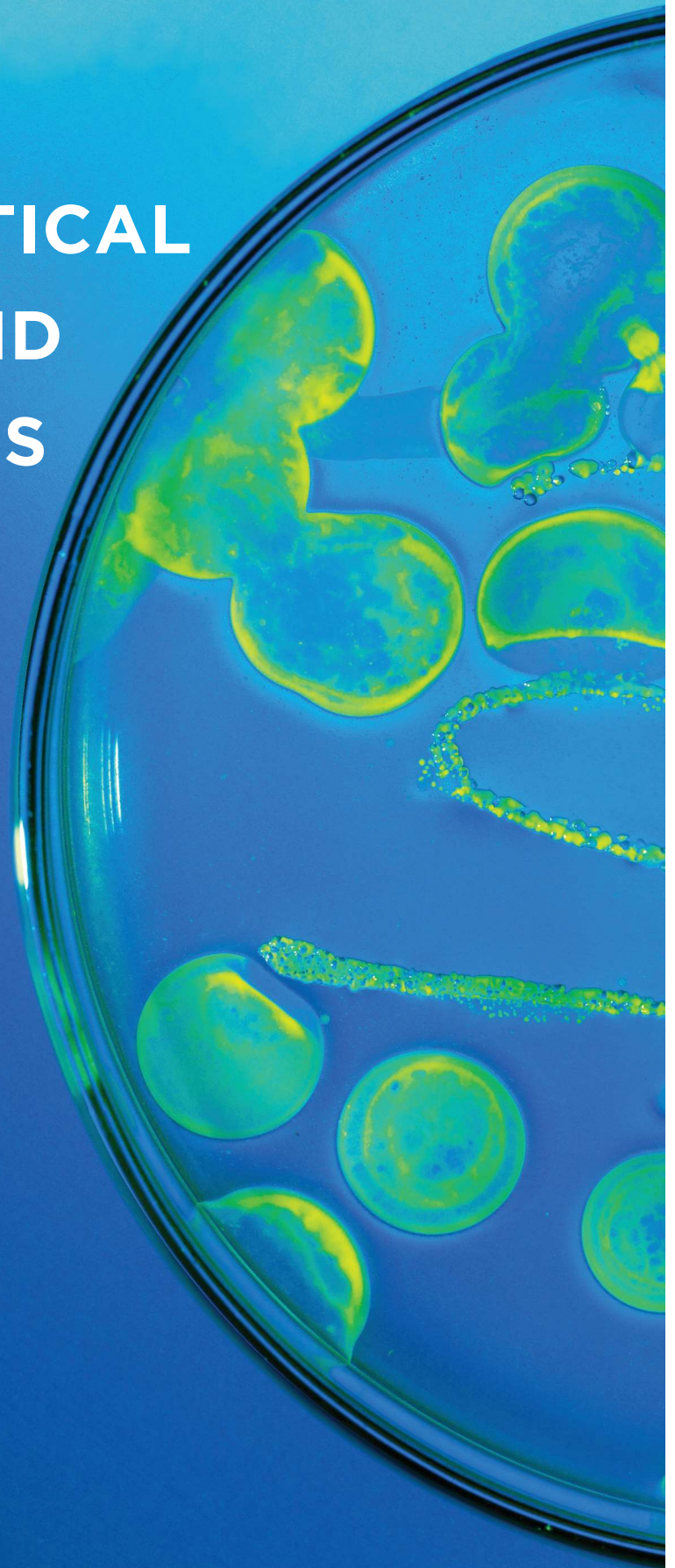
The central convention for protection of copyrights. The directives of this convention establish the prohibition on copying or translation of a work without permission of the author, the prohibition on copying without permission excluding fair use, the prohibition on broadcasting, screening or public recitation of a work without permission, as well as modification, processing or distortion.

Trade-Related Aspects of Intellectual Property Rights (TRIPS)

Intellectual property agreement between countries in the World Trade Organization (including more than 150 countries) that went into effect in 1995. When a country joins the organization, they are automatically included as a party in the TRIPS agreement. The directives of this agreement created a common denominator in intellectual property laws for the member countries in the agreement and these countries must adopt the agreed-upon directives into their local laws within a defined period.

CHAPTER 04

PHARMACEUTICAL INDUSTRY AND LIFE SCIENCES



There is practically no industry that is as intimately connected to the content world of intellectual property as the biomedical industry. Whether in the development of new drugs or generic drugs, whether in the design of medical devices and medical equipment – in all these areas patent protection has a critical role in the development and marketing processes.

In principle, patent laws are organized separately by each country. However, the TRIPS Agreement established a set of rules to which policies of the signatory countries must adhere. These rules mainly ensure a minimum standard of intellectual property protection in general and patents in the pharmaceutical market in particular.

Pharmaceutical Drug Development, R&D and Intellectual Property – Worldwide Outlook

Pharmaceutical R&D companies are completely dependent on suitable protection of intellectual property rights. Without this, it is doubtful whether they would invest the substantial resources required for the process or take upon themselves the inherent risks. At the end of the day, the time and costs involved in the research and development (R&D) process in pharmaceutical industry innovation are especially high. On average, the research and development process, including drug licensing, takes approximately 12-15 years, and the costs are estimated at approximately 900 million dollars.

In addition, out of every 5000 selected molecules, on average only 5 are examined in clinical trials, and only one of them becomes an approved drug for treating patients. In fact, less than 20% of the drugs that reach the stage of trials on human subjects receive regulatory approval at the end of the process.

In addition, on average, only three out of every 10 prescription drugs available for treatment produce income equal to the average costs of R&D. Without patent protection, 65% of existing drugs on the market today would not have been developed at all.

At the opposite end of the spectrum, the business model of generic drug companies is based on patent expiration and the possibility of producing similar or identical drugs.

Between these two branches of the worldwide pharmaceutical industry – the innovative ethical companies (that produce original drugs) and the

generic companies – difficult economic, legal and political struggles take place, mainly surrounding issues of patent regulation.

While the innovative pharmaceutical companies seek to lengthen the duration of patent life as much as possible, the generic companies seek to decrease it. Since the cost of generic drug development is relatively inexpensive, these drugs are sold at cheaper prices, approximately 30-50% of the original drug price. After two years of activity, generic drugs control approximately 70% of the market for the particular drug.

Patent Expiration

This struggle is sharper in light of what has been defined as the moment of truth for the original pharmaceutical companies. In the coming years, the moment they have feared will arrive – the moment when the patent expires. A series of patents that protect important original drugs will expire and the original companies do not have sufficient R&D pipelines of new patents. Experts estimate that many pharmaceutical companies will seek out business partnerships or mergers that can ensure their continued survival in a market in which more and more companies are producing generic alternatives sold at prices that are lower by tens of percentage points.

It is in fact becoming clear that the traditional business model of pharmaceutical companies is changing. After the large companies – that manufacture approximately 70% of pharmaceutical drugs in the world – saw their market value skyrocket, they are now under huge pressure and the prediction is that by 2020 the traditional model will cease working and will change – from use of drugs by the wider population to use of drugs adapted to a particular user based on his or her genetic profile, and thus medications will be adapted to smaller populations of users. The economic significance is that the income from each new drug will significantly decrease and the economic feasibility of developing new drugs will be dubious.

The Global Pharmaceutical Market

The global pharmaceutical market is estimated at approximately 850 billion dollars. The main players in this market are the United States (responsible for 50% of all the existing drugs in the world) and also Western European countries (mainly Switzerland, Germany and England), Japan and Israel, which is very dominant in the field of generic drugs (mainly due to the Teva company).

The scope of prescription drug sales in the U.S. alone in 2014 was 374 billion dollars. New drugs that have come on the market in the past year yielded aggregate revenues of approximately 20.4 billion dollars, out of which 11 billion were in sales of SOVALDI, a medicine for treatment of hepatitis manufactured by the Gilead company, and approximately 2.6 billion dollars in sales of the breakthrough drug Tecfidera produced by Biogen.

The numbers in Israel are also large. In December 2014, the Israel Pharmaceutical Committee authorized the addition of 320 million ILS to the government “basket” of medications and technologies, which is estimated at 6 billion ILS per year and is considered advanced and comprehensive by worldwide criteria. The main portion of the additions to the basket were in the field of treatment for hepatitis and breakthrough drugs for cancer treatment (Opdivo, Imbruvica).

It is no secret that the health market moves big money and that life sciences and biotechnology companies demonstrate unprecedented performance alongside exceptional growth rates and profitability. The constant questions are whether this can continue, what are the risks to investors, to companies and to patients, and whether the stocks are cheap or expensive?

Changes in the United States Intellectual Property Regime

In the past, the United States was one of the most developed and most liberal countries in all matters connected to approving patents, but since 2010 and until today, following a series of Supreme Court decisions that occurred one after another, the situation has changed completely.

One of the most recent decisions of the United States Supreme Court held that it is not possible to register patents on human genes, but it is possible to register patents on genes that have undergone manipulation, on methods for isolating genes, or on innovative applications that are derived from genetic research. “The DNA sequence is a product of nature and therefore a patent cannot be registered for it simply because the genes in it were isolated in a laboratory. However, the product of genetic manipulation is something that does not exist in nature and therefore it can be defined as an invention that can be protected in the framework of intellectual property laws,” wrote Justice Clarence Thomas in the court decision.

The judges’ ruling cancelled patents held by Myriad Genetics regarding two genes related to the development of breast and ovarian cancer. At the center of the

case was the question of whether genes isolated in the company laboratories were a “product of nature” or a “human invention.” The case began in 2009 and over its course the company claimed that they should be able to keep their patents, while the American Civil Liberties Union (ACLU) and the medical Association for Molecular Pathology claimed that the matter would thwart the advancement of research and would not make it possible to lower prices for genetic testing.

This court decision joined a previous U.S. Supreme Court decision in another case that held that the laws of nature cannot be patented and therefore inventions that are an expression of the laws of nature are an act of thought and are not entitled to patent protection.

There is no doubt that this most recent court decision will shape the nature of research and medical testing in the future. It has created great consternation and called into question many technological developments. Biomedical research industry entities even warned throughout the case that a sweeping prohibition on registering patents in genetic research would put research that had already begun at risk and prevent the development of advanced disease treatments. In an opinion presented to the Supreme Court, the Obama government advised reaching a compromise in which existing patents in the field of synthetic molecules (complementary DNA) would receive protection under the intellectual property laws. Some even thought that Congress would intervene and pass legislation, but that did not happen. Instead a book of guidelines from the U.S. Patent and Trade Office (USPTO) was published, which did not untangle the problem and in fact increased the uncertainty. Only recently has a public body been appointed that has held a number of discussions, studied the problem in depth and published a new book of guidelines that is slightly clearer. However in many different areas, especially in all matters concerned with diagnostic methods, the situation is still bleak.

The Pharmaceutical Industry and Intellectual Property in Israel

As a result of the changes in the biomedical field worldwide, multi-national pharmaceutical companies are trying to associate with research companies, universities, laboratories, clinics, hospitals and even drug distributors in order to identify new trends and technologies and to develop effective products for the public.

In fact, this process is already active in Israel and we are witnessing large global pharmaceutical

The global pharmaceutical market is estimated at approximately 850 billion dollars. The main players in this market are the United States (responsible for 50% of all the existing drugs in the world) and also Western European countries (mainly Switzerland, Germany and England), Japan and Israel, which is very dominant in the field of generic drugs (mainly due to the Teva company)

corporations, such as Roche and Novartis, as well as the Israeli company Teva, partnering in research on drug development with academic researchers, while investing in small pharma and biotech companies. Israel has great potential to attract investment in research and development of biomedical products, as well as to conduct clinical studies. Until recently this potential was not sufficiently realized due to a series of legal and regulatory problems in the field of intellectual property protections for pharmaceutical drugs and other bureaucratic difficulties.

Following entrance into the OECD, Israel began implementing changes, adjustments and corrections that were intended to provide suitable protection of intellectual property rights for pharmaceutical drugs in accordance with the accepted standards for the organization's member countries. These changes are still in the process of legislation and their main importance relates to extending the validity of patents, an area in which Israel lags behind the West. What follows is a brief survey of the existing situation and the changes that Israel is planning to make in this area that are intended to improve protections for intellectual property rights for pharmaceutical drugs.

Extending Patent Validity

In principle, the issue of extending patent validity in Israel is quite complicated, cumbersome and laden with gaps and uncertainty that has still not been addressed in local rulings. Likewise, the system for extending validity in Israel is not balanced and clearly tends toward the interests of the local generic industry

over those of the ethical companies (the innovative companies that produce original drugs).

The entire topic of extending patent validity in Israel is integrated in the framework of amendments to the patent law of February 1998. For a number of years, a bill has been before the Israeli parliament (Knesset) that would regulate the subject; to date the bill has not yet passed. However, by means of article 64 of the patent law, it is possible to extend the period of patent protection in the area of drugs and medical equipment under certain conditions. The matter derives *inter alia* from increasing international pressure on Israel to raise and adjust the level of protection Israel provides for intellectual property rights.

The main reasons for integrating the process of extending patent validity are as follows:

- Compensation to ethical companies for prolonged required regulatory processes prior to receiving market authorization, during which they are prevented from realizing any commercial benefit from their patent protected invention.
- The effective lifespan of drug patents is much shorter than the period recorded in law (20 years). The long required process for drug development and receiving market authorization leads to a situation in which the ethical pharmaceutical companies have only a relatively short period of time to market the drug.
- Balancing out the impact of the Bolar Exemption, the permission given to generic producers to conduct trials during the period of the original patent protection for the purpose of receiving market authorization for generic alternatives when the patent expires.

Calculation of the period of extension in Israel is not conducted independently, but rather is based on prior decisions. There is a clear and direct link (linking mechanism) for calculating the extension period for Israeli patents and patents in one of the 21 recognized countries. The extension decree can be valid for a period equal to the shortest of the extension periods given to the comparable patent in any country among the recognized countries, but not more than five years. The aforementioned calculation is cumbersome and puts excessive bureaucratic burden on ethical companies seeking to receive extension decrees.

The essential conditions for granting an extension decree in Israel are:

- The material, the production process or the use of it, the medication that includes the material, or the production process, or the medical equipment is an intrinsic part of the basic patent and the basic patent is valid.
- The medication is listed in the Israeli pharmaceutical registry.
- The product registration is the first registration confirming the use of the material in Israel for medical purposes.
- The basic patent or the material has not received a previous extension decree.
- Marketing authorization has been issued for the medication or medical device in the United States that is protected by a comparable patent – if the comparable patent validity was extended in the United States regarding the stated medication or medical device.

In the memorandum of understanding signed between the Israeli and American governments on February 18, 2010, the Israeli government committed to initiate and promote certain legislative changes in the instructions for patent extensions. On September 18, 2010, the Ministry of Justice published draft legislation to make a number of corrections in the instructions for patent extensions. Following are the main proposed points:

- Decreasing the number of recognized countries – the number of recognized countries that constitute the basis for calculating the duration of extension decrees in Israel will be decreased to about five countries in the European Union (France, Germany, Italy, Spain and Britain) and the United States.
- Setting official date targets in the matter of application claims to extend validity.
- Adding the option to submit a request for extending patent validity to patents that are still in the examination process.
- Adding a process for examining requests for extensions also in cases where the extension of validity has not yet been granted in recognized countries.

There is no doubt that improving the protection of intellectual property rights will accelerate the pace of registration of new medications in Israel and increase the competition among the different

original medications for treatment of different kinds of illnesses. It is worth remembering that the cost to the economy of importing medications that are not registered in Israel is higher than the cost for medications that are registered in Israel and that are based on intellectual property rights. Moreover, the lack of registration of these medications in Israel prevents any possibility of generic competition or of lowering prices over time.

Clinical Studies

Regarding clinical studies, no fewer than one thousand clinical studies are conducted in Israel each year solely in the area of medications. The developed infrastructure in the hospitals, the heterogeneous population, the accessibility of information and the level of cooperation still attract pharmaceutical companies to Israel. Clinical studies bring approximately 350 million dollars into Israel each year, and in the last decade approximately 1,300 new medications were authorized in Israel.

Israel still attracts large companies and is perceived by the world as a center of innovation, but we cannot be complacent. There is an annual increase of 5-10% in the number of clinical studies conducted in Eastern Europe and Asia, and countries that were considered leaders in the field are actually experiencing a decrease, fighting to preserve their portion of the field. In order to ensure Israel's continued advantage in this area, Israel must decrease bureaucratic barriers that create difficulties in the process of promoting clinical studies. The world is advancing and there is concern that Israel is standing still. If changes do not occur in the field, we will witness companies' increasing preference for conducting clinical studies in Eastern Europe and the Far East.

Maximizing Israel's Comparative Advantage in the Biomedical Field

Israel has impressive statistics that provide a significant comparative advantage in the field of biotechnology. The central basis for Israel's comparative advantage is the potential human capital. Israel is in third place among OECD nations in percentage of academic degrees, with 47% of the relevant age group (age 25 to 64) in Israel holding an academic degree, compared to the average of 33% in OECD nations. A significant portion of these degrees are in subjects relevant to biotechnology: approximately 40% of doctorates completed in Israel are in the sciences, compared to an average of only 24% in the OECD.

In contrast to the fields of computer and information technology, in which there are indications of a trend of excess demand for personnel, in the biotechnology field there is a large reserve of skilled, academically-trained human capital. In the past decade the number of (second and third) degree recipients in fields relevant to biotechnology (biology, chemistry, biochemistry, engineering and agriculture) reached approximately 15,000. In contrast, the number of employees in biotechnology in Israel is relatively low – only approximately 6,500 people are employed in this field. Hence there is a high potential for human capital in the biotechnology field which offers a wide area for industry development. Israel's comparative advantage is also expressed in academic excellence, which has important significance in these research fields. Israel is one of the world leaders, relative to its size, in publications in the life sciences, and Israeli universities rank highly in worldwide ranking indices.

Israel's comparative advantage in biotechnology fields is not only in academics. It is also actualized in an impressive scope of activities of R&D companies in biotechnology fields. In Israel, there are currently approximately 260 operating companies focused on biotechnology fields; of them, 220 are Israeli companies and approximately 40 are foreign companies. Israel

ranks fifth among OECD nations in the number of companies in the field relative to the GDP. For comparison, in the U.S., where the economy is 60 times larger than Israel in GDP, there are only 9 times more companies operating with a business focus on biotechnology fields, approximately 2,200. In addition, another approximately 4,000 companies operate in a range of fields in the U.S. that also include the biotechnology field.

In scope of investment in business R&D in biotechnology fields, Israel is also among the world leaders. The scope of annual investment in R&D in biotechnology fields is approximately 4 million dollars, and Israel is in fifth place worldwide in terms of investment in business R&D in biotechnology relative to GDP.

The integration of advantages in human capital, the relatively large number of companies dealing with development in this branch and the relatively high level of investment in R&D are bearing fruit, as expressed in the high percentage of patents in biotechnology held by Israeli companies. According to the OECD index of comparative advantage in the field of patents, which measures the percentage of patents in biotechnology fields in comparison to the overall percentage of patents from each country,

GRAPH 01

ISRAEL'S COMPARATIVE ADVANTAGE IN BIOTECHNOLOGY

	Israel	United States	Israel's rank in OECD
Relative advantage index*	1.5	1.6	9
Investment in Biotech business R&D as percentage of GDP	0.15%	0.16%	5
Total number of patents per million \$ GDP**	538	246	2
Number of new patents per year***	141	4,132	12
Number of Biotech companies per billion \$ GDP	1.0	0.4	5
Total number of Biotech focused companies	259	2,178	10

Source: OECD and BDO | Israel accounting firm data

Israel is in 9th place out of 33 OECD countries. Israel's comparative advantage index stands at 1.5 in biotechnology fields, very close to the U.S. index of 1.6. Israel is in second place among OECD countries in the number of patents in biotechnology fields per dollar of GDP, following Denmark.

Medical Devices

The field of medical devices is a branch in constant growth in Israel. Only recently, the Israel Export Institute published statistics regarding Israeli exports for 2014. From the data it appears that in 2014, the scope of export of medical equipment from Israel increased by 11% over 2013, and totals approximately 2 billion dollars. The Export Institute estimates that the life sciences industry in Israel numbers approximately 1,100 companies, with 70% of them in the medical device field.

Jerusalem Biotech Cluster

In public media discourse, Jerusalem usually merits mention in political and religious contexts. This discourse is replete with emotions and tends to obscure the fact that the city is also a metropolitan economic and employment center. After all, Jerusalem is the largest city in Israel and contains several central economic-employment anchors that attract human resources and investment. One of the prominent anchors is the field of life sciences, which is considered the central economic growth engine of the capital city.

Jerusalem currently has a number of clear advantages in the field of life sciences. In the city, there are several institutions of higher education, medical centers and sites that concentrate significant activities in the field of biomed R&D. First and foremost, Hebrew University, the leader in the field of biotech in Israel, controlling 43% of research in the field, as well as the Hadassah University Medical Center and Shaare Zedek Medical Center, two leading medical centers of significant reputation. There are also three technology colleges in Jerusalem – the Jerusalem College of Engineering, the Jerusalem College of Technology (Machon Lev) and Hadassah College – as well as the Bezalel Academy of Design, whose graduates make an important contribution to designing medical products and devices.

Alongside all these, in Har Hotzvim and Atarot there are tens of pharma and biomed companies operating, including Teva, Rafa, Medinol, Omrix, Covidien, Sigma,

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Bio-Lab, and Fermentek. A total of 32,000 people are employed in the city in the medical and life sciences fields – 14% of the labor force in Jerusalem. We note that on the Ein Karem campus there is a dedicated area for biomed companies, operated in cooperation with the University and Hadassah. This is the Jerusalem Biotechnology Park which is currently operating with renewed momentum. All these aspects together constitute a unique advantage for Jerusalem in the biomedical field.

Conclusion

The life sciences industry in Israel is taking great steps forward, but is still in the formative stages. We have indeed succeeded in becoming an attractive center of innovation, based on scientific excellence and entrepreneurial spirit, but there is still a long way to go to become a mature, sustainable industry.

Scientific breakthroughs in the field take place mostly in academia. In order for these discoveries to ripen into products, there is a need to bridge the gap between scientific discovery stage and the product development stage. The biotech industry is largely capable of developing scientific discoveries only into the first stages of product development, afterwards, and especially in the field of drug development, the biotech industry is dependent on the global pharmaceutical industry for continued development and commercialization of products on the market. In Israel, there is a lack of skills in the field of development and commercialization of

medications, and sources of funding for expensive development processes, involving investments of hundreds of millions of dollars or more, are lacking. Other than Teva, there are no pharmaceutical companies capable of bringing products from initial development stages to market. Therefore, the lion's share of the profits on final products does not stay in Israel, despite the fact that the initial discovery of the medication is "blue and white."

Creating a mature, sustainable industry in Israel requires massive support from the government, Israeli and international financial bodies, and partnerships with international pharma companies. Only in this way can we create the infrastructure, environment and growth climate here for additional pharmaceutical companies that can leverage the life sciences industry to create significant income for the Israeli economy and bring about the growth of more companies in their wake.

ISRAELI LIFE SCIENCE INDUSTRY

Analysis of the data shows that although the Israeli life science industry is relatively young, it has been growing steadily in the past decade, experiencing a compounded annual growth (CAGR) of 10% from 2008 to 2017. Out of the 1,200 life science companies active to date, around 60% (720) were founded in the last decade. A closer look reveals that 31% (374) of the companies were established in the last five years. Four hundred and eighty companies were established prior to 2008, with the first one, Teva Pharmaceutical, founded in 1901.

Out of the 720 companies that were established in the past decade, 137 companies (19%) are revenue generating entities. Approximately 160 companies (22%) are at the seed stage, 187 (26%) are at preclinical stages and 137 (19%) are at clinical stages of development. A closer analysis of the companies established in the last decade reveals that 72 medical device, 15 biotechnology and 21 pharmaceutical companies are currently in the preclinical stage. Concurrently, 63 medical device, 19 biotechnology and 23 pharmaceutical companies are currently clinical stage companies.

Interesting to note is that the emergence of the health IT sector in recent years has changed the composition of the different sectors within the Israeli life sciences industry. While five years ago, the medical device sector accounted for the majority of the companies (60%), today this sector still leads, but accounts for only 41%, with 493 of the 1,200 companies. Health IT is the second largest sector, with 360 companies (30%), followed by

biotech with 157 (13%), and finally pharma with 112 companies (9%).

Over 65% of the Israeli life sciences industry is composed of "tiny" companies with 1-10 employees. Altogether, this group employs an estimated 6% of the total 65,000 employed in the life science workforce. In comparison, the 119 "large companies" (10% of 1,200) with over 50 employees, employ around 52,400 individuals or 81% of the total life science workforce. In the case of the multi-national companies, the data includes only R&D professionals, and for domestic companies, only employees based in Israel.

According to a 2018 IVC report, in 2017, Israeli life sciences companies raised \$1.2 billion from VC funds in 135 investment deals, a 41% increase compared to \$850 million raised in 137 deals during 2016. In 2017, funds received from the Israeli Innovation Authority reached approximately 135 million dollars. The most prominent Israeli venture capital firms active in the life science sector are Orbimed Israel, Pitango Venture Capital, TriVenture, Pontifax, Accelmed, Arkin Bio Ventures, and the latest two entrants, aMoon and Israel Biotech Fund. 2017 marks two record breaking exits: NeuroDerm was acquired by Mitsubishi Tanabe for \$1.1 billion, and Valtech was acquired by Edwards Lifesciences for \$1.0 billion with an upfront payment of \$340 million. Other noteworthy events include Urogen's public offering on the Nasdaq raising \$58.2 million, and Redhill Biopharma raising \$22.5 on the Nasdaq.

National Digital Health plan

The Israeli government approved recently a National Digital Health plan, which, plans to create a digital database of the medical files of some 9 million residents and make them available to researchers and enterprises.

To promote the initiative, Israel will unify the existing database of the digital medical records it has collected over a period of 20 years - which holds the medical files of more than 98 percent of the population - to create a single database, in which one's participation is optional, that will help attract researchers and industry leaders from across the globe, the Prime Minister's office said Sunday.

Prime Minister Benjamin Netanyahu estimated the global digital health sector at some \$6 trillion, calling the field "huge." He speculated that Israel might be able to snag some 10% of this market potential, worth some \$600 billion. "I think this is a conservative estimate," he said. "And if we succeed, just like we succeeded in cybersecurity and in autonomous cars," then Israel can expect a significant boost of new products.

Israel has medical records of close to 9 million people collected over the past 20 years, Netanyahu said. "This is a huge asset," he said. "We want to make this available to researchers and developers and enterprises." The aim is to boost the development of preventive medications as well as personalized, custom-made treatments. "Of course this depends on the consent of each and every person," he said, adding that this new policy was a "global breakthrough," and global companies have already expressed a huge interest in the initiative. "I've already met many of them. They all want to come here. Quite rightly, they see that this is a new direction."

Leading academic researchers

Also noted is that Israeli universities are staffed with leading academic researchers, offering excellent curricula in engineering and science. Many students pursue advanced degrees that form the backbone of R&D in Israel's life science companies. In 2016, approximately 8,020 students received academic degrees in life sciences related fields. Of those, 51% earned Bachelor's degrees, 27% MSc. degrees and 22% MDs and PhDs. Despite this highly educated group, the Israeli industry suffers from a lack of large corporations that typically nurture management talent and serve as a conduit for personal and professional growth of industry leaders.

Areas of focus of the Israeli life science

The data indicate that the areas of focus of the Israeli life science industry are aligned with the current trends in the global life sciences industry. The most innovative and active therapeutics areas are still cancer, neurodegenerative diseases, fibrotic diseases and anti-inflammatory/immunomodulation. In general, we see biologics (e.g. antibodies, proteins, mRNA and cell therapy) taking the lead over the traditional small molecules.

Immunotherapies have produced remarkable results for many, but not for all, cancer patients. The future fight against cancer lies in developing novel therapeutics that are based on the unique characteristics of tumors and individual patients and that will help a larger number of cancer patients. Companies pursuing this challenge include BioLineRx, Kahr Medical, VBL Therapeutics, Compugen and more. A new trend involves the expansion of immunotherapy beyond checkpoint inhibitors. One example is a novel form of immunotherapy that is based on oncolytic viruses that preferentially infects and kills cancer cells.

Gene therapy

Another burgeoning area is rare genetic diseases and gene therapy, with the first gene therapy approved by the FDA last year (for eye treatment). Innovative Israeli companies in this area include Eloxx Pharmaceuticals (treating rare diseases caused by premature termination codon nonsense mutations), LogicBio Therapeutics (treatment for a rare liver disease using gene editing), Emendo Biotherapeutics (gene editing using synthetic biology), SpliSense (antisense oligonucleotide based treatment for cystic fibrosis through splicing modulation) and Art Biosciences (mRNA based therapy).

Personalized medicine

Personalized medicine tailored to the unique needs, genetic makeup and lifestyle of each patient will continue to be an important trend in healthcare. Among the growing numbers of Israeli companies developing such technologies are NevellusDx (cancer), Day two (metabolic) and Taliaz (neurology).

Artificial intelligent

The computing power of artificial intelligent (AI) will drastically decrease the time scientists spend analyzing data, testing new molecules and predicting the relationships between biological mechanisms and disease symptoms. AI also has the potential to improve the diagnosis and treatment plans of patients. Israeli

companies, such as MDClone, Zebra Medical and Ibex Medical Analytics develop AI-driven decision-support tools that help physicians deliver more efficient, metric-driven, objective and accurate diagnosis.

medical device

In the medical device arena, metabolic and ophthalmic diseases are two prevalent fields due to population aging and the obesity epidemic. Israeli scientists and medical engineers have come up with novel approaches to treat or halt disease progression. Diabetes is a modern epidemic and a deadly disease, the continuum of abnormal biology that ranges from mild insulin resistance to full-blown diabetes. People with metabolic diseases are more likely to be diagnosed with cancer, and tend to have risks factors for heart diseases or stroke. In addition, an extensive and advanced ophthalmic R&D community has emerged in Israel, leading to the establishment of several new and exciting companies in the fields of advanced diagnostics, corneal and retinal implants, surgical helmets, artificial vision and more, including companies such as OrCam Technologies, Nano Retina, EyeYon Medical, Visionix and BeyeOnics.

CHAPTER 05

COUNTERFEIT PHARMACEUTICALS AND SMUGGLING



Alongside the active pharmaceutical market in Israel, a parallel market operates with great energy, the scope of which would embarrass any economic branch – manufacturing and trade of counterfeit pharmaceuticals, which are medications that are not original, manufactured under non-pharmaceutical conditions. This phenomenon, it must be said, is not only characteristic of Israel, and many countries are trying to combat it with greater or lesser success.

In fact, the worldwide scope of pharmaceutical crime is constantly growing alongside the growth of the pharmaceutical branch. Pharmaceutical criminals are not small fry but are rather international organizations for illegal production, theft and trade in medical products. Over and above counterfeiting medications, the criminals deal in counterfeit packaging and repackaging of medication, in diverting drugs from their original destination (for example, to markets where the profits for vendors are greater), supplying illegal medications to pharmacies and selling medications through illegal methods, including through advertisements in the press and on internet sites.

Currently there are no exact data about the global scope of distribution of counterfeit pharmaceuticals, and estimates range from one percent of all medications sold in developed countries to more than ten percent in developed countries. A more rigorous estimate holds that every fourth medication sold in developed countries may be counterfeit. Another estimate holds that 50-60% of medications in the third world are counterfeit. The leading countries in counterfeiting medications are China, India, Russia and the United Arab Emirates. Three years ago, the U.S. Food and Drug Administration estimated that the scope of annual sales of counterfeit medications worldwide totals 3.5 billion dollars. Another estimate published recently in the U.S. warns that unless concrete steps are taken to cope with the phenomenon, the scope of the phenomenon is likely to rise to 75 billion dollars per year.

Pharmaceutical Crime in Israel

A few years ago, the Institute for Pharmaceutical Health, an international organization, published a report in which Israel was ranked 10th in the world in the number of cases of counterfeit medications located by enforcement agencies. Israel's neighbors

on this uncomplimentary list are countries like Russia, China, Uzbekistan, Ukraine, Brazil and Peru. With the publication of the report, its authors note that the findings included are not necessarily reflective of the actual scope of crime. Other entities estimate that Israel is in 8th place worldwide in the scope of counterfeit medications.

The risks in distributing counterfeit medications are many. They include harm to the patient public, to the point of causing death (according to one estimate between half a million and one million people die each year from consuming counterfeit medications) as well as damage to the production companies whose reputation, scope of sales, and public trust are seriously damaged, leading to significant economic damage and loss of market share.

What is Counterfeited?

Original and generic medications (Viagra, Cialis, Levitra, diet medications), steroids, anti-cancer products, antibiotic products, medications to lower blood pressure and more.

It seems that the lack of appropriate legislation, ridiculous punishments, lack of enforcement, parallel imports, the possibility of purchasing medications on the internet, and a long, unsupervised supply chain make it easy for counterfeiters. Israel also has unique characteristics that make counterfeiting easier such as being a connection point between the East (location of counterfeiting) and the West (target market) and its proximity to the Palestinian Authority.

Pharmaceutical manufacturers in Israel estimate that last year more than a million counterfeit and stolen medications were sold in Israel, in an inclusive scope of approximately 120 million ILS. In contrast, the official entities dealing with the subject, the police and the Ministries of Health and Justice, have no exact data on the scope of the phenomenon. With that, those involved in the situation emphasize that the phenomenon does exist in Israel. According to those in charge of public health, it is not a minor phenomenon at all, and all means possible must be used to combat it.

The mounting pressure from different organizations in the field [the Permanent Forum on International Pharmaceutical Crime (PFIPC), the International Medical Products Anti-Counterfeiting Taskforce (IMPACT) which operates under the auspices of the

World Health Organization (WHO), and Interpol] and the pharmaceutical companies led to the establishment in 2007 of a unit within the Ministry of Health dedicated to fighting pharmaceutical crime. This unit - which reports directly to the Director General of the Ministry - is dedicated to fighting pharmaceutical crime, theft and marketing of stolen medications, and counterfeit preparations, use of medications and chemical components to manufacture dangerous drugs, use of medications not according to authorized indications for the drug, import of anabolic steroids and even trade and marketing in counterfeit veterinary medications.

However, this unit, despite the good intentions, suffers from under-budgeting and under-regulation. The Knesset Information and Research Center, which was requested to prepare a special report on the subject, examined the question of why the scope of the unit for fighting pharmaceutical crime was decreased despite its great importance. According to the report, the Finance Ministry noted that in the framework of the most recent budget law, the Ministry of Health received authorization for 140 inspectors (70 from the 2011 budget year and an additional 70 in the 2012 budget year) and the decision not to allocate the positions required for the unit for pharmaceutical crime was a decision of the Ministry of Health. The Finance Ministry added that for the past three years, the Ministry of Health has not requested any discussion of the topic in the framework of budget discussions.

According to the Knesset report, the request to increase the scope of the activities of the unit for fighting pharmaceutical crime encompasses all those active in the field. Thus, for example, the drug unit of the Customs Authority states that the assistance of the unit is required daily, both in the central unit and at the border crossings. However, because the pharmaceutical unit is very small it cannot provide a response to the needs. Thus, for example the customs unit is required by the U.N. to inspect 23 materials that can be used to produce drugs; however without consultation from the pharmaceutical unit, the customs agents cannot identify the materials as required.

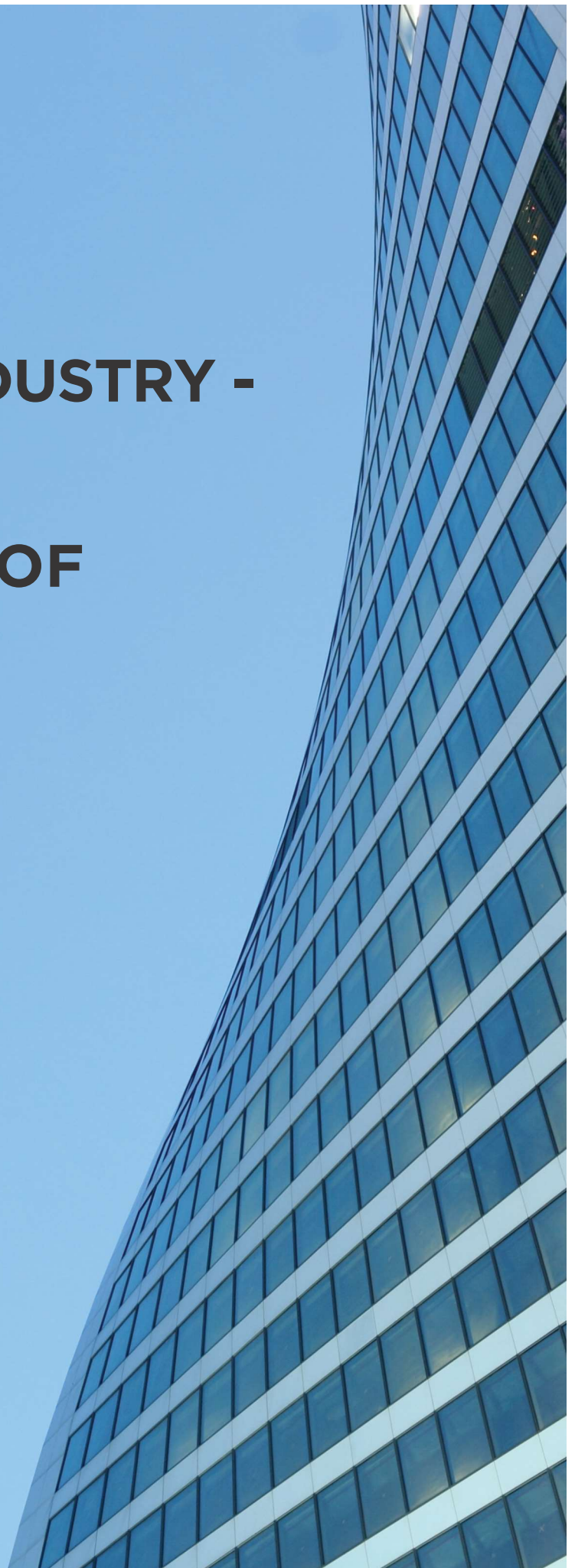
In our conclusions, we will discuss the question of what must be done to address the phenomenon of counterfeit medications and smuggling of counterfeit medications. However, we note here

that without new regulation and budgeting for the unit for fighting pharmaceutical crime in the Ministry of Health, without personnel in customs and police enforcement, and without raising consumer awareness of the dangers involved in consuming counterfeit medications, it will not be possible to effectively fight against these dangerous phenomena. Likewise, legislative changes, increased punishments, increased inspection of the supply chain and adoption of new technologies for follow up, and inspection, supervision, location and identification of counterfeit medications will be required.



CHAPTER 06

**THE ISRAELI
HIGH-TECH INDUSTRY -
FACING THE
CHALLENGES OF
TOMORROW**



In recent years, the Israeli high-tech industry has reached exceptional achievements on a global scale, placing Israel at the forefront of global technology innovation. But this industry is not exempt from problems - challenges, chief among them the need to assure the continuation of the human capital advantage, in light of the grave shortage in skilled personnel (engineers, programmers), the crisis in technology studies and the maturation of the high-tech industry which is causing investors to prefer entrepreneurs who have already proven themselves. Above all, there is a need to find new growth engines

In recent years, the Israeli high-tech industry has reached exceptional achievements on a global scale. High-tech exports, for example, were 45 billion dollars in 2017, approximately 45% of total Israeli exports, while the scope of capital raised and the scope of exits reached new heights. Anyone who examines the Israeli economy over the past three decades understands that Israel has gone from a sleepy economy to a technology tiger by virtue of high-tech. Israel has already surpassed the per capita GDP of superpowers like France and Britain and is approaching those of industrial giants like Germany and Japan.

These achievements constitute the expression of record continuous technological growth that has lasted more than 25 years and whose source is in the unique integration between several different factors: the maturation of products of technological education; civilian applications of defense industry and government support for raising venture capital – that has created a developed infrastructure of private venture capital; a high level of entrepreneurship and innovation; excellent human capital, based among other things on immigration from the FSU, which brought a large pool of talented engineers; and the shift in the emphasis

of the global computer industry from hardware to software – which developed, beginning in the 1990s, a wide opening for the entrance of dozens of Israeli companies which presented a significant comparative advantage in the global technology market.

Indeed since the beginning of its existence (actually, since the beginning of Zionism), Israel has placed emphasis on scientific research and human development, among other reasons as a response to its inferiority in natural resources and as a response to the Arab boycott, but in the past three decades Israel has doubled its efforts. Between 1984 and 2014, for example, Israel registered growth of 378% in the number of students in universities and colleges, growth of 223% in national expenditure on R&D as a percentage of GDP (from 1.3% in 1984 to approximately 4.2% in 2014) and Israel is ranked today in first place among 148 economies in innovative capacity, in second place in entrepreneurship and in third place in global innovation.

In fact, since the 1980s Israel has created one of the most vibrant technology communities outside of Silicon Valley. The groundbreaking products in the Israeli high-tech sector extend over a wide range of fields – internet, ed-tech, cyber, fintech, gaming, mobile technologies and apps, medical devices, sophisticated defense and security products, agro-technology, cleantech, food tech and more. This is all taking place despite global investors' declining enthusiasm for investment in technology companies, troubling security problems (three intifadas and several military operations) and a hostile atmosphere towards Israel, especially in Europe.

Israel's strengths in the field of innovation and specifically the value of its human capital have brought a stream of technology companies here from around the world. Currently more than 300 leading international companies, such as Facebook, Microsoft, IBM, Intel, Google, Apple, Cisco, Motorola, Philips, Applied Materials, Siemens, HP and EMC, have chosen Israel as a destination for establishing R&D centers and have acquired dozens of Israeli startup companies (see below). These companies provide direct and indirect employment to approximately 300,000 workers.

The Unique Israeli Ecosystem: Connection between Military-Industry-Academia

One of the reasons for Israel's technological success in the global arena is the accelerated growth and development in recent years of a unique technological

ecosystem. This ecosystem rests on four pillars: military-defense development, which radiates and spills over into the civilian sector; the close links between industry and academia; the arrival of multinational companies in Israel and the integration of all these elements. The technology sector in Israel owes a great deal to the defense/security establishment. Each year the elite intelligence and computer units of the IDF, and especially Unit 8200, release thousands of alumni with exceptional talents into civilian life who integrate into the Israeli cyber industry. This industry has merited 20% of total new investments.

The Israeli situation, which is so complicated from an existential security perspective, is responsible for the continuum that exists between the educational system and the military. The military selects the most suitable people from within the Israeli educational system at early stages, invests a fortune in training them, and immediately places them at the technological forefront. No entity knows how to quantify this investment in human capital, which afterwards serves as a reserve for high-tech (see the entry on the quantity of startups for which former 8200 members are responsible), but there is no doubt that it must be taken into account.

The spread of human capital, ideas and budgets from the military to the civilian market is one of the prominent force multipliers of the special technological ecosystem that has been created here. Anyone who visits the new high-tech park in Beer Sheba – which can successfully compete with any advanced technology park in the world – can see for themselves how strong the foundations of the Israeli ecosystem are and how they serve as a force of attraction for multinational companies.

The connection between Deutsche Telekom, for example, and Ben Gurion University, and between the company and the military – that is relocating the teleprocessing and intelligence units here – has created an exceptional core of technology cooperation (for example, in the cyber field). When all this happens in a relatively small market, these multipliers have excess power.

The security establishment and the intelligence establishment need experts in analyzing, understanding and basing decisions on a huge flow of constantly changing complex, multi-dimensional data. Therefore, Israel developed capacities to deal with data in three categories that are growing globally: Business

Intelligence (BI), Artificial Intelligence (AI), and Big Data. These abilities and talents have permeated from the military sector into the civilian sector. In the wake of this, new companies and entire sectors have started, such as cyber, which are receiving a huge shot of energy.

In this context, it is also worth mentioning that at the beginning of the 1990s, the state of Israel created two programs that gave a boost to the Israeli high-tech industry, which had mainly focused up to that time on defense industries. The Yozma (Initiative) Program led to the establishment of ten venture capital funds and an increase in investments from overseas. The better-known Incubator Program led to the establishment of technology incubators that accepted 80-100 startups each year and provided entrepreneurs with financing and widespread assistance. The two programs created the venture capital industry in Israel, which later turned Israel into the “Startup Nation.”

Until the beginning of the 1990s, most of the necessary components of the ecosystem were operating in Israel, among them institutions of higher education and research centers, service providers including patent and accounting offices, global companies and more. The venture capital industry was the missing piece of the puzzle and with its completion, the path to success in promoting entrepreneurship and innovation became faster and simpler.

In recent years, an additional component has integrated into the Israeli ecosystem in the form of accelerator programs. These accelerators assist in increasing the rate of progress of startups in the early stages with the goal of assisting companies in getting through one of the most complex hurdles – obtaining initial funding. The accelerators are characterized by short activity cycles and are distinguished from one another in kind and scope of the services offered, but together they are a growth engine for additional startups.

Characteristics of High-Tech Companies

In recent years, the technology industry in Israel has been the growth engine of the Israeli economy. It has the greatest contribution to exports from the state of Israel (approximately 50% of all exports, with a leap of 3,700% since 1984), it has the highest level of access to capital markets in the world and it is in fact the only sector of the economy that has succeeded in raising foreign equity capital at the highest rates,

in contrast to the government, the banks and the electric company that have raised debt financing only.

The success of the Israeli high-tech industry, that reached its height in 2015, attracted, on the one hand, more money into the Israeli market, with global and local investors who seek part of the enticing yields of investment in high-tech, especially in light of low worldwide interest rates. On the other hand, more and more entrepreneurs are establishing new enterprises, like mushrooms springing up after rain. Currently 6,650 high-tech companies are operating in Israel (as of 2017), among them 4,750 are startup companies at various stages of development. Approximately 77% of all the companies have raised capital at least once from an external source such as government funding, angels and venture capital funds.

The division of high-tech companies into sub-categories reveals that approximately 25% are in the field of internet, 20% in communications, 19% in the IT and enterprise software field, 17% in life sciences, 9% in cleantech, 2% in semiconductors and 2% in other fields.

The scope of direct employees in the high-tech field is estimated at approximately 300,000 people, but it is worth remembering that the scope of indirect employees is higher. In fact, for every position in high-tech, there are four additional positions in service fields.

Israel also has one of the most developed infrastructures in the world in all parameters required for a flourishing technology industry. The quantity of engineers and scientists in the population is among the highest in the world, as is the number of new enterprises relative to the population, which is the highest in the world. We also note that in Israel approximately 90% of the inventors are local, similar to India, China, Japan and Korea, such that most technological innovation in Israel originates with Israeli inventors.

Israel Puts Itself on the World Car Map

2017 will enter the history of Israeli high-tech as the year that Israel became a significant player in the car industry alongside places like Germany and Detroit. The change trend began a few years ago, with the opening of the American GM development center and visits from a delegation of representatives the leading global car manufacturers, who streamed into Israel unceasingly. Among the prominent events of 2017 were the acquisition of Argus Automotive

Cyber Security by the German Continental firm for approximately 450 million dollars. The acquisition of Mobileye by Intel for 15 billion dollars is also part of this trend and is likely to turn Jerusalem-based Mobileye into a core technology in all autonomous cars. In addition to these events, there was a series of significant investments in companies developing technology in the field. The growth of the auto technology industry in Israel is based on utilization of the comparative advantages of Israeli high-tech, among them technology in the field of machine vision, which comes from the defense industry. It may be assumed that Israel is at the height of a wave that will continue in upcoming years and influence local industry.

Industry Maturation

According to the Dun and Bradstreet research company, there is a clear trend of annual growth in the number of large companies – those employing over 100 – that increased in the past year. Currently, 385 large firms operate in Israel – approximately 6% more than their numbers in 2015. Since 2010 their number has grown by 4% annually.

Moreover, today there is more money in the market, but it is invested in fewer companies, as noted by the IVC research data. The difficulty in raising funds is felt mainly in the initial stages; the sums raised by those who do succeed are larger than in the past and are set according to unprecedented valuations; the intervals between rounds of capital raising are decreasing; exits are fewer and Israeli companies are growing; and most of the money is found in companies at advanced stages. The result is that in order to succeed in raising large sums of money in the early stages, companies need to respond to more rigid criteria than in the past. With the maturation of the high-tech industry, conservatism is rising. In other words, rather than enterprise establishment and investment broadening to larger segments in Israeli society, the number of enterprises that succeed in raising investment in the early stages is actually shrinking.

The data from IVC reveal that this is a gradual change: in 2014 estimated valuations in early stages began to rise, and with them the sums raised. The number of deals declined from 708 in 2015 to 659 in 2016, with a continued increase in the total sums raised – which indicates growth in the scope of the deals. Also in 2016, the increase in sums raised in early rounds

became more moderate, and the numbers of round B decreased by 30% relative to 2015.

The lack of ability of companies who relatively easily raised funds in seed and A rounds in 2015, to raise funds in further rounds in 2016 was expressed in a decrease in the number of deals in early rounds in 2017: 140 funding deals for companies at the seed stage, in contrast to 196 in 2015.

Recently, large strategic investors have also entered Israel. In 2017, the Japanese SoftBank raised a fund of 100 billion dollars and began investing large sums in companies around the world and also in Israel: SoftBank led with an investment of 120 million dollars in Lemonade and also invested 100 million dollars in the Israeli Cybereason company. This pushed many funds that had focused on more advanced stages to also get into seed investments.

Exits and Raising Capital (1): Intellectual Property as a Comparative Advantage

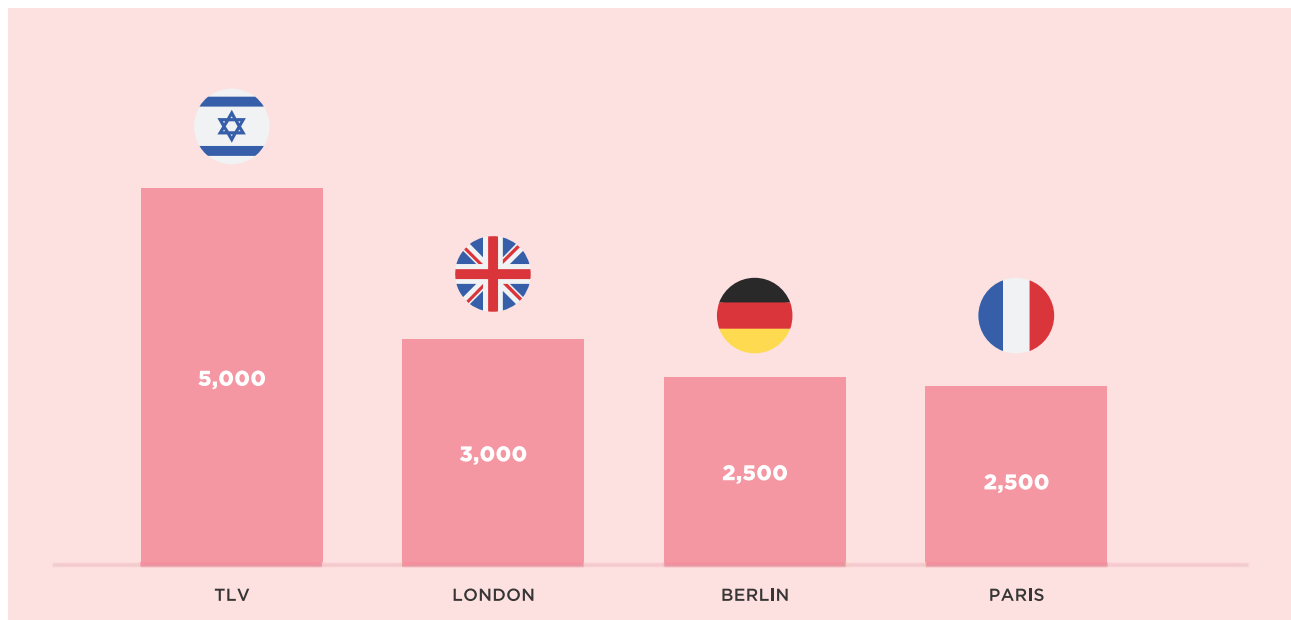
In-depth reflection on the Israeli high-tech industry makes it possible to better understand the intellectual property situation in Israel because of the clear linkage

and inseparable connection between the technology industry and intellectual property. In large measure, intellectual property – in its broadest meaning – reflects the essence of technological development, and frequently even predicts it, and this is because of the simple fact that entrepreneurs and developers register patents on their developments before they enter the market.

The matter is illustrated even more in Israeli startups that have been sold to giant overseas corporations. The scope of acquisitions by giant global firms in recent years exceeds everything known from other economies. Thus, for example, Intel acquired 14 companies in a scope of 17.4 billion dollars, Cisco acquired no fewer than 13 Israeli companies in recent years, with a total worth of 7.1 billion dollars, HP acquired 6 companies in a total scope of 5.5 billion dollars, Marvel acquired 4 companies in a scope of 3.5 billion dollars, IBM acquired 14 companies in a scope of 1.6 billion dollars, Covidien acquired for companies in a scope of 1.6 billion dollars, Microsoft acquired no fewer than 22 Israeli startup companies in a total scope of 1.5 billion dollars, Broadcom acquired 12 companies in a scope of 1.2 billion dollars while Google acquired 10 companies in a scope of 1.2 billion dollars.

GRAPH 01

NUMBER OF STARTUPS



Source: Microsoft Ventures

GRAPH 02

AMOUNTS RAISED BY ISRAELI VENTURE CAPITAL FUNDS

	Number of Funds Raising Capital in Billions of Dollars	Scope of Capital Raised
2007	11	1.08
2008	10	1.08
2009	2	0.23
2010	2	0.03
2011	15	0.87
2012	17	0.85
2013	9	0.51
2014	21	1.40
2015	19	1.50
2016	23	1.55
2017	15	0.8

Source: IVC Research Center

Let us emphasize that these giant corporations acquired Israeli startups for the value of the innovative technologies they had developed that constitute intangible intellectual assets, that is, intellectual property. These acquisitions did not include cash flow, accumulated customers, or scope of sales that justified the high values that were paid for these companies. It was primarily the technological innovation, which is, as stated, of great worth, that justified this. There is also no doubt that intellectual property will continue to be the focus of the attractiveness of Israeli companies for multi-national corporations.

In other words: intellectual property reflects technological innovation, just as this is expressed in intangible intellectual assets, and constitutes the core of value in processes of sales and acquisition of technology companies.

This can also be seen through the prism of venture capital. From 2007-2017, venture capital investment in Israel was 21.8 billion dollars, with consistent and persistent growth over the years.

Israeli technology companies raised a record amount of capital investment in 2017, a total of 5.24 billion dollars - a record since 2013 - and this was in 620

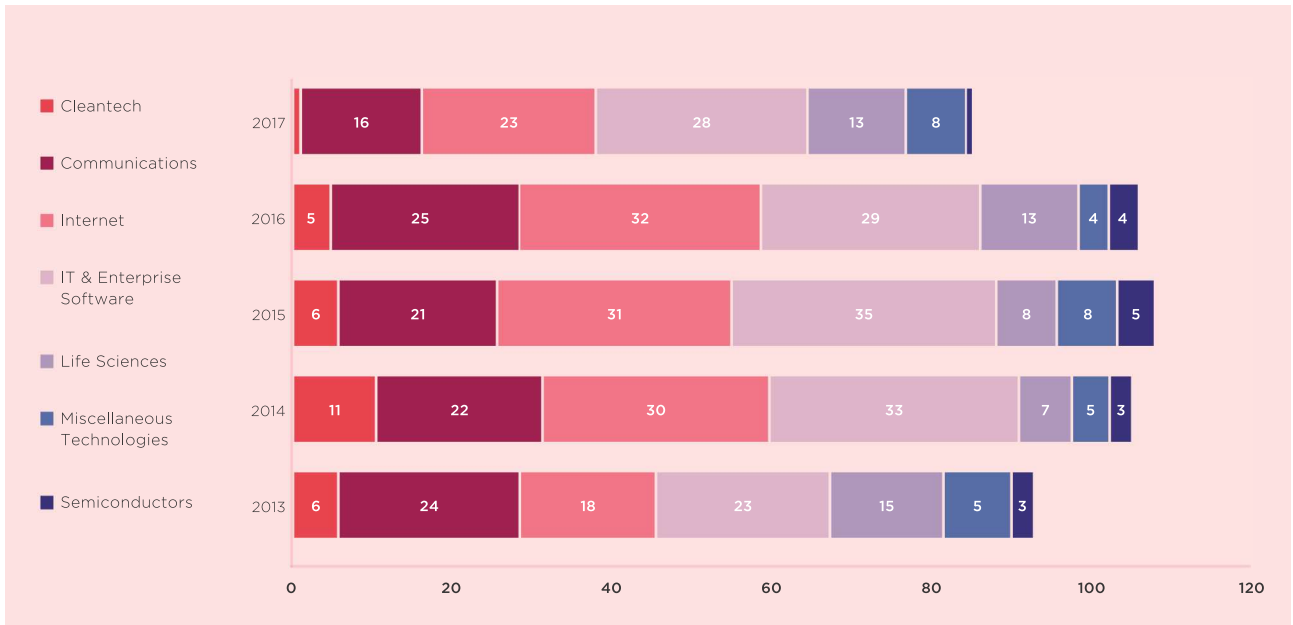
deals. This is an increase of 9% over 2016, in which 4.83 billion dollars was raised in 673 deals. However, it is worth paying attention to the fact that over the years, the portion of Israeli funds in the total investments has been decreasing, which increases the dependence on foreign investment, mainly from the United States.

Another dimension of the growth of the high-tech sector is expressed in the scope of new startup companies that open each year. These companies are significant producers of technological innovation and intellectual property even if they do not succeed in engineering an exit. And indeed, from the IVC data, it appears that in the years 2013-2017, 4,826 startups were established in Israel (the 2017 data relates only to the first half of the year). This is an exceptional level and it well demonstrates the power of local innovation. It is true that quite a number of startups close and some of them do not succeed on returning investment, but the scope of innovation that they create - which is also expressed in the scope of intellectual property - is completely out of proportion to the scope of the population.

We can see that in 2017 423 startup companies were opened, a decrease from 2016 in which 951

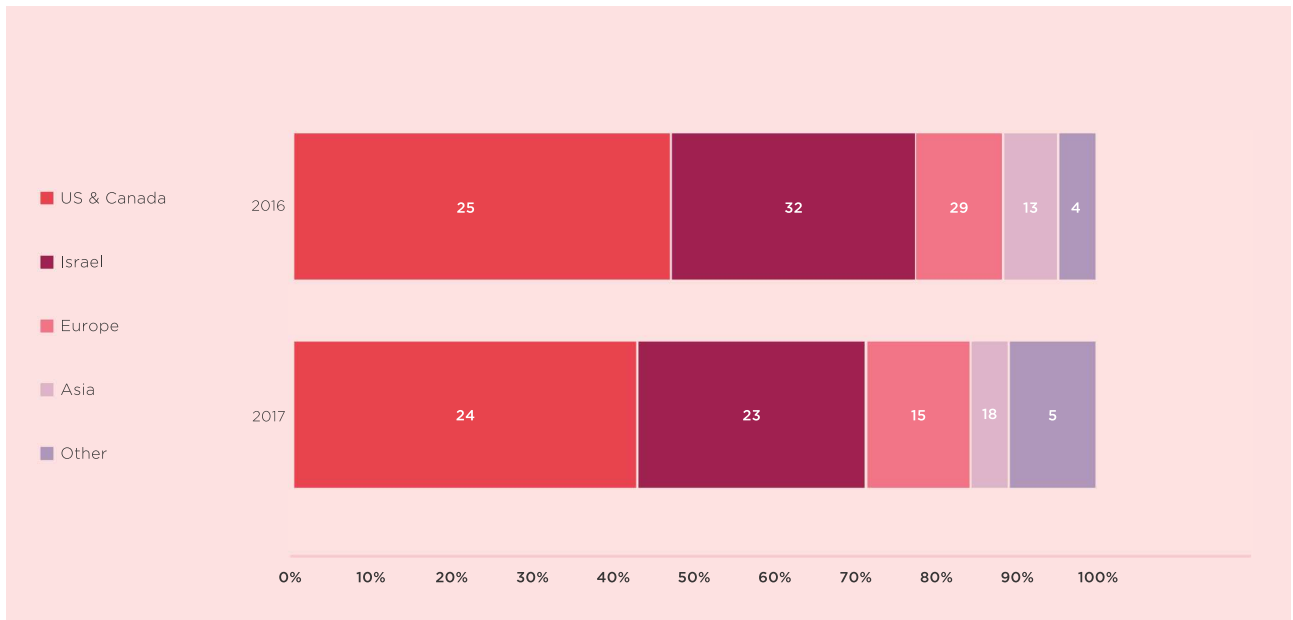
GRAPH 03

ISRAELI HIGH-TECH M&AS BY SECTOR 2017



GRAPH 04

ISRAELI HIGH-TECH M&AS BY COUNTRY OF ORIGIN



new companies were established, but in 2017 fewer companies closed: 181 versus 441 in 2016.

The field of venture capital in Israel behaves like an upside-down pyramid. At the tip of the vertex are the angel investors at the pre-seed stages and at the wide base of the pyramid are the foreign funds, which usually invest in the second and third rounds in companies that are already showing growth. In the middle are entities like incubators, crowdfunding and micro funds that invest in seed stages and Israeli funds and foreign funds in partnership with Israeli funds that invest in the first round of funding.

Regarding exits, in 2017 the amount of exits doubled and nearly tripled compared to 2016 and reached 22.6 billion (an all-time record amount, including the huge deal for the sale of Mobileye to Intel).

The average return on investment in the case of exits by year stands at 4.2 for the first half of 2017, compared to 9.3 for all of 2016, 4.2 for all of 2015, 5.4 for 2014, and 4.3 for 2013.

The High-Tech Sector: Impressive Achievements and Structural Challenges

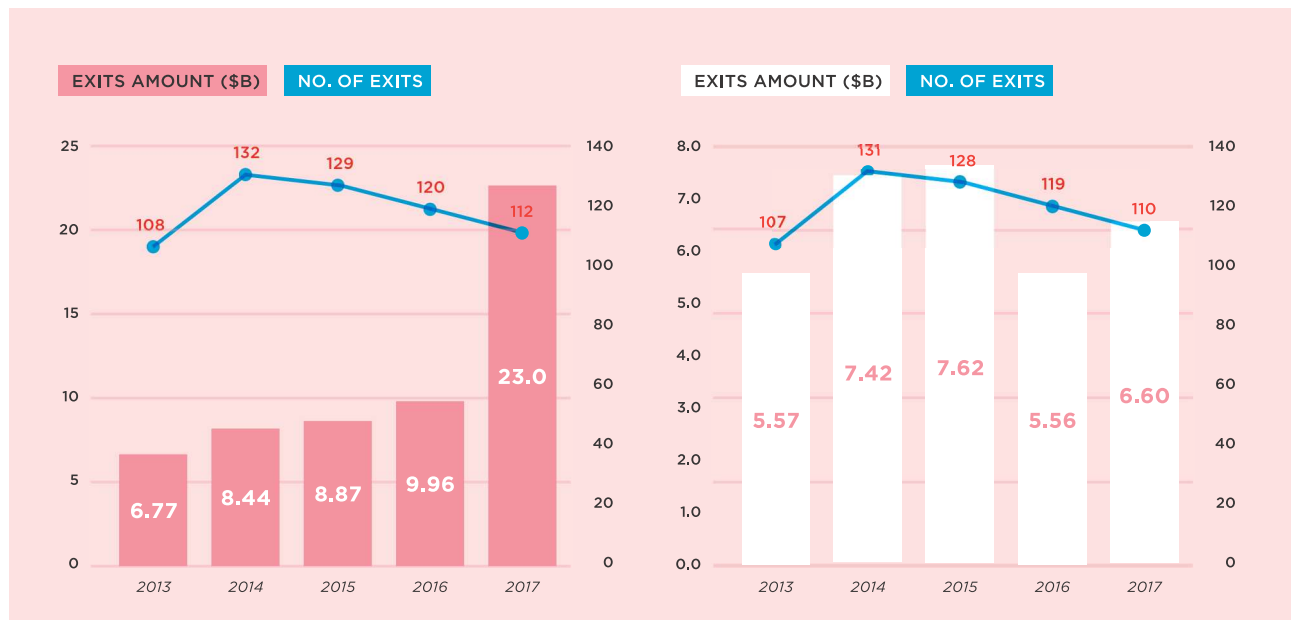
As stated, the Israeli technology industry has attained exceptional achievements over the past

three decades. A long term analysis of trends shows that an unprecedented number of start-ups are operating in Israel, alongside development centers of multinational companies, which alongside excellent academic institutions and a security establishment with a clear technological orientation have created an ecosystem that is unique in the world.

According to data from the IMD Research Institute – which studies market conditions of countries around the world – Israel leads in all essential and important parameters for building and establishing a technology industry that develops innovation: technological and scientific infrastructure; a sophisticated capital market; flexibility; approach to globalization; developed venture capital; a skilled work force; a courageous business sector; and broad scientific research. According to the same study, Israel is ranked in first place in innovative capacity, in second place in entrepreneurship, and in third place in global innovation. Above all, the state of Israel is blessed with entrepreneurial spirit, human capital and exceptional innovative talent. No one can take from us the advantages of the Israeli engineer: complex, systematic vision; effective teamwork without class importance; and ambition to achieve the impossible.

GRAPH 05

EXITS 2013-2017



Source: IVC-Meitar exits report, 2017

Despite all this, we cannot ignore the fact that the challenges of the high-tech industry are growing rapidly and require wiser, more effective intervention by the government in order to preserve Israel's comparative advantage. These challenges include:

- A hyper-competitive global environment
- A sophisticated industry that is changing at the fastest pace
- The diversity of technological fields, in which each field has unique characteristics and needs
- Complete dependence on external and diverse target markets and the need for increased international activity
- Funding sources that are mainly foreign and are exposed to the volatility of world markets
- Lack of mature companies that can be an employment anchor in Israel
- A serious shortage of engineers and professional personnel for the high-tech industry
- Difficulties in technology education to create a reserve of labor for a knowledge-intensive industry
- The concentration of Israeli high-tech in a narrow geographic sector between Herzliya and Tel Aviv and minor presence in the rest of the country and especially in the periphery.

In addition to maintaining a strong and leading high-tech industry, the government must work to advance technological innovation in other industries and sectors in order to increase the competitiveness of the Israeli economy.

Recently, a number of figures have popped up in the media that have raised a red flag regarding the future of Israeli high-tech. The chief economist of the treasury, Yoel Naveh, published a survey according to which the status of Israel as a leader in global technological innovation has been damaged. The survey determined that high-tech no longer serves as a growth engine of the economy as it has in recent years. The Prime Minister, it was reported, is considering importing software engineers into Israel due to the shortage of high-tech workers. The Finance Minister stated at a press conference that he is considering giving relief to high-tech companies that are requesting mergers in order to solve the problem of the shortage in skilled personnel. At the same time, the Minister of Taxes sought to examine the possibility of relaxing the requirements of the law for encouraging investment in order to enable more high-tech companies to benefit from

it. Finally, a new report from the Samuel Neaman Institute for National Policy revealed that for the first time, South Korea surpassed Israel in national spending on research and development as a percentage of GDP, and this was prior to the new report published by the OECD.

Despite this, analysis of long-term trends shows that there are an unprecedented number of startup companies operating in Israel, alongside development centers of multinational companies. The amount of foreign investment and the number of new startup companies show a fixed increase every year. The exits are a source of income that returns to the country, while entrepreneurs who made successful exits serve as private investors and consult with startup companies, thus encouraging innovation. Israeli companies are maturing and are creating more value and business activity and therefore need funding rounds that reflect high valuations.

The Crisis in Technology Education

In the opinion of this report's authors, one of the central challenges to Israeli high-tech is inherent in the current crisis in technology education. There are disturbing signs of a budding crisis already happening, among them the consistent decline in the number of students completing five matriculation units in mathematics (prior to the launch of the new Education Ministry program), for these are the main potential target population for academic studies in science and engineering fields and the criterion for measuring high schools according to the percentage of success in matriculation and not according to the quality of the matriculation certificate and its ability to assure acceptance for academic studies – a fact that does not encourage students to choose advanced science studies. This is in spite of the fact that success in a high number of learning units in mathematics and science is a good predictor of academic success in higher education in engineering or sciences.

The full meaning of the weakening of school science studies is already being felt. In Israel today there is a shortage of 10,000 engineers. The significance is that if in the past Israel relied on its human capital, in a number of years Israel will confront a significant problem, which will cause companies to move their activities to competing countries. This is one crisis that the state of Israel cannot afford.

The solution to the problem is not simple, mainly because it is not in the hands of one entity. There is no magic solution – what is required here is mobilization of holistic, long-term processes with involvement from the government, the private sector and the third sector.

The program to strengthen mathematics studies is a step in the right direction, especially in the adoption of the roundtable model that puts private entrepreneurs, relevant government ministries, academics and education NGOs side by side. However, mathematics is not enough, and it is impossible to be satisfied with only high school and matriculation studies. We must think about the entirety of science and technology learning, and initiate a program for the educational continuum beginning with elementary school and continuing through middle and high school, military service and academic studies, one that does not stop even after placement in technology companies.

If we return to the data, we discover that in 2014 only approximately half of the graduating cohort completed full matriculation eligibility. Out of those eligible for a matriculation certificate in this cohort, the percentage who took advanced mathematics exams was on a downward trend. Among those eligible for matriculation, those who took advanced mathematics exams and advanced science and technology (STEM) exams in addition (in physics, chemistry, biology, computer science and electronics) was on a downward trend. Those high school students who are eligible for matriculation certificates at an advanced level of mathematics and especially those who take the test for five matriculation units in mathematics and in an additional advanced STEM subject, these are the potential future college students in science and technology subjects. In addition, there was also a decline in numbers of bachelor's degree graduates in most science and technology subjects.

Therefore, the central solution is to be found in increasing the percentage of high level matriculation graduates in mathematics and sciences, through a conceptual, multi-level STEM education continuum, beginning with pre-school through the end of high school, professional school, and technology training tracks in the military. To this must be added an important stage of providing bonuses and incentives for academic study in the sciences. This can be done through granting scholarships to students who complete advanced matriculation in mathematics, English and sciences, or providing a free year of study at colleges and universities in science and engineering subjects, or through individual grants.

Increasing the Number of Workers in Knowledge-Intensive Sectors

The government recently made a decision to allocate the sum of 900 million shekels to increase the number of workers in knowledge-intensive sectors. In this context, Prime Minister Benjamin Netanyahu emphasized

correctly that the program is intended to preserve Israel's comparative technological advantage through "incentives to the high-tech sector and increasing the number of engineers and scientists and significantly increasing the number of graduates of relevant departments in universities." Netanyahu also mentioned that "the central problem that we have in the high-tech sector is responding to the demand, and for this purpose we need personnel selection at the highest level."

However, this program is not enough. In order to meet this acute challenge the government must have a broader, long-term vision, while dealing with the fundamental factors that have brought us to the current situation, chief among them, as stated, the weakness in STEM education. There is no place for patchwork tactics. Rather, what is required is a comprehensive, coherent long-term strategy.

Alongside this there is a need for a comprehensive change in the public consciousness regarding professional education. Currently professional technological education is considered inferior. One of the reasons for this is the sense that it establishes ethnic discrimination by "tracking", that is, steering children from the geographic and urban periphery into vocational tracks in contrast to steering children from the center into theoretical tracks. However, the content world of STEM professions has innovated and advanced so as to be unrecognizable: students in technological and vocational education can today study a variety of exciting and advanced subjects beginning with robotics, software and electricity and ending with automobiles, construction and architecture. All these require technological-scientific teaching personnel, of which there is also a shortage. Therefore, a courageous government program is also needed to address this aspect, while providing incentives for integration of teaching by graduates of science and engineering programs (such as high-tech workers and retirees) after they receive professional development training in teaching, doubling the salary for all excellent teachers in mathematics, sciences and technology through personal contracts and administrative flexibility for school principals in choosing teachers to teach sciences.

An additional strategic solution can be found in the integration of populations that currently do not participate in the high-tech branches – residents of the periphery, ultra-Orthodox, minorities, and a portion of the population of women. All these are not sufficiently involved in sciences, engineering and R&D.

This situation creates a rare opportunity for changing the labor market in Israel and reducing social gaps.

The shortage of technological personnel is an acute and ominous challenge, but one that is solvable. Just as we have known how to get out of distress and cope with challenges in the past, so in this situation we must pull ourselves together and face this challenge, which threatens the definition of Israel as the “Start-Up Nation”, while taking advantage of the challenge as leverage for achieving national socio-economic objectives.

Additional Improvement in the Business Climate

An additional aspect that should raise a red flag is connected with the fact that Israel is currently operating in an extremely competitive environment – China and India are breathing down our necks and every self-respecting country in the world is investing significant sums in R&D. In parallel, the Trump administration announced a massive reduction in the level of taxes on corporations, something that is liable to attract many Israeli high-tech companies, whose efforts are already directed to that market, to the United States.

The government must continue to foster a sympathetic environment for innovation and entrepreneurship. In this context, it is also important to remove bureaucratic and regulatory barriers, to create laws that encourage investment from at home and abroad, and to implement long-term programs that will decrease uncertainty and attract international bodies to open and increase activities in Israel.

A significant part of meeting these challenges depends on the new Innovation Authority that will replace the Chief Scientist’s office. The Authority has the ability to quickly mobilize solutions and tools for supporting the competitive capacity of Israeli high-tech with as few bureaucratic restrictions as possible.

In parallel, we must work to establish a more favorable tax environment and to restore incentive programs that were used in the past to encourage institutional investors to invest in this important and profitable channel. We must remember that venture capital funds are the main funders of young technology companies and over the past 20 years have been the main growth engine of the Israeli technology industry. In this context, the topic of investment in R&D is critical

and particularly conspicuous (in a negative sense) is the government’s contribution, which has been in a continual decline over the years and now stands at 20%. This is offset, luckily, by an increase in investment from the business sector and multinational companies, but currently, less than 5% of government investment in R&D is invested in the business sector, which puts Israel in a comparatively low position relative to western countries.

Growth in Mature Companies

Over the past half-century, hundreds and thousands of high-tech companies have been established in Israel, but only about 50 have broken through the limits of imagination and attained market valuations over a billion dollars. Among them at least 14 companies reached this valuation in the past two years. Without entering into the discussion that has been going on in recent years about whether one should encourage the sale of startup companies at the technology stage, or try to grow them into significant leading companies in their field, in the opinion of this report’s authors, both alternatives are necessary for the continued growth of the industry, in which companies that are acquired in relatively early stages continue to constitute a source of attraction for acquisition by international companies. But the big challenge to the industry in the next 25 years is to develop 50 local companies with sales of approximately one billion dollars a year. Currently the number of companies fitting this criterion is not more than ten.

Encouraging Institutional Investment in High-Tech

An additional concerning aspect is the topic of financing. More than 90% of the venture capital investment in Israel comes from foreign investors. We are witnessing a situation where the primary beneficiaries of the Israeli high-tech and life sciences industries are American pension funds and not the Israeli public. We definitely see a place for increased participation of institutional investors in direct investment and through Israeli funds, as happens in the United States and other developed countries.

This is an anomalous situation: on the one hand, institutional entities are sitting on mountains of shekels in a desperate search for yield-bearing investment channels, and on the other hand, they avoid investing in the flagship of the Israeli economy, in their own harbor, which is a destination for investments from foreign institutional entities (that is, 90% of the investors in in

venture capital funds are foreign). That is to say, what is good for foreign nations is not good for us Israelis.

Moreover, in contrast to the situation in the United States, in which most of the money invested in high-tech comes from pension funds, insurance companies and other institutional investors, Israeli pension funds have hardly been involved in the successes of companies such as Chromatis, Mellanox, Waze, NDS and others that registered phenomenal yields from initial investments through sale or stock issue. Indeed an anomaly.

It is important in parallel to re-educate the market and those who are saving. The market tends to measure the success of institutional entities in the short term, while pension and provident funds serve as long term investments. As a result of that, the yields on these funds need to be measured over time and create profits in the long term, similar to the yield profile of the high-tech companies. In fact, this is the advantage

Economic damage from cyber-attacks around the world is estimated in billions of dollars a year and provides a business opportunity for Israeli companies with expertise in the cyber field who are developing defensive programs at the defense and civilian level

of institutional entities over regular venture capital investors – their long-term outlook. This also has importance from a national perspective – they can aid the growth of high-tech companies over time, in contrast to investors who are interested in actualizing their investment through the sale of the company and getting out, with whom it is hard to build a company for the long term.

However over and above the change in institutional behavior, the government has an important role to play in changing the rules of the game in the capital market. In the past, the Treasury adopted an initiative to launch the “Comparative Advantage” program which was meant to provide a safety net for institutional investment in high-tech. This was an excellent program but limited in time and budget that ended with a weak response. A safety net for institutions should

be restored, at least on a portion of their investment, as was the policy of the Treasury a few years ago. In fact, the country has the obligation to work with determination and perseverance and to enact a number of policy measures in order to encourage institutional investors to invest in Israeli high-tech.

Shifting of only 1% of the funds of institutional entities, valued at approximately 1,200 billion shekels, into investment in Israel high-tech, would enable the technology sector to take off again. It is clear that this investment is not without risk, but it is certainly more intelligent than investment in Eastern European real estate.

By the year 2020, the sum of managed pension assets is expected to double and reach approximately 2.2 trillion shekels. It is a matter of national economic importance of the first order that at least a small portion of these giant sums be directed to investment in Israeli high-tech.

A New National Alignment

The importance of Israeli high-tech to the national economy cannot be overstated. This sector is not measured solely by the scope of its direct or indirect employees, but also and mainly by its contribution to export, to foreign currency income, to Israel’s leadership in global markets, to the flow of investors and investment into the country, and to the foundation of Israel’s status and positioning as a technology superpower (the “Start-Up Nation”).

The data coming from the field are mixed – on the one hand, Israel continues to present strong numbers, for example in everything connected with exits and raising capital, but on the other hand, there is a certain weakness in the high-tech sector, which is seeking new growth engines.

Responsible government policies need to provide a solution for this challenge. From a national perspective, this is currently the role of the government – to support, to push and to invest in the same successful industry which is currently at the beginning of a crisis. If So, What is Required of the Government?

In order for the high-tech industry to continue to lead the Israeli economy, to ensure Israel’s comparative advantage in the global markets and to fully utilize its intellectual assets whose source is its human capital – which is crucial in the era of the information economy

- the government must outline a comprehensive national program to develop the technology sector, based on some central anchors:

- Cultivating human capital throughout the production chain – the secondary and higher education systems, the connection between higher education and industry and the connection of these to the military technology development establishment.
- Establishing the regulatory and tax basis for additional platforms for raising capital for entrepreneurs to take the place of crowdfunding on the internet and other platforms.
- Providing an additional safety net through tax relief and benefits to investors, while directing institutional investment into high-tech.
- Providing incentives to multinational companies to establish additional R&D centers in Israel.
- Continued diversification of export efforts beyond the American market to new markets.
- Assistance to entrepreneurs, startup companies and research institutes.
- Encouragement for developing generic technology and transferring knowledge from academia to industry.
- Increasing government allocations for research and development.
- Encouragement for traditional industry to adopt new technologies that will provide added value in international markets.

As stated, everything is not rosy in the Start-Up Nation. The Global Competitiveness Report indicates that the factors that are placing the growth of the economy at risk are government bureaucracy and high taxes. This is especially true in the high-tech sector, which is very sensitive to the work environment and to the local taxation level. Companies can very easily relocate themselves and their intellectual property to a more attractive location. Again we repeat that in light of Trump's significant tax reforms in the United States, it will be necessary for the government to reexamine the tax regime in Israel and improve the business environment in order to ensure the continued attractiveness of Israel for foreign companies.

The challenge before us now is to ensure Israel's technological superiority in the global arena for the future. This requires the creation of an enabling,

encouraging and supportive economic environment for technology entrepreneurship along the entire production chain. This requires increasing allocations for research and development, both on the part of the government and the private sector. This requires cultivating human capital beginning at the elementary school level and preserving it over time. This requires a system of incentives, taxes and benefits for high-tech projects. This requires continued subsidies for basic research within academic institutions. This requires cultivating the special ecosystem that has grown here integrating the military, industry, academia and research. The goal is to ensure that constant movement between the military-defense establishment and the business-civilian sector, which in the context of the relatively small market has created huge advantages for Israel.

In conclusion, it seems that the situation that has led to the growth and prosperity of the Israeli high-tech industry is changing and in order not to wind up in dangerous ossification, new blood must be pumped into the system. As stated, some of the foundations on which the technology sector is based are still solid – excellent entrepreneurial ability, excellent academic institutions, relatively high national investment in R&D, highly developed sense of invention and ability to adapt to changing conditions in a dynamic global market saturated with competition. However some of the conditions that facilitated the prosperity of the industry are disappearing, especially against the backdrop of accelerated competition from Asian countries, and a dangerous void is beginning to emerge. This is the crucial moment for the country – it must preserve the exceptional achievements of the Israeli technology industry and lead it to the next level.

Israel therefore requires a long-term technology vision, with the government playing a central role. This vision must make Israel's scientific-technological development a top priority and needs to be based on strong budget foundations and a lenient regulatory regime, with high level inter-agency coordination.

A market as important as high-tech, that is responsible in no small measure for Israel's economic success in recent decades and constitutes a clear advantage for Israel in global markets, is worthy of serious treatment by policy makers. It is to be hoped that the Prime Minister, and the Minister of Finance, will be able to provide renewed momentum to the high-tech sector in Israel.

THE WORLD'S PROBLEM – ISRAEL'S OPPORTUNITY

According to experts in cyberterrorism, the expected dangers of cyberattacks include the collapse of critical or strategic national or military infrastructure, such as electricity, energy, defense systems, transportation, warning and emergency alarm systems. According to different published reports, more than 500 million cyberattacks take place on a daily basis around the world, many of them directed at giant companies. 60% of Fortune 500 companies deal with information leaks, internet fraud, and theft of data and customer information.

Each day we witness attacks on countries, militaries, banks and financial institutions, which expose the weaknesses of security solutions. The economic damage from cyberattacks is difficult to estimate, but all the experts agree that it is in the range of billions of dollars annually. In the United States, it is estimated that the damage from cyberattacks is 100 times greater than that from physical theft, and in Britain cyberattacks have cost the British economy 48 billion dollars. Regarding Israel, according to the BBC every minute there are 1,000 attempts to attack Israeli targets. For Israel, the cyber threat is not theoretical, but a daily reality.

The state of Israel benefits from groundbreaking capability in the field of cyber defense and the world's problem is an opportunity for Israel. In recent years, approximately 200 companies have been operating in Israel in the cyber field and developing defense programs at military and civilian levels. Many of the tools are already available to us and the state of Israel is perceived as a pioneer in development and application of defense programs against cyberattacks. Collaboration and cooperation between the military, the public sector, the private sector and academia are making us a world laboratory in the field and turning the worldwide threat of cyberattacks into a new economic and social opportunity.

The Vision – Turning Beer Sheba into a National Cyber Center

In the midst of this, Beer Sheba, which has been declared the national cyber capital, is becoming a giant incubator for cyber warfare companies, bringing together leading companies, international interest, workplaces for students and engineers and opportunities for regional growth.

A university that has grown in the past decade from 5,000 to 20,000 students and is a leader in the field of computer science, the establishment of the IDF technological computing campus, a high-tech park and a technology incubator for cyber security, and the fact that the national cyber headquarters is located in the new high-tech park in the city – all these are helping to turn the capital of the Negev into the world "Cyber Valley" which is exporting programs for defense on the virtual battlefield and is assisting many countries to cope with the new terror strongholds.

This is all happening in the new city high-tech park that is spread out over 350 dunams, and will integrate, alongside international and Israeli high-tech companies, the IDF technological computing units. This move will in fact turn Beer Sheba's high-tech park into one of the centers of the country in the coming years.

In the dedication ceremony for the park, the Prime Minister said that, "I have a vision of seeing Beer Sheba as a world high-tech center. Ben Gurion's vision has not yet been fully realized because there was not a business center here, there wasn't an engine that would move the parts. In future, elite units of the IDF will be located here and even though we are talking about great technological strength, the cherry on the top will be the national cyber headquarters that will build its new home here in the high-tech park. Beer Sheba will become the cyber center of the state of Israel and one of the leading cities in the world in the high-tech field."

Alongside strengthening Israel's status as a technology superpower, the city of Beer Sheba and its surroundings will be strengthened. It is estimated that in the coming years between 5,000 and 10,000 new jobs will be added around the high-tech park, with significant growth in small and medium-sized businesses in the city, the establishment of new centers for leisure and culture and relocation of tens of thousands of citizens to the south of the country.

High-tech is an important growth engine that must be brought to many regions of the country and to different populations. Leadership in the cyber field is one of the strategic assets of the state of Israel, and it can be leveraged not only on the security plane, but also on the economic and social planes.

CHAPTER 07

COPYRIGHT PROTECTION



Because of the unbearable ease with which it is possible to copy and/or distribute software, films and music illegally, these industries are most vulnerable to pirating, and from this derives the clear need for their protection

The ability to realize the commercial potential of intellectual property and to enforce copyright protection is one of the central characteristics determining the quality of the intellectual property regime in different countries. The existence of an effective intellectual property regime is vital to the functioning of diverse economic and cultural branches including software, music, film, book publishing, design and related industries. These industries constitute the clearest expression of intellectual property, for all the products are the result of intellectual activity. Because of the unbearable ease with which it is possible to copy and/or distribute software, films and music illegally, these industries are most vulnerable to pirating, and from this derives the clear need for their protection. In addition, an intellectual property regime is measured by its enforcement of the law against counterfeit merchandise and trademarks.

The Legal Framework – The 2007 Copyright Law

About a decade ago, the 2007 Copyright Law went into effect, replacing the Mandatory Order from 1911. The law was intended to create, “the required balance between the need to create fair incentives for creation, by granting economic rights on works, and the need to enable the public to use works to advance culture and knowledge, all this while preserving freedom of expression and freedom of creativity, and ensuring free and fair competition.”

In the ten years that have passed since the new law went into effect, the courts have been required to achieve the same balance between the need to compensate and provide incentives for creators, and the need to enable the public access to works for the purpose of advancing culture and knowledge and providing the possibility for fair competition.

In this chapter, we will survey the weaknesses that have been discovered in the law in light of far-reaching changes in the way consumers today consume

copyright-protected content, in comparison to the early 2000s during which the law was discussed in Knesset committees and passed into law. In addition, we will assess the way the law has been interpreted by the courts in Israel in a series of industries and suggest how in our opinion the law should be corrected in order to maintain the balance upon which it is based.

Protecting Computer Software and Applications

Computer software is a copyright protected work. Copyright provides protection for expression of an original creative idea, that was developed by the copyright holder, usually after great investment of resources and time including planning, specifications and writing the software code. Modern software requires the capability of communication with many other hardware and software applications. Therefore, the work of development becomes more and more complex over the years. Protection through monopoly on the product of the development process is therefore an important incentive for continued investment by software development companies.

Up until a number of years ago, Israel was termed in an uncomplimentary way, “a one-program country,” due to the proliferation of illegal software copies. Today, this phenomenon is in decline; according to one estimate, the rate of pirated software in Israel according to 2015 data stands at 29%, a rate similar to the distribution of pirated software in Western Europe that is estimated at approximately 28%. This rate indicates the continuation of the steady decline in use of pirated software in Israel, a trend that has continued since 2006.

To understand the economic significance of effectively addressing pirated software, we note that according to the BSA organization, the organization responsible for the issue of copyright for software manufacturers, decreasing the distribution of pirated software from 30% in 2013 to 29% in 2015 resulted in excess economic activity in the software industry in Israel worth 16 million dollars.

As will be detailed below, software companies' transition to cloud-based service platforms, alongside providing effective legal tools to combat the problem of pirating, is behind the steady decline in the rate of use of illegal software in Israel.

In the past copyright protection for software focused on the right to “duplicate” that was traditionally considered

as the meaningful economic right given to the copyright holder. This right was mainly protected against physical copying of programs onto CDs and discs, and mainly for computer games and game consoles.

Today, with the transition to cloud services, fewer programs are physically copied, and the main violations are committed on online platforms, when a skilled user enables other users unauthorized access to programs that are copyright protected.

The solution that the Copyright Law provides for these kinds of violations is through a new right to “provide public access.” Usually when an unauthorized entity breaks into a protected program and uploads a link to the program on a site that is accessible to the public or to other users, a number of violations have occurred: (1) copying/downloading a program to the computer for the purpose of breaking in is a violation of duplication rights. (2) Making a link to the breached program is a violation of the right to provide public access. (3) Running and using an unauthorized program requires temporary storage in the working memory of the computer (RAM) and creating a temporary copy is sufficient to constitute a violation of unauthorized duplication.

Another important provision in the aspect of software protection is expanding the circle of violators to include indirect violators. An indirect violator is someone who makes commercial use of an infringing copy of a protected work.

According to the law, possession of an infringing copy for commercial purposes with knowledge that it is an infringing copy is a contributory infringement of copyright. It is important to note that an infringing copy is not necessarily an illegal copy. A program whose license was obtained legally, but which was used in a manner that was not in accordance with the license terms, can be considered an infringing copy and its continued use constitutes infringement. In a legal verdict, it was determined that a company that provided technical support to users of a protected software indirectly violated the copyright.

“It is enough to possess an infringing copy of a program for commercial use to constitute an indirect violation according to article 48 (3) of the 2007 Copyright Law, that forbids ‘possession for commercial purposes’ of an ‘infringing copy,’ knowing that it is infringing.”

In order to prove the existence of an indirect violation the copyright holder must prove the following cumulative conditions:

1. The existence of an infringing copy.
2. Forbidden commercial use of the infringing copy according to the article conditions.
3. Actual or constructive knowledge at the time that act was committed that it was an infringing copy.

The cumulative conditions set by law constitute, in our opinion, a suitable balance between the need to make it possible for copyright holders to be repaid by those who benefit from the violation (even if the violation was not direct), and the need to protect those who come into possession of infringing copies without actual or constructive knowledge (an unwitting infringer).

As will be clarified below, this arrangement is not exhaustive and it requires amendments to the legislation and setting up a mechanism for “notice and take down”.

In order to prevent the existing lack of clarity in court rulings related to indirect violations, we recommend amending the law and adopting the permanent arrangement used in the United States known as the “notice and take down” procedure.

According to the procedure that has been adopted in a number of court decisions in magistrate’s and district courts, the managers of a website are not responsible for civil wrongs committed on a site that they manage, if they were given direct notice of material suspected of infringement and they took it down within a reasonable period of time.

Until the law is amended, we recommend that anyone who establishes or operates a website on which other users can share or upload content establish through their user agreement the rules for implementing a notice and take down procedure on the site. The existence of an organized procedure for the site can prevent claims of infringement or serve to distance the site owners from responsibility in the event that infringing content is inadvertently placed on their site.

The Music and Film Industry

Over the past decade, the music and film industries have also gone through technological changes of vast dimensions that derive from changes in content distribution platforms. The transition from distributing music and films on CDs, DVDs and tapes to consuming

content online and on-demand (VOD), has changed the music and film industry and influenced the economic models of the content companies. Today most of the access to content is not through purchase but rather through licensing. In the past two years, significant players such as Netflix, Apple TV and Apple Music have begun to enter Israel, and for the first time, users from Israel can enjoy vast content at low cost accessible to all. Access to content today is through multi-channel broadcasting available from any location through mobile phones and tablets. Alongside the veteran companies Hot and Yes, new and significant content providers have entered the market such as Cellcom and Partner, who have increased the competition in the market and are expanding the cordless phenomenon – disconnection from cable or satellite disk infrastructure and transition to digital content on online platforms.

However, the change in technology has not escaped the attention of violators and they have also changed and improved their methods. Consumption of infringing content through the internet is practically at the level of a norm in Israel, and recently Israel was even ranked in tenth place in the world in the number of entries by users to sites with infringing content relative to the number of internet users. According to the data, on average each Israeli user enters sites that provide copyright infringing content 176.87 times (MUSO GLOBAL PIRACY REPORT 2016).

Despite the scope of the phenomenon, the law enforcement authorities are practically inactive in this subject and the legal ability to act against violators is quite limited.

Similar to what is done in other countries, the enforcement efforts that are made are directed not only towards direct violators (the person who created the infringing copy), but also towards those who make the infringing copy accessible to the public, that is, the site owners who supply access to infringing content and to internet service providers and various network mediators.

Copyright Bill (Amendment number 5), 2017

As of this writing, a proposed amendment is before the Knesset Economics Committee prior to its second and third reading in the full plenum. It is intended to create a balance between “the difficulties of enforcement experienced by copyright holders in the shadow of new technologies” and “the various rights

and interests of third parties, such as internet users, intermediaries, and the general public.”

The bill includes four central amendments:

1. Expansion of indirect infringement to the virtual world, thus performing an action on a work that was made available to the public without the permission of the copyright holder will be considered an indirect violation of copyright;
2. Regulation of the issuance of injunctions against third parties for the purpose of limiting access to internet sites whose main content is such that it constitutes direct infringement of copyright or that activity on it constitutes indirect infringement of copyright;
3. Establishing a process for exposing the identity of persons who perform actions on internet content;
4. Amending and adapting the criminal section of the copyright law to the technological era.

If the proposed amendments become law, they will resolve the lack of clarity in the court rulings on the matter of applications for injunctions to limit access to internet sites that allow access to infringing content.

In recent years, contradictory decisions have been made, sometimes by the same court, in the matter of the court’s authority to block access to sites that make infringing content accessible when the site owner is not known and the injunction is directed toward the internet service providers.

In an important ruling by (Retired) Senior Judge Gideon Ginat, relief was granted against third parties, internet service providers in Israel, instructing them to block access to the unidown site, a platform for converting music content from YouTube to MP3 files for downloading.

The court held that granting relief against third parties was consistent with similar decisions in England, and that there was nothing preventing an application for injunction against internet service providers even if the matter was not regulated by law.

The Zera organization (Copyright on the Internet) and various production and broadcasting companies tried to leverage this decision and to block the internet site Popcorn Time, which provides a popular service for viewing films and other copyright protected content.

The Tel Aviv District Court (Judge Magen Eltuvia) rejected the request of the copyright holders in an intermediate proceeding for injunctions against internet service providers. The court held that despite the decision in the Parpuri matter, that decision does not bind the court as a precedent. However, the court did implement as a precedent a previous decision of the Supreme Court in which it was ruled that injunctions should not be granted against third parties in cases where the injured party does not have direct cause against that third party.

The copyright holders' request to appeal to the Supreme Court was rejected.

If the proposed amendment to the Copyright Law is accepted, this will support the approach of the Honorable (Retired) Judge G. Ginat. In the explanation of the amendments, it is clarified that "it is proposed to anchor in proposed article 53a a process for receiving an injunction for the purpose of limiting access to an internet site of which the main content is content that was published, broadcast or made available to the public in direct infringement of copyright, or of which the content is the product of indirect infringement."

This amendment will make it possible for copyright holders to obtain relief through an injunction that will prevent access to an infringing site even if no action is taken against the site owner – the direct infringer.

An additional important amendment proposed in the framework of this bill is the establishment of a legal process to demand and receive identifying details of someone who exploits the anonymity of the internet for the purpose of committing acts of infringement.

In our opinion, this is an important amendment that can improve the situation of copyright holders who currently face a hopeless situation. Yet in our opinion an opportunity has been lost to complete the legal regulations with the establishment of an effective mechanism for "notice and take down" that can prevent litigation in many cases and save the costs involved in these processes.

Because of the viral nature of the internet, infringing content on the internet can spread like a "fire in thorns" and in a matter of a few hours or days void the economic rights that the copyright law grants to copyright holders. Thus, for example, mass distribution of a video through social media can prevent the

content owners from enjoying their exclusive rights to determine the scope of making their work available to the public. Currently we are witnessing phenomena in which content that was created for the purpose of promoting a certain site or Facebook page is distributed hundreds and thousands of times by social media users and for all practical purposes the content owner loses the ability to control the distribution of the content and through it to promote his commercial activities. The immediate way in which we consume content is making litigation irrelevant in such cases.

Due to the inability of plaintiffs and defendants to receive relevant, speedy relief in the event of copyright infringement, new models of controlling protected content are being examined in Israel as well as in other countries. These include models that enlist internet service providers in the struggle against piracy through a "notice and take down" regime.

A notice and take down procedure is intended to provide a solution for situations in which unwitting users are liable to serve as a tool for distributing copyright protected content without having the level of knowledge required to implicate them for contributing infringement and without turning the entire community of internet users into copyright infringers against their will. A notice and take down procedure is based on the assumption that internet service providers are not aware of all the content distributed through them and they do not have the ability to prevent infringement of content prior to its distribution. However, from the moment that a content owner approaches the service provider to remove the content due to harm to intellectual property rights and/or other protected rights, the internet provider must remove the information and/or content within a reasonable time period and/or block access to it, and if the provider does not do this, they can be held responsible for secondary infringement of copyright.

A notice and take down procedure was "imported" into Israeli law through a ruling that was influenced by American and European legislation that regulates this field (Electronic Digital Millennium Copyright Act 1998; Commerce Directive 2000). Implementation of the regulation in the matter of application of the procedure in Israel is exceedingly limited and currently there is no positive obligation that regulates the responsibility of site content managers to implement the procedure in Israel (Professor Niva Elkin-Koren and Dr. Sharon Bar-Ziv, Copyright Enforcement on the Internet: The Israeli Arena, July 2015).

An additional supplement that should be regulated by legislation is the creation of mechanisms to prevent abuse of copyright through regulation of exceptions and exemptions to the right such as the “private use exception.” The exception for private use that was established by the European Directive allows a user who has a legal copy of protected content to copy or convert content that was legally acquired to other formats, without this being considered infringement, as long as it is for the person’s own private use. An example would be converting a song from a CD that was legally acquired to an MP3 file or another musical format that can be listened to on a mobile device. An exception for private use would constitute an appropriate balance between the need to protect the copyright holder from mass commercial infringement of protected content and the right of the public to access content.

Trademark Protection

Today, more so than in the past, the internet permits easy, quick and inexpensive access that sometimes connects between an infringing manufacturer and a potential importer who is interested in introducing into the local market products that imitate successful brands that are protected by copyright and/or trademark. The phenomenon of counterfeit trademarks in Israel is increasing and gaining momentum and threatens the business sector. Although the Customs Administration of the Tax Authority combats smuggling of counterfeit merchandise in the framework of its activities enforcing the laws on imports to Israel, it is unable to deal with the entire scope of the phenomenon.

The distribution of counterfeit products and the efforts to import merchandise that infringes on intellectual property rights into Israel harm both the owners of the intellectual property rights on these products and the Israeli economy, which loses revenue and tax payments. Moreover, the main injured parties are the consumer public, who purchase, with their hard-earned money, counterfeit products that are liable to harm them and their health.

Which Products are Counterfeited?

The list is long and includes fashion, perfumes, pharmaceutical products, labels, shoes, alcoholic beverages, toys, etc.

Enforcement Against Infringers

In accordance with Articles 200a of the Customs Ordinance [New Version], and Article 65 of the 2007

Copyright Law, Customs units at the ports and border crossings are authorized to delay merchandise that is suspected of violating trademarks or copyrights for a period of three days.

In accordance with Customs procedures, the Customs Apprehensions Unit is authorized to operate according to one of two methods that are known as the “short procedure” and the “long procedure”.

According to the short procedure that is executed in most cases in which the merchandise that is apprehended is a small quantity, or the cost of destroying the merchandise is negligible, the Apprehensions Unit contacts the copyright or trademark holder or their representative with a request to provide, within three business days (which can be extended for three additional business days), an opinion based on photographs of the merchandise or on samples, that the apprehended merchandise is indeed infringing merchandise. The Customs Authorities will destroy the merchandise at no additional expense if the copyright or trademark holder provides the aforementioned opinion and a letter of undertaking and indemnification to join as a defendant if the importer sues the Customs Authorities and it is found in a judicial ruling that the merchandise did not infringe legal rights.

In the event that the Customs Authority chooses to execute the long procedure, the copyright or trademark holder will be required to furnish bank guarantees in the amount set by the Customs Authority within three business days and to file a claim to the authorized court against the infringing importer within ten days. According to the accepted practice of the Customs Authority, in exchange for depositing the guarantees at the Customs Authority, they provide the importer’s details to the copyright or trademark holder for the purpose of conducting negotiations with the goal of making it unnecessary to file a claim. An agreement between the importer and the copyright or trademark holder requires the approval of the Customs branch of the Ministry of Finance.

Difficulties in Enforcement Against Importer Infringement

Despite the efforts of the Apprehension Units at the ports and land border crossings into Israel to prevent the importation of infringing products into Israel, many times the rights holders are prevented from acting against the infringers due to difficulty in enforcement and collections against infringers in Israel. The result is

that the importer receives the infringing merchandise and is able to trade in it without limit or punishment.

This situation in which the criminal benefits is possible because, inter alia, because of a situation in which a great deal of infringing merchandise is imported by importers who are residents of Judea and Samaria who are not deterred by legal proceedings against them in Israel, and also because of the difficulties in execution of judgements against those found liable.

It must be remembered that when counterfeit merchandise of large scope is apprehended, the rights holder is required to deposit bank guarantees which can be worth tens of thousands of shekels, only in order to receive the details of the infringing importer. Only after he receives the details and he is already invested in the process is he able to evaluate the worthwhileness of compromise versus filing a claim.

This fact is exploited by many infringing importers. On more than one occasion an infringing importer estimates that the cost of storage and destruction of certain merchandise will be greater in comparison to the legal expenses and financial compensation that the rights holder expects to receive if he decides to file a claim against the importer. Therefore, the importer avoids conducting negotiations with the rights holder, with the goal of causing the rights holder to compromise and to himself pay for the destruction and storage. The result is that the rights holder who invested in developing the brand and reputation and in registering the trademark in Israel is forced to pay again and to pay a great deal in order to exercise his right to defend his rights.

In order to improve enforcement, several changes are recommended for adoption:

1. To amend the law such that importers who are apprehended as importers of infringing merchandise are required to deposit a bank guarantee with the Customs Authorities as a condition for future merchandise imports. This guarantee will be confiscated if the importer imports counterfeit merchandise in future.
2. To intensify the civilian and criminal enforcement against importers of counterfeit merchandise after the merchandise has entered Israel. The police and the Ministry of the Economy must allocate personnel

to enable identification of counterfeit merchandise.

3. The level of punishments and compensation decreed by the courts against infringing importers should be raised.



CHAPTER 08

**PROMOTING WOMEN
IN TECH POSITIONS -
A NATIONAL
PRIORITY**



Israeli high-tech suffers from a gender problem. What is the scope of problem and what can be done to solve it?

The sociology of gender, stereotypes, and a male-dominated environment have all led to a scarcity of women employed in high-tech positions in Israel. This situation compels a change, considering the important role that women can play in promoting technological innovation and high-tech in Israel. Indeed, we have recently been witnessing a process stemming from government activity 'from above' and from public, social activity 'from below' designed to increase the presence of women in tech organizations.

General background

Over the course of the past two decades, Israel has become a high-tech 'Mecca.' Many people make the pilgrimage to Israel for an up-close examination of the entrepreneurial spirit, which generates hundreds of new start-ups a year, and of the military, industrial, academic ecosystem that offers a decisive contribution to Israel's status as a global hub for technological innovation.

Nonetheless, Israeli high-tech suffers from a gender problem; by any scale, women make up only a small proportion of those employed in the Israeli tech industry. Some even go so far as to say that Israeli high-tech is a 'distinctly male-dominated domain.'

There is a myriad of reasons for this. Few women study engineering in academic institutions. Work in high-tech requires long hours, conditions which are unsustainable for working mothers. Few female high school students study sciences, and the familiar, male-dominated support system (friends/reserve military duty/studies) excludes women.

This is unfortunate, because women could play a key role in promoting Israeli high-tech. The world has already come to this realization, and prominent tech corporations are now headed by women. Studies also indicate that women employed in tech management positions increase companies' success rates and their fund-raising capabilities.

A loss of innovation and creativity

According to the Ministry of Finance, which has addressed this issue in a series of publications, "The scarcity of women in high-tech results in a loss of innovation and

creativity that talented women, who are not integrated in the industry, could offer. The ramification of this loss is amplified by the limited supply of a skilled workforce required in the Israeli high-tech industry."

Moreover, the scarcity of women in the high-tech industry has a considerable impact on the gender pay gap, on work productivity, and on market growth. If women have applicable skills, and due to gender norms and perceptions, they choose not to pursue studies relevant to industries that offer particularly high wages and productivity, this hinders potential economic growth, especially in light of the shortage of a skilled workforce in the industry.

In light of all of this, it is incumbent upon the government to make the promotion of women in tech a national priority, to encourage women to study engineering and computer science, and to enact affirmative action in the hiring of women in tech companies. We could all benefit from this.

Government and employment organizations should encourage companies to enact policies that support the integration and promotion of women. These policies could include paid maternity leave with better-than-average conditions, women's representation in senior management roles, flexibility in employment conditions, which is of utmost importance to women, offering female employees to work at 60-80% work schedules, assimilating women's mentoring programs, equal pay, so that the recruitment of women in the workforce is prioritized.

Integrating women in the high-tech industry - key statistics

According to Israel's Central Bureau of Statistics, while women comprise over half of Israel's workforce, they make up only a third of those employed in the high-tech industry and about 8% of high-tech entrepreneurs. Moreover, there is a more notable prominence of men in key roles in tech organizations, with only 22% of R&D positions filled by women. The situation is even more dire in start-ups, with very few women employed in the field. In contrast, in peripheral positions (administration, human resources, marketing), there is a more discernible presence of women in start-ups and in high-tech organizations. Despite an increase in the total number of salaried female employees in high-tech, according to a 2014 study on human resources, only about 35% of salaried workers in the high-tech industry were women. This situation is not static. In 2016, there was a 10% drop in the number of women employed in high-tech positions. In the same year, the salaries

of women in high-tech roles dropped by 3%, while men's salaries increased by 14%.

A study published in June 2015 by the Ministry of Economy and Industry's Equal Employment Opportunity Commission indicated a 45% gender gap in average wages in high-tech – a gap that manifests in thousands to tens of thousands of shekels a month. In contrast, a study by Israel's Central Bureau of Statistics demonstrated a lower industry gap of only 30%. Either way, many women are employed in high-tech positions in Israel, both in established organizations and in start-ups, indicating that women's entry level salaries were significantly lower than their male counterparts. Nonetheless, some industry players claim that there is no pay gap, and that findings reflect a situation in which women in high-tech work less than men, and are consequently paid less.

Beyond the pay gap, there is also a glass ceiling in high-tech organizations. For example, there are no female senior managers in 55% of software companies or in 45% of electronics companies.

It is important to keep in mind that while recent findings demonstrate a rapid increase in the number of women in the workforce, despite this narrowing gap, women still make far less money than men. In 2014, the total gender pay gap was 3,650 shekels a month. The reason for a third of the gender pay gap is that women tend to work in professions and industries with relatively low pay. According to the Ministry of Finance, considering the background of the gender pay gap, there is a predominantly low percentage of women employed in the high-tech industry, where the average wage is double the national average wage.

Furthermore, according to the Ministry of Finance, many women working in high-tech hold positions in administration and in human resources, and not in key positions such as software and hardware development, where wages are particularly high. Consequently, Israel's Central Bureau of Statistics classifies only 36% of women (36,000 positions) working in high-tech as holding high-tech positions, in contrast with 56% (102,000 positions) held by men. Meaning, women comprise only 26% of salaried workers in key high-tech positions.

Causes for the scarcity of women in tech professions

There are a variety of reasons for the low number of women employed in high-tech professions. As a rule, researchers in the field tend to underline social, environmental and

psychological causes leading women to choose different career paths than their male counterparts in the education system and in higher education.

According to the Ministry of Finance, the main reason for the shortage of women in high-tech is that fewer women choose to pursue relevant professions in the sciences, especially computer science, mathematics, engineering and physics, at first in their selection of high school majors, and later in higher education institutions. These selections are made despite the fact that graduates of engineering, computer science and mathematics earn significantly more than graduates of other subjects, and despite the fact that women pursuing these subjects have a higher chance of graduating on time than their male counterparts.

The scarcity of women in high-tech results in a loss of innovation and creativity that talented women, who are not integrated in the industry, could offer. The ramification of this loss is amplified by the limited supply of a skilled workforce required in the Israeli high-tech industry

The data demonstrates that while girls comprise 47% of high school students majoring in mathematics, they comprise only 37% of high school students majoring in physics, and only 31% of high school students majoring in computer science. Conversely, girls comprise the majority of high school students majoring in biology and chemistry. Meaning, there is no significant difference in the number of female high school students taking a double major in mathematics with another science; the difference lies in the subject selection – biology and chemistry as opposed to physics and computers.

Interestingly, this is not the case in the Arab sector, where girls choose to major in mathematics and science more than their Jewish counterparts, and more than Arab boys.

According to the Ministry of Finance, the gender gap is no less notable, and is even more notable in higher education institutions. Women comprise the majority of undergraduate students and comprise roughly 56% of overall undergraduates. However, while they account for

about 80% of students majoring in education, teaching and medical auxiliary fields, they comprise only 25% of engineering students.

The gender gap in undergraduate studies is also evident when surveying high school mathematics majors, who naturally possess relatively high capabilities in mathematics, and are better suited to pursue studies in professions relevant for high-tech.

This being the case, what changes for girls when they continue to pursue higher education? For one, environment and education. Studies describe the selection of fields of study through the prism of sociology. Technology and sciences are viewed as male disciplines. As a result, girls pursuing these disciplines are considered more manly and as having lower chances of pursuing a 'normative' lifestyle. Moreover, studies point to 'manly' traits being attributed to women in technology, primarily women who reach management and leadership positions. They are perceived as 'competitive,' 'aggressive,' 'control freaks,' while men who possess similar tech capabilities and similar management status are viewed as 'successful.'

Gender socialization also affects behavior in the workplace. Studies demonstrate that women have a lower tendency to 'assertively demand what they deserve,' to negotiate their salary and conditions, or to take even more dramatic steps, such as threatening to resign. Furthermore, women's experience with rejection over the years in their struggle to advance in the workplace and to reach management positions in high-tech, or in raising capital from investors or from other strategic partners as high-tech entrepreneurs, has caused many women to 'come to terms with their fate,' as long as they can remain in their professional field. They will not risk losing their position when negotiating their salary or conditions when it could cost them further rejection (or termination).

And what is being said on the ground?

A position analysis questionnaire collecting data from dozens of female and male human resource managers and CEOs in high-tech companies was conducted in order to examine the reasons for the underemployment of women in high-tech. Findings demonstrated that according to 30% of respondents, women feel repressed by the fact that most high-tech managers and employees are male, and that this is why women do not shatter the glass ceiling in the industry. Roughly 65% of those managing large companies or tech departments of large companies believe that there is gender discrimination in the integration of women in tech professions. The gaps are seen both in the scarcity of women employed in tech

organizations, and in the gender pay gap.

Women employed in high-tech organizations and start-ups seem to consistently be in the minority and can even experience gender isolation. Many women attest to feeling like outsiders when male colleagues or managers socialize, even when they do not deliberately intend to exclude women.

According to 40% of respondents, the basis for the scarcity of women in high-tech is not the education system, but rather women themselves. Another 40% believe that the education system bears partial responsibility. Despite efforts to encourage women's pursuit of scientific professions, there still are not enough women choosing these professions.

Women's conduct in a male-dominated work environment could also hinder their promotion and could sometimes deter them from entering the field to begin with. According to many respondents, another reason why women are unable to shatter the glass ceiling in tech positions is that women sabotage themselves. 28% of respondents felt that this is the main reason for the gender gap in promotion and pay.

The situation in other countries

To Israel's 'defense,' this problem is not localized; rather, it is global. Across the globe, high-tech suffers from gender employment gaps. In the US, this is called the 'gap of 30,' because only 30% of High-tech employees are women. The gap can also be seen in the underemployment of women in knowledge-intensive tech organizations, both in the low rate of women serving in senior and managerial positions in these organizations, and in the low rate of women in tech professions. Reports published in the US about its gender pay gap demonstrate that in Microsoft, Twitter and Google, for example, only 10% of female employees hold tech positions.

The gender gap is not only seen in these fields. According to data published in a 2015 Catalyst report, women integrated in knowledge-intensive organizations after completing an MBA are employed in positions offering lower pay and status than men with the same level of education and the same extent of work experience. The data also indicates that their initial motivations are similar, and MBA graduates of both genders integrated in tech organizations express a desire to take on senior, influential roles. In other words, the problem is not motivation; rather, it is implementation, which falls short for women. Nonetheless, recent years have seen a notable trend

of feminization in senior management positions in giant tech organizations.

In this context, Western countries have a lot they can learn from Asian countries. According to data published by WIPO (World Intellectual Property Organization), the rate of female inventors, as reflected in the number of PCT (Patent Cooperation Treaty) requests, is particularly high in South Korea (where 46.6% of the total number of patent requests were made by women) and in China (43.8%). The US is only in 6th place (32.3% of all requests), while Israel is in 11th place with 25.7% of all PCT

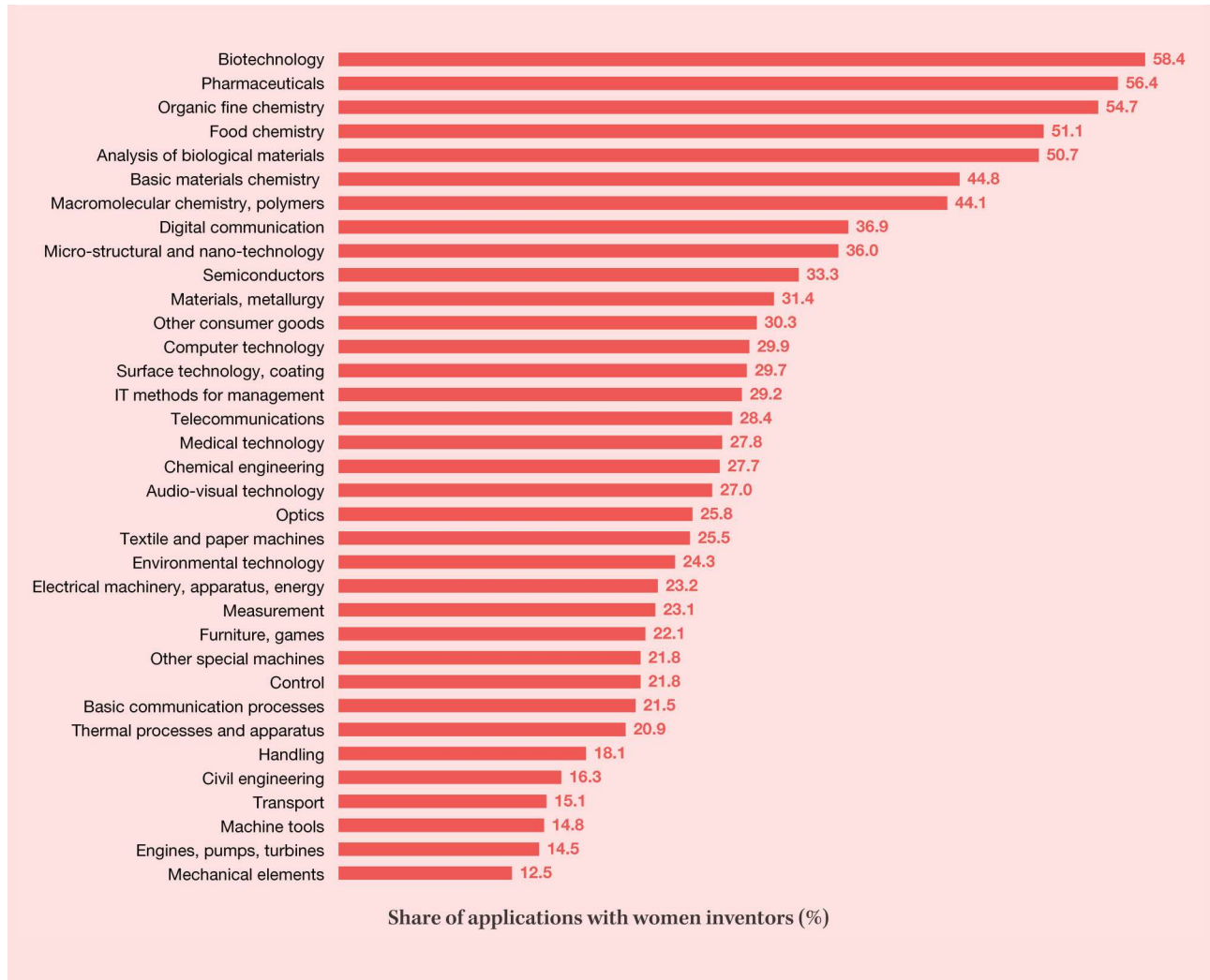
requests. Incidentally, the high rate of women inventors is especially apparent in requests made in fields such as biotechnology (58.4%) and pharmaceuticals (56.4%).

Opportunities for change

In recent years, the tech field has undergone changes both in the perception and the definition of the term 'high-tech,' and in the modification of the perimeters of the sector. These changes offer opportunities to women. The perception and definition of the high-tech field are broader than ever before and include a wide range of specialties such as biotechnology, chemistry and

GRAPH 01

WOMEN INVENTORS FOR SELECTED TECHNOLOGY FIELDS



source: WIPO statistics database, April 2017

biology, and are not limited to hardware and software. Moreover, the modification of the perimeters of high-tech has allowed the inclusion of a variety of fields such as agriculture, nutrition, water, transportation, apparel and cosmetics. In other words, women can work in high-tech in fields such as apparel, space or plastics, and not only in hardware and software.

The assimilation of innovation in traditional industry also provides new opportunities for women, because roughly two thirds of women work in traditional industries, in contrast with 30% who work in high-tech organizations.

All types of organizations, whether high-tech or low-tech, are now committed - in this era of fierce competition - to enact 'continual innovation.' In this respect, women have an unequivocal advantage. Studies on creativity, innovation and gender point to girls possessing a significant advantage in these fields. Furthermore, women have a 'woman's touch' for understanding clients' needs, identifying situations, and in their overall intuition when dealing with other people. As such, women enter the world of high-tech without the need to reinvent themselves or to adapt the way they conduct themselves in order to be more suited for successful development in the high-tech sector. To the contrary, the surrounding sector changes and accommodates them, to successfully utilize the inherent advantages of integrating tech-oriented women.

Looking to the future

Following a government resolution on the matter, a steering committee operated by the body responsible for employment and the Office of the Chief Scientist (currently known as the Israel Innovation Authority) under the auspices of the Ministry of Economy and Industry has been assigned with bolstering the supply of engineers and programmers in the high-tech industry. As part of its overall focus on the shortage of a knowledge-intensive workforce, the team operates to establish and implement policy tools to increase the integration of women in the industry. This includes the encouragement of women in their pursuit of studies in relevant fields.

Many high-tech organizations, both in Israel and across the globe, have taken on the task of attracting women to exclusive tech professions, roles and projects within leading organizations, start-ups, and organizational innovation centers. Various companies, such as Intel, now highlight equal pay, extended maternity leave, and a gradual return to work as some of their benefits designed to attract women.

This directional shift can also be seen in the increased awareness of gender diversification in organizations. In tech professions, women's touch has a notable impact on creating exclusivity and on bettering the organization. Gender diversification benefits women, men, the product, the organization, and the company as a whole. It facilitates the expansion of corporate responsibility towards women, it creates a fair environment, it maximizes the tech capability of half of the population for the benefit of the products and of services provided by the organization, while creating exclusivity and innovation.

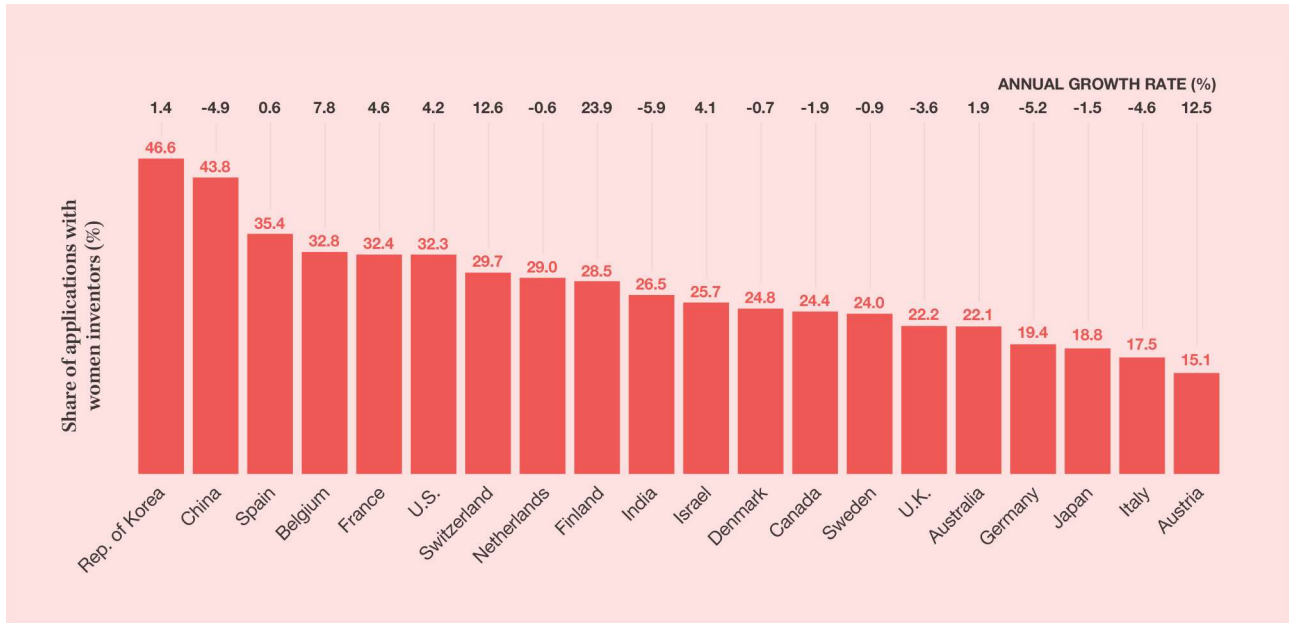
Reports by female and male entrepreneurs and managers of venture capital funds also point to a shift in the field of start-ups. Forbes Israel published its 2015 global ranking of start-ups, wherein the number of female entrepreneurs was markedly higher than it had been in previous years. Tel Aviv has infiltrated the top ten ranking of women who encourage women's entrepreneurship and is ranked at seventh place with 20% of women having launched start-ups. One explanation for this is that more women have entered the world of entrepreneurship since they combine their tech capabilities with products from traditional industries, sometimes 'feminine' products (for example, combining technology with fashion, apparel, footwear, cosmetics, design, etc.). Hence, environmental changes in the world of technology benefit the infiltration of women into the field.

In summary, it appears that beyond the objective challenges that all working women face, in high-tech, where output is measured as opposed to input, women are far more capable of moving ahead than they are in other sectors. It appears that in high-tech, women are able to shatter the glass ceiling more than they could elsewhere, because the industry is highly focused on promoting women and recognizes their worth and their contribution. Nonetheless, it is important to note that this is a taxing industry with long work hours, sometimes long-time differences when working with other continents, and frequent international travel. These elements can be intimidating for women at certain times in their lives, but apt career planning can greatly facilitate women's integration and their climb to the top, if this is what they want.

while women comprise over half of Israel's workforce, they make up only a third of those employed in the high-tech industry and about 8% of high-tech entrepreneurs. A 45% gender gap in average wages in high-tech and only 22% of R&D positions filled by women.

GRAPH 02

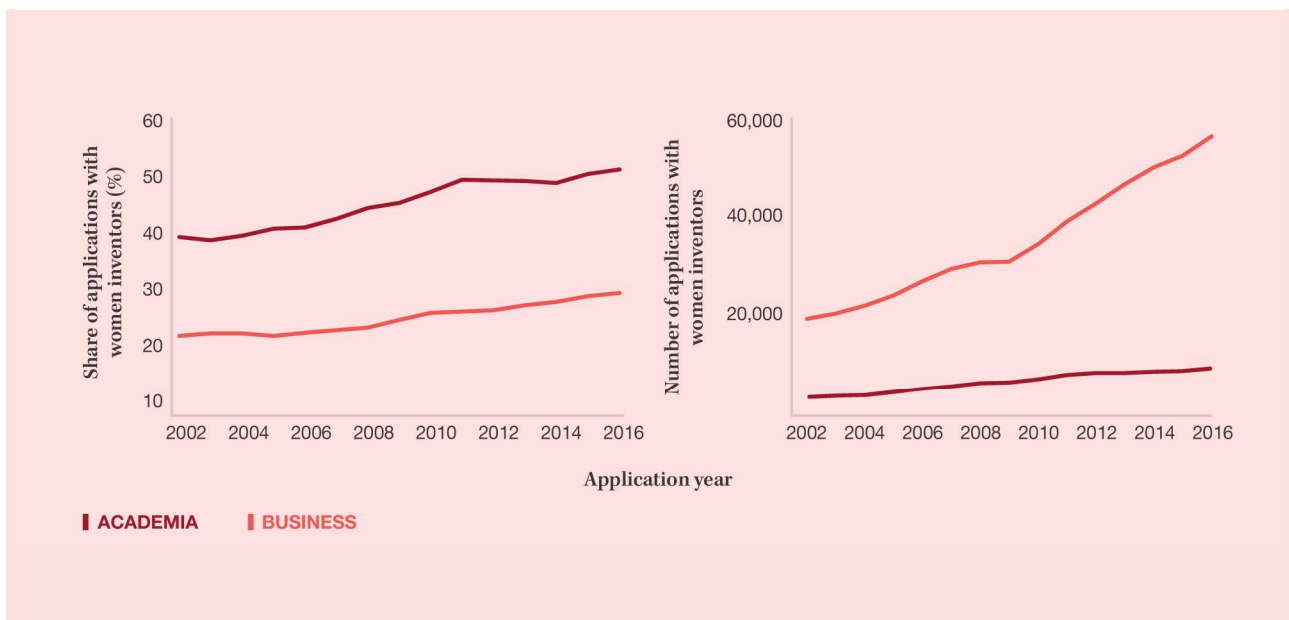
PCT APPLICATIONS WITH WOMEN INVENTORS



source: WIPO statistics database, April 2017

GRAPH 03

WOMEN INVENTORS BY INSTITUTIONAL SECTOR



source: WIPO statistics database, April 2017



CHAPTER 09

THE FUTURE IS NOW



We are on the cusp of a new reality that will impact every aspect of our lives. Technological constraints are no longer an obstacle. In the world of computers and networks, almost anything is possible

Concepts from the world of technology such as social networks, mobile applications, business analytics and big data, cloud computing, artificial intelligence and machine learning, wearable computing, cognitive computing, advanced robotics, internet of things, virtual and augmented reality, 3D printing and more have revolutionized our way of life and the way that organizations do business. Managers of all organizations are now required to address new challenges arising from the advent of digital technology.

These technologies have led to the emergence of new business models such as sharing economy, crowdsourcing, ecommerce, data selling and others. At one of the recent Davos conferences, this bundle of changes was labelled the Fourth Industrial Revolution, a game changer that subverts commercial branches and blurs the boundaries between them – a phenomenon that can be dubbed the digital transformation.

The digital transformation poses an explicit threat to organizations, yet it also presents a remarkable opportunity. As such, addressing this transformation requires that organizations adopt a culture of business flexibility, continual awareness of changes in the business environment, an ability to make decisions based on an understanding of the inherent value of data, the promotion and encouragement of innovation, and a willingness to take risks. This is a profound business and organizational transformation, which consequently necessitates that the organization oversees it. These factors have all become a critical condition for the modern-day manager operating in a dynamic, global, digital environment.

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an understanding of the inherent value of data, the promotion and encouragement of innovation, and a willingness to take risks.

The following review will cover a few of the new technologies that offer a dramatic potential for change – a change that has only just begun:

Artificial Intelligence - the transition to Broad AI

In recent years, humankind has been demonstrating an increasing interest in AI, and not for naught. The ability to leverage the data we possess, to extract new insight from this data in real time, and to communicate this through the use of human language is a game changer in practically every aspect of our lives.

The study of AI began in the mid-fifties, but has picked up steam in recent years. There are several reasons for this. First, the amount of data has grown with the introduction of social media and IoT (internet of things) to our lives. The ability to translate unstructured data (images or video) into insight unveils new, infinite opportunities. Secondly, significant progress has been demonstrated in the research of AI based on the amount of data for learning and developing technological tools such as machine learning and deep learning. Another reason that has propelled the technology forward is the increasing involvement of the business sector. Processes have become more efficient and automated, requiring less resources and leveraging organizations' capabilities and the customer experience to new ground. It is therefore also easier to raise funds for R&D for additional groundbreaking technological tools.

Research indicates that we can now achieve better results in very specific tasks in the field of AI. Autonomous vehicles, face and emotion recognition, and even the personal adaptation of medication – these tasks are called Narrow AI. However, even the smartest autonomous vehicle cannot talk to us about the weather, unless its developers have programmed the vehicle with the capabilities required to undertake this specific task. The vehicle clearly cannot learn how to play a new card game after a brief explanation of the rules – something that any small child can do with ease.

Researchers' long-term goal is to achieve General AI: a machine that 'contains' enough information, basic knowledge, and a very solid handle of language, allowing it to learn any new topic and to communicate

in an entirely human manner in a minimal amount of time. It could be effortlessly taught to talk about the weather, to prepare for a major life event, or to play a new game. We are still far from reaching this goal, and it would necessitate significant advances combining an understanding of human language, modeling knowledge and information, and programming – integration that would help form logical deductions.

The next stage in technological advances is the field of Broad AI. Broad AI could use minimal effort to take models learned for one task and adapt them to be used in a new task. Conversely, it can begin a development process with very limited information, learn new information, and combine it with accumulated knowledge in order to succeed with more complex tasks. To this end, new technologies are being developed in labs. These technologies are called Active Learning (the ability of a computer to understand what it doesn't know and to request additional examples), Transfer Learning (the ability to shift from learning in one field to learning in another), and Meta Learning (computers' abilities to independently adapt the learning algorithm to existing data).

The blockchain revolution

The distributed ledger method at the core of blockchain technology amplifies the transparency and control of all involved parties, minimizes mediating factors, and cuts cost, risk and precious time – a huge asset for any organization. Moreover, this technology changes the way organizations communicate with customers, suppliers and competitors, creating new business procedures with significant potential for disruption. Accordingly, Gartner Consulting projects that by 2030, the added value of blockchain-based transactions will amount to no less than three trillion dollars.

Tech companies recognize the enormous potential of blockchain technology and work in collaboration with universities across the globe to develop applications in fields such as finance, education, information security, supply chain, and other fields where many of these technologies are accessible by the cloud and by open-source code.

Furthermore, not only does blockchain technology transform the way that organizations communicate with their ecosystem; it creates new models for business communications and helps extract new commercial value from organizational data. These are all core components of digital transformation. It

is not a necessity to perform digital transformation in an organization in order to assimilate blockchain technology, but without a doubt, organizations that have already succeeded in beginning the transformation that is fundamental and required in our digital reality are slated to reap the benefits of what they have sowed in the preliminary feasibility stages.

The digital transformation poses an explicit threat to organizations, yet it also presents a remarkable opportunity. As such, addressing this transformation requires that organizations adopt a culture of business flexibility, continual awareness of changes in the business environment, an ability to make decisions based on an understanding of the inherent value of data the promotion and encouragement of innovation, and a willingness to take risks

The revolution of quantum computing

Quantum mechanics currently lies at the core of the upcoming revolution in the world of computing that is projected to have a significant impact on our lives – quantum computing. Quantum computers have incredible calculation capabilities that no other computers can contend with – not even supercomputers or the cloud, which is comprised of a large quantity of powerful computers. Technology giants are racing for quantum computing development that can solve a wide range of problems and that can be used extensively both by the scientific community and by the commercial scientific community.

Quantum computing will contribute to humankind in a variety of aspects. In the world of pharma, new medicine and materials will be discovered through a deeper understanding of molecular interactions and chemical processes. In the world of supply chain management and complex logistics tasks, quantum computing will offer the optimal path to actions that will ensure maximum efficiency and an improved

customer experience. The industry of financial services could build new financial models through the precise identification of risk factors and through reaching better investment decisions. In the field of AI and in applications such as machine learning, quantum computers will be able to contend with particularly large collections of data and aid in instantly issuing vital insight. In the field of cloud security, the new technology will offer better privacy protection.

So why is quantum computing a game changer? While a regular computer bit can only display two potential values (0 or 1), a quantum bit (qubit) also displays a range of states that combine these two values. In effect, the number of potential states increases by magnitudes relative to events in the world of classical computing. This is an alternate mathematical infrastructure that uncovers infinite calculation possibilities and a number of simulations we have never seen before, generating possibilities for innovative solutions, as described above. Moreover, the time required for relatively complex calculations will drop dramatically, which will consequently save precious time and resources. In certain situations, in medicine, for example, time not only means money; it means life.

According to one assessment, the global quantum computing market will be valued at \$10.7 billion by 2024, of which \$8.45 billion will come from sales of products and services, and \$2.25 billion from government funded R&D programs.

Looking to the future - Deep learning

Deep learning is a field of computational learning inspired by brain activity. Like the brain, deep learning utilizes multiple layers of neurons linked together within a 'neural network.' When data flows from one region of the network to another, they change structure and are integrated with other information along the way. By digesting and processing large quantities of complex data, the program learns to identify digital expression patterns of voices, sounds, images and text.

Today, deep learning is a remarkably popular concept in the world of computing, and as such, it is important to remember that its core principles have been around for decades. With the promotion of the concept of quantum computing, deep learning has been playing a key role in the next generation of AI applications rapidly emerging around us.

The most fascinating aspect of deep learning is the fact that it has no need for human intervention in order to display information through a collection of characteristics that serve as the basis for computer learning. In deep learning, computers are exposed to large quantities of data that allow it to independently learn the expression it will use to learn how to perform the task in the best way possible. The process is similar to the way that a parent can teach an infant how to distinguish a dog from a cat: the knowledge comes after the infant has observed a large number of examples on their daily ride in the stroller when they hear their mother or father call the animal they see a cat. The parent does not need to introduce a defined rule to the infant by which "if it is furry, it meows, and it rummages through garbage; it is a cat."

Other than the availability of an unprecedented scale of data, another notable development that facilitates deep learning is powerful, dedicated computing that allows computers to run complex learning algorithms, which can be used to effectively learn from large quantities of information. The computer learns what to search from the information presented to it; it then builds a model that it can use to solve an identical problem in a new situation.

As consumers, we are already reaping the benefits of deep learning on our smartphones. For example, deep learning is used to improve voice search capabilities even when users are located in noisy environments. Virtual agents, also known as chatbots, are already well known, and we haven't even discussed our growing expectations of autonomous vehicles and the revolution they will spark.

Israel's hi-tech industry recognized the inherent potential of deep learning. For example, in the field of computer vision, deep learning allows cars to monitor the road in front of them and to detect close vehicles, to alert drivers about pedestrians that might step off the curb at any moment, or to understand natural language commands by drivers. Other Israeli companies have created advanced deep learning algorithms that improve face detection capabilities, malware file detection through cybersecurity systems, or the supply of financial consulting that leans on the infinite wealth of information and data accessible outside the organization across the web.

The financial and commercial potential offered by the world of deep learning is particularly extensive.

In order to facilitate natural communication with computers, we must study these computers in order to understand human speech in a variety of different accents. Computers must learn how to build sentences from scratch, to identify who is entering a particular room, and when someone expresses themselves cynically or sarcastically, to know how to discern between this type of expression and identical text uttered without a trace of cynicism. IBM's research lab in Haifa is currently working on a series of projects in this field.

The revolution of autonomous vehicles

Our interest in the image of the smart city, in all its facets, especially in terms of smart transportation, makes us feel like we are reading a riveting sci-fi novel that we are a part of. The thought that we are on the cusp of a new reality that will impact every aspect of our lives is exhilarating. Technological constraints are no longer an obstacle. In the world of computers and networks, almost anything is possible, unlike the old world where we still needed products based on metal, plastic and leather for taxing manufacturing processes abundant with engineering, planning and stabilization. Is this possible?

It is no wonder that of all the components in the fabric of our lives, the smart vehicle comprises such a significant share of our deliberation of future virtualization. The reason for this can be found in several aspects: first, the position of the vehicle in our lives. While for some, the vehicle serves for the convenience of independent mobility alone with no significance beyond this purpose, for others, a vehicle serves in their direct life environment as an almost living entity. Something used to reflect social status, a topic of conversation between friends, not to mention an object to take care of and treasure. The position of the vehicle in our new reality is derived from precisely these two perspectives. For those seeking convenient mobilization solutions, the smart vehicle will be no more than an 'elevator' in the three-dimensional sphere. Reading will be performed with the use of a device similar to a cellphone, and the mobilization service will be completed (and paid for) towards the required destination with the utmost convenience and efficiency. For those who 'raise' their vehicle like a pet, the vehicle will be upgraded to the position of 'personal assistant.' Knowing all aspects of its master's daily routine, personal preferences (both overt and covert), and the map of present and projected constraints on the road, the vehicle would be pleased to advise, remind, coordinate and update in a continuous,

pleasant manner, all the while autonomously, smoothly moving from destination to destination.

Secondly, the position of the vehicle as a bridge between past and future technologies, in that despite all the innovations, we will not forget our most basic demands for safety, reliability, comfortable travel conditions, and reasonable travel costs. All of these are deeply ingrained in traditional vehicle technology that has developed over the past 120 years, and is still led by the large, well-known vehicle industries in Europe, the US, and the Far East. Another question briefly raised on international debate forums: who will be the key players in the manufacturing of future vehicles? Vehicle manufacturers that will integrate new IT technologies in their flagship products, or software companies such as Google and Apple who will integrate engines, tires and gearboxes in communications network based cyber solutions? As of today, it appears that the answer to the question is connected to the debate on the first aspect. The management of autonomous public transportation routes operating as 'elevators' will be conducted by social media and software companies through mechanical motion products to be constructed from available modular components, while personal vehicles operating as 'personal assistants' will continue to be built by industries familiar to us, with software and network applications integrated based on adjustable individual planning and design.

The third aspect relates to the degree of autonomy of vehicles in the public sphere. While public opinion dictates full autonomy of all vehicles in this sphere looking no further than 2-3 decades to the future, the consensus in the industry is that the difficult challenge lies in the interim period, which will be characterized by a combination of autonomous and manual vehicles on the road at the same time. On the one side, there is a robotic, autonomic, predictable, calculated, 'level-headed' system; and on the other, there is a human driver – an unpredictable, improvising player who at times reacts emotionally and illogically (in warm, humid climates more than in northern, colder regions). Furthermore, the foundation of the cyber technology of autonomous vehicles is connectivity; the continuous flow of information at remarkable rates between all players sharing the network. In a reality where every vehicle 'shares' all the details in its environment that provide relevant information as a condition for reaching collaborative decisions both as individuals and as a group, human drivers will be

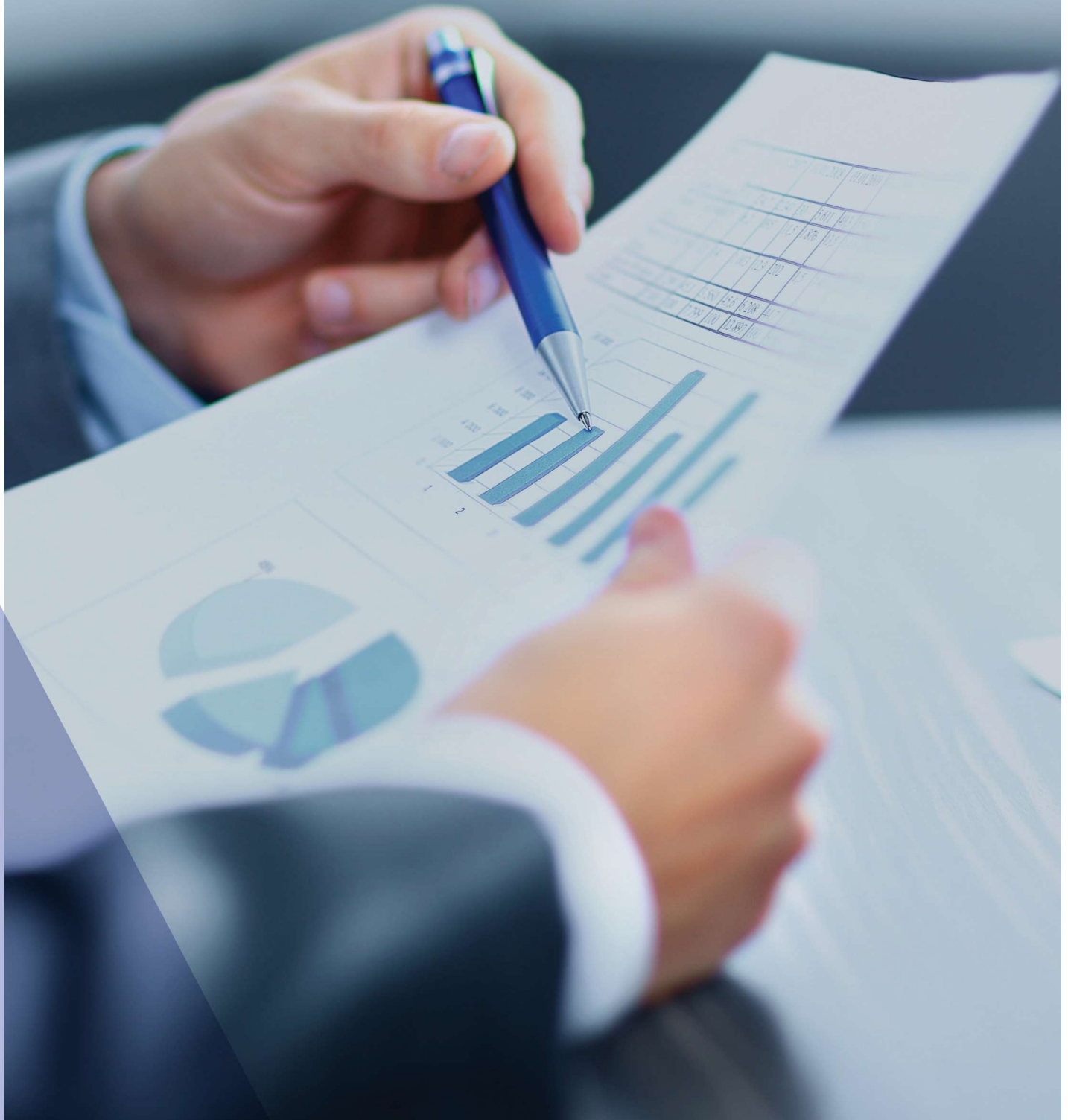
'autistic' beings that are disconnected at both ends: in updating members of the network, and in reaching decisions or guidelines for future implementation. We see the implications through the immense investments in multidimensional sensor systems that are wholly dedicated to providing early alerts about unpredictable behavior by a manually driven vehicle in the area. At the time of full autonomous driving, these systems will of course be obsolete, as will the entire principle of sensors, because every individual will be aware of the intentions of the individuals in their environment before any event occurs, due to the connection through a holistic system. This is analogous to the way our brain is aware of our hand movement before it moves, and it does not learn about this movement from sight.

The fourth aspect relates to cyber defense. Like other fields in our emerging autonomous, connected environment, in terms of smart transportation, cyber security considerations carry critical weight in two dimensions: safety/security and trust. Transportation systems are characterized by potentially high risk to life by definition, whether due to crowdedness in the two-dimensional urban sphere, or due to falling and crashing in the vertical dimension. Many years of investment in technological reliability on the one hand, and human training on the other, have brought the percentage of accidents to a very low number and a socially sustainable level. Behavioral deviation of individuals, even if extreme, is limited to isolated events that do not trickle down to other events, as severe as they may be. This characteristic of reality can change dramatically during a cyberattack on the extensive network system. For example, offensive cyberattacks that cause the 'irrational' behavior of hundreds of autonomous vehicles can bring about a disaster on the scale of a regional natural disaster. However, beyond the fatalities, it can be assumed that in contrast with natural disasters, such an event would lead to society losing faith in smart solutions as a whole, inevitably leading to a human-machine crisis that is difficult to foresee.

The way to deal with this risk is to assume feasibility in early planning stages, to integrate solutions with independent cyclic redundancy at the productization stages, while at the same time, establishing examination areas with authentic characteristics of holistic reality, in which the immunity of the full systems can be examined for a range of attacks in a perpetual, continuous manner.

CHAPTER 10

RECOMMENDATIONS AND CONCLUSIONS



Israel's intellectual property regime has undergone favorable changes in recent years, but there are some persistent lacunae. Israel must prioritize intellectual property on the national agenda and allocate the proper resources to tackle violations on a scale befitting one of the world's leading technology-oriented economies.

Another important aspect of intellectual property is the untapped potential of the intellectual assets held by the State. On this count, the only remedy is to locate and identify the intangible assets that have economic potential and promote their commercial leverage.

So what do we need to do?

On the legal level—dealing with intellectual property laws differs from other disciplines heard by the courts, since it necessitates delving into scientific and technical topics as well as extensive judicial experience. The legal system must create a new culture where the State Prosecutor, the plaintiffs' attorneys, and the judges themselves "live" the subject of intellectual property and follow a clear policy intended to promote its protection. The policy must be jointly defined by the Ministry of Justice and the judicial system. As a crucial part of this process, we must raise awareness among judges with the aid of regular seminars on the subject and promote the training and appointment of judges qualified to arbitrate in intellectual property cases.

It is also imperative to strengthen the internal systems that grant rights in intellectual property (especially patents, trademarks and design) in order to encourage the public to take advantage of the legal tools at their disposal.

At the same time, action is required on the legislative level to ensure the ongoing revision of intellectual property legislation with the participation of the rights proprietors, especially in connection with the problematic laws mentioned in this report. Proceedings in investigation cases and the filing of indictments against rights infringers must be expedited (by the State Attorney's Office), including by invoking the Money Laundering Law.

Strengthening the enforcement system

The enforcement system requires additional manpower and tools—essential ingredients in any

successful reform. Legislation should support the enforcement system with stiffer criminal sanctions. Japan and the U.S. have carried out successful reforms on this front both internally and in their dealings with other countries.

Proper enforcement cannot take place in a bubble. To prevent the import of counterfeit goods, cooperative mechanisms must be forged with other countries, legislation of trade agreements relating directly to intellectual property will require dedicated advocates, and we must join international treaties that relate to inter-state cooperation, create an extra-territorial enforcement system, and foster intimate cooperation with the Customs Authority.

It is plain that without an effective and aggressive enforcement system there can be no improvement in the situation as is today. Therefore, we recommend the following provisions:

- Subordinating all policemen in the districts to the national intellectual property unit and treating the unit as one combating economic crime.
- Allocating additional positions to the national intellectual property unit.
- Hastening the issuing of indictments, implementing the Arrest Law and creating a professional framework within the Police of prosecutors to deal with indictments relating to the matter and handle intellectual property cases.
- Increasing cooperation among municipal police stations on enforcement and as part of this, increasing the frequency of raids on channels of counterfeit goods.
- Collaborating with police forces in other countries.
- Allocating manpower to deal with the transfer of counterfeit goods from the Palestinian Authority areas.
- Setting up a collaborative mechanism with all enforcement agencies (Income Tax Authority, VAT, the Ministry of Economics and Trade and copyright proprietors)
- Allocating resources as part of the State budget and funding for at least 75 positions in the special police unit.
- Instructing the Income Tax Authority and VAT to increase preventive efforts and enforcement

of prohibitions against the import of counterfeit goods via the ports using existing means and by the addition of new ones.

- Using Ministry of economics, Trade and Employment inspectors to check businesses and markets and exercise their authorities, including confiscating goods and imposing fines.
- Integrating the Tax Authority in the overall activity and reviewing the issue as part of income tax audits of businesses known to be involved in producing, marketing and selling counterfeit goods in Israel.
- Regulating the phenomenon of photocopying and duplicating books in the possession of educational institutions, which today are deemed a copyright infringement, and payment of royalties for using them.

Learn from global experience

Violating intellectual property rights is no different from stealing any other kind of property. The fact that this does not involve the actual physical taking of an object but the production of a counterfeit product or a copy or a software download does not detract from the severity of the misdeed. Sometimes extensive information campaigns are necessary, such as the one undertaken by the Business Software Alliance (BSA) in order to convey a clear message to the public regarding the serious nature of the misdeeds. Criminal sanctions should be broad and enable trying anyone who is part of the chain of infringements, from the importer and storage people to the distributors and in extreme cases, the users (whether it is companies or individual people). Intellectual property infringements are easy to commit, and sometimes even a tempting possibility. Without a strong and determined criminal enforcement system backed by a civil system that guarantees a golden path to compensation for those affected, it will not be possible to combat this problem.

England provides a good example for enhancing enforcement. After adopting the European Directive in 2004, it set up National IP Crime Strategy Committee (2004), headed by the English Patent Office, a committee tasked with addressing criminal cases involving intellectual property infringements. The

committee's work led to the conclusion that in order to combat counterfeit and pirate copies, it is extremely important to set up an intelligence arm that will coordinate the information coming in from the different law enforcement agencies overseeing import methods, manufacturing, transport and storage of counterfeit intellectual property goods. Hence the Tellpat Intelligence Database was set up under the auspices of the British Patent Office, which oversees all information the authorities have on intellectual property infringements. Notably, the British committee, like its counterparts in the U.S. and Japan, also publishes an annual report describing the achievements relating to enforcement in England during the preceding year.

Education and information

We can learn from the experience of the U.S. and Japan, two countries that worked to encourage the creation of intellectual property in academic institutions and in national research institutes, offering incentives sometimes subsidized by the government and with greater cooperation among the research institutes themselves. At the same time, an educational program was launched, distributed information, and increased awareness of the importance of creating and protecting original work. The applicable lessons derived from these programs are the fundamental cooperation with local industry, government-backed encouragement of education on the subject, and an institutional war against violations.

Of no less importance than legal changes is working towards a shift in public awareness to promote mindfulness about safeguarding copyright in Israel and the necessity of avoiding participation in the illegal enterprise. In addition, the government should work to make lessons on intellectual property and sensible consumer habits part of our schools' curriculum, and to increase awareness of this subject among teaching staff.

Balance between short and long-term needs

The U.S., Japan and European Union countries are contending, as are many countries around the world, with limited resources in the public sector. However, budgetary concerns do not lead these countries to favor short-term goals, such as expropriation of intellectual property rights and supplying equipment and information to the public for a reduced price. These countries understood the importance of, and implemented policies with a balance between innovation and access.

Coordination of government activities

Until there is a decision to set up a central body to be responsible for promoting the issue of intellectual property protection in Israel, the matter must remain the province of various government ministries. Therefore, during the first stage, it is advisable that the prime minister should act immediately to form a ministerial committee headed by the Minister of Justice. This will be a committee to prepare an operating plan and guide the various government offices in order to streamline and focus the advancement of these issues. To do so, the committee can look at reforms already instituted in other places around the world

Missed opportunities: leveraging existing intellectual property assets

The financial losses due to the improper handling of intellectual property do not simply end in the area of counterfeits and duplications, but also extend to the lack of sufficient leverage for intellectual property owned by the state. The State Comptroller already noted shortcomings in the work of the university technology transfer companies. The Finance Ministry's accountant general has already warned that the State is not doing enough to promote the intellectual property found in government hospitals. An internal report by the defense establishment (the Tishler Committee) determined that the State is not doing enough to leverage the intellectual property being created within the walls of Israel Defense Authority.



SUMMARY

Israel took upon itself many international commitments in the realm of intellectual property protection (international treaties, trade agreements, adapting OECD standards). It is in the process of constant improvement. However, in certain areas, such as counterfeit drugs, goods and brand name items, as well as in all matters relating to international standards regarding patents for drugs and in the life science industry, more work is needed in order to “fall into line” with the world’s advanced countries.

The losses from intellectual property violation are felt throughout the economy—lost sales for industry and businesses, lost taxes for the state, blows to consumers, negative incentive for development and innovation, impaired health (due to counterfeit drugs, for example), damage to the normal economic fabric of the country, the development of organized crime and negative employment impacts. In addition, Israel is missing the business potential contained in the leveraging of intellectual property found inside the walls of academia, government hospitals and the defense industry.

If Israel is to maintain its status as a leader in the technology and business fields, it must vigilantly protect intellectual property rights. Since its economy is party to a network of foreign trade agreements, it

cannot permit such damage to intellectual property rights. The Israeli Government must be proactive and take vigorous steps that will fundamentally change the public’s attitude and the official view of intellectual property products. Such action will contribute to Israel’s economy and to the country’s international standing.

Israel must work to bolster the high-tech industry which has begun show cracks in its arm of late. The problem is two-fold: we are experiencing a severe shortage of engineers to usher in the next generation of innovation at the same time that the financial infrastructure that supported the high-tech industry to his point is beginning to falter.

As far as technology education goes, the plan for strengthening the study of mathematics is a step in the right direction—but it is not a magic bullet for the long-term problems facing the high-tech industry and Israel as a whole. The government must address the entire spectrum of science and technology education and initiate a plan that straddles the school and professional careers of our future innovators—starting in elementary school and continuing beyond placement in technology companies—in order to ensure that Israel’s most pressure resource, its indefatigable human capital, continues to produce cutting-edge intellectual assets.