

2020 HIGH-TECH HUMAN CAPITAL REPORT



TABLE OF CONTENTS

PARTNERS	3
FOREWORD: CEO OF START-UP NATION CENTRAL	4
FOREWORD: CHAIRMAN OF THE ISRAEL INNOVATION AUTHORITY	5
EXECUTIVE SUMMARY	6
METHODOLOGY	7
MACRO OVERVIEW: STABILITY IN A TURBULENT YEAR	8
Status of Employees.....	8
Dismissals and Voluntary Departures	9
THE IMPACT OF THE CORONAVIRUS PANDEMIC ON COMPANIES AND COPING WITH THE CRISIS	10
Company Size.....	10
Sectors	11
Type of Ownership: Multinational Corporations Compared to Israeli-Owned Companies	11
THE DEMAND FOR EMPLOYEES IN THE HIGH-TECH INDUSTRY	13
POPULATIONS: A TEMPORARY HALT IN THE TREND TOWARD DIVERSITY IN HIGH-TECH	15
Women.....	15
The Arab Population.....	16
The Ultra-Orthodox Population.....	17
Juniors and Students.....	18
PROGRAMS AIMED AT PROVIDING SOLUTIONS TO THE SHORTAGE IN HUMAN CAPITAL	19

PARTNERS



The Innovation Authority is a statutory public entity responsible for Israel's innovation policy. The Authority was established in 2016 on the basis of the Office of the Chief Scientist in the Ministry of Economy and Industry. The Authority promotes innovation as a lever for inclusive and sustainable economic growth from the perspective that innovation is the most significant growth engine for the Israeli economy. The Authority works to strengthen the infrastructure on which the Israeli knowledge industry is built, while constantly examining the obstacles and opportunities in the Israeli innovation ecosystem. It offers entrepreneurs and innovation-oriented companies in Israel a variety of financing tools to help them cope with the changing needs of the modern world of innovation. The activity to increase human capital for high-tech is led by the Authority through the Societal Challenges division.

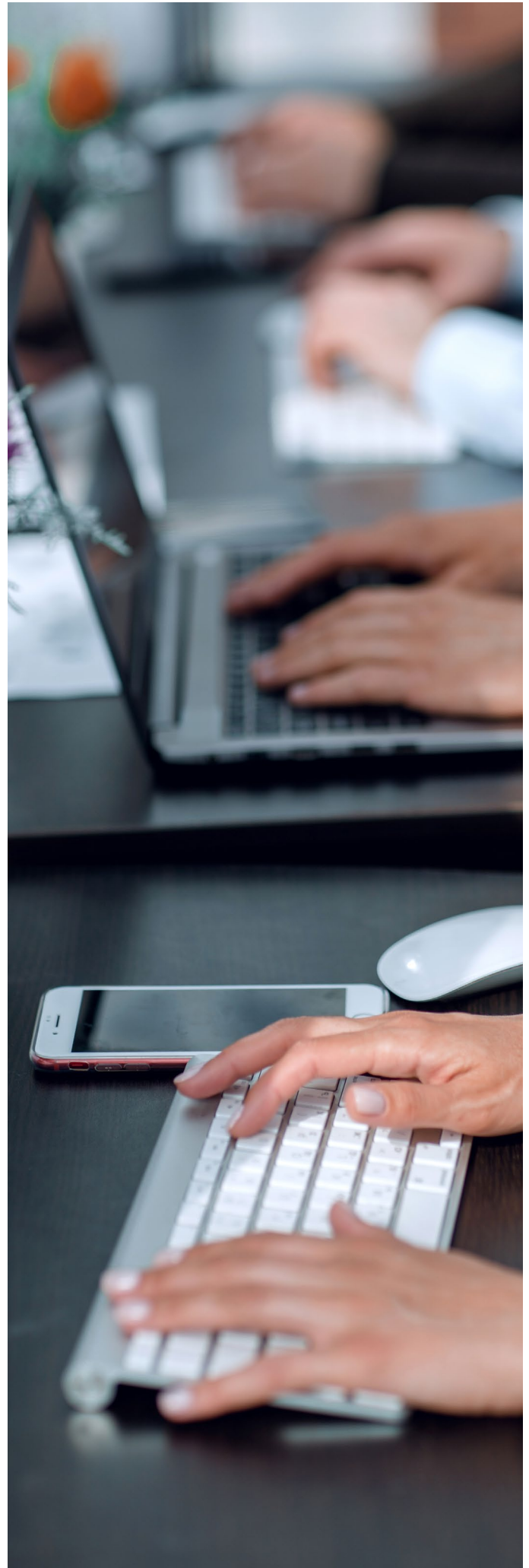
START-UP NATION CENTRAL

Start-Up Nation Central is a nonprofit organization whose mission is to help the growth of the Israeli high-tech sector and increase its impact on the world. The organization has two main tasks: to connect Israeli high-tech to global challenges and to strengthen the Israeli innovation ecosystem. Start-Up Nation Central is funded entirely through philanthropy and works through the creation of partnerships with government, industry and civil society. In the field of human capital for high-tech, it operates through the nonprofit Scale-Up Velocity, which specializes in the design and implementation of dedicated and focused programs with the aim of expanding them to a significant extent.



Zviran is the largest company in Israel in the field of data and consulting on salaries, benefits, pensions and insurance for employers, as well as human resources processes. For over three decades, Zviran has served hundreds of employers from a variety of industries, including small and large companies, both local and global, from the public and private sectors. Zviran combines in-depth knowledge of all aspects of the Israeli labor market – including the areas of taxation, employees' committees, capital compensation, and wages, pensions and insurance labor law – with the collection and analysis of wage data, benefits and terms of employment for hundreds of companies for over 30 years. Zviran is the Israeli partner of Mercer, the largest human resources consulting company in the world.

The report was authored by Eynav Ehrlich and Uri Gabai from Start-Up Nation Central, Gily Maor from Scale-Up Velocity, and Kheir Abdel Razeq and Avia Asher from the Israel Innovation Authority. We thank Michal Milo, Noga Burg Sagan-Cohen and Roni Percik of Zviran for their ongoing support and contribution to the report. Special thanks to Riki Kadury and Tal Enselman of the Central Bureau of Statistics for their significant contributions to the report.



FOREWORD: PROF. EUGENE KANDEL,

CEO, START-UP NATION CENTRAL

START-UP
NATION
CENTRAL



Despite, and perhaps because of the coronavirus pandemic, 2020 was, in retrospect, one of Israeli high-tech's most successful years – a trend that has continued into the first quarter of 2021. More than \$10 billion in venture capital investment indicates that the demand for Israeli technology is at its peak and that Israeli companies and entrepreneurs have once again succeeded in turning a crisis into an opportunity.

This is also the place to commend the Innovation Authority's quick and determined response to the crisis, which led to a reduction in the extent of the damage to the high-tech ecosystem.

But while financial capital quickly adapted to [the new digital age](#), employees and employers were required to make difficult adjustments in order to deal with the limitations presented by the coronavirus pandemic and its consequences. But even in this area, the report indicates that, overall, Israeli high-tech has shown remarkable stability in this challenging year. Following the shock of the second quarter of 2020, high-tech once again demonstrated the feature that best characterizes it: the ability to adapt quickly and effectively to changes in global demand, all while taking advantage of the technological benefits and entrepreneurial spirit that has made us the Start-Up Nation.

However, the report also indicates that we have not made it through the crisis unscathed. There are clear indications that on average, small technology companies have been significantly more affected than larger companies. Many of these small companies lost experienced technology employees and recruited fewer new employees. While this damage to startups hardly registers in the short-term – the economic activity of these companies is not high in terms of GDP, profits, or employment – it has really negative consequences in the long run. This is because, some of the companies that did not survive the crisis, could have in the future become growth companies employing hundreds or even thousands of employees, yielding high productivity and wages.

Another prominent phenomenon this year has been the moderation of the “employee's market”, indicated by a decrease in the voluntary resignation of employees and their transfer between companies. Under the uncertain conditions that prevailed throughout the global economy in 2020, even employees with skills in high demand tended to remain in more secure and stable positions.

The distress of companies on the one hand, and a decrease in the “frenzy” of employees on the other hand, led to a decrease in demand for employees relative to previous years. Nevertheless, the demand for employees still remains higher than the existing supply, despite a significant and welcome increase in the number of students pursuing high-tech studies in academic training frameworks.

The fact that the demand of human capital in high-tech remains high even in a year of global crisis suggests that the shortage is chronic. As we presented in The New Digital Age report published by Start-Up Nation Central in September 2020, we expect the demand for technological solutions will only increase. This will result in a corresponding increase in the demand for employees capable of developing such solutions, both in the high-tech industry and in other industries undergoing digital transformation. Moreover, the rise in valuations of Israeli high-tech companies and the shift in investment from the physical economy to the digital economy created the potential for rapid growth in demand in 2021, especially against the backdrop of the expected end to the health crisis.

The way to bridge this chronic shortage is through systemic and cross-sectoral work to produce solutions that can be widely implemented. In recent years, Scale-Up Velocity (from Start-Up Nation Central's “family”) has specialized in developing such solutions, especially among underrepresented populations in high-tech. Apart from the social aspect of integrating of these populations, they represent the main potential for increasing the supply of high-tech employees. Without the large-scale integration of women, Arabs and the ultra-Orthodox population in high-tech, the primary growth engine of the Israeli economy will be without fuel, and the negative impact will far exceed the tech industry's relative size in the economy.

Unfortunately, the report shows that the positive trend of the last few years regarding the integration of these populations diminished in 2020. This result is disappointing but not surprising. Economic crises are characterized by an increase in risk aversion and a convergence to the familiar and safe course of action. This is reflected both in the reduction in willingness to absorb employees from diverse backgrounds and in the reluctance of employees from these backgrounds to look for work in an unfamiliar environment during a health and economic crisis. I sincerely hope that this is only a temporary setback, and that in parallel with the return to normalcy after the pandemic, the integration of underrepresented populations in high-tech will also return to the positive trend present on the eve of the crisis.

As in every year, I would like to thank all of those who co-wrote this report: the employees of Start-Up Nation Central and Scale-Up Velocity, and especially Uri Gabai, Eynav Ehrlich and Gily Maor. We would also like to thank our partners, in the Central Bureau of Statistics; the Ministry of Labor, Welfare and Social Services; and the Zviran company. Special thanks are of course reserved for the staff of the Israel Innovation Authority and to its Chairman, Dr. Ami Appelbaum.

FOREWORD: DR. AMI APPELBAUM,

CHAIRMAN OF THE BOARD OF THE ISRAEL INNOVATION AUTHORITY AND
THE CHIEF SCIENTIST



The year 2020 was one of severe global health and economic crisis due to the coronavirus pandemic, which did not leave the local high-tech industry unscathed. As can be seen in this report, at the outbreak of the crisis, high-tech companies in Israel responded by taking steps to reduce their workforce, mainly due to the uncertainty that prevailed at the time. However, the high-tech industry recovered very quickly

and contributed greatly to reducing the annual decline in gross domestic product. Moreover, despite the complexity of this year, the high-tech industry continued to grow and now employs more than 334,000 employees, which is 9.76% of the total workforce – a record figure that indicates the contribution of this industry to the growth of the economy.

Private capital raising also broke records: about \$11.5 billion raised last year, indicating a 25% increase in invested capital compared to 2019, along with the conversion of 15 additional startup companies into unicorns. This data indicates the resilience of Israeli high-tech, also in the eyes of investors around the world. There is a real opportunity to increase the number of high-tech employees in research and development and surrounding positions. This is an urgent national task in the interest of sustainable economic growth.

The Innovation Authority operated this year with a variety of new and flexible tools on two major financial and employment fronts to strengthen the local high-tech industry in the face of the coronavirus crisis. On the financial side, at the beginning of the crisis, the Authority quickly launched a program designed to make cash flow assistance accessible to companies whose technological and business assets ran into a cash flow shortage due to the crisis, enabling these businesses to overcome the issue. In this context, the Authority distributed 283 grants totaling approximately NIS 650 million.

The Authority also launched a program to strengthen investments in the early stages of pre-seed and seed rounds to encourage venture capital firms to make seed investments in high-risk, early-stage startups. The goal was to increase the number of startups in the local market, that are expected to become the future growth companies that will employ thousands of employees in high-productivity positions.

Furthermore, in order to help companies finance their growth stages and become whole companies, a new program was launched to encourage investment by institutional entities in the high-tech industry in collaboration with the Ministry of Finance and the Capital Market Authority. This program provides a safety net for the institutional entities when investing in high-tech companies that grow at an investment volume of NIS 2.5 billion, which constitute 40% of the total investment, resulting in an inflow of some NIS 5 billion that will enable the growth of high-tech companies.

On the employment front, in response to rising unemployment, the Authority, in cooperation with the Ministry of Finance, the Training Administration and the Ministry of Economy, launched an emergency program for training and rapid placement in high-tech professions. Within this framework, the Authority has distributed financial grants in the amount of some NIS 125 million to 47

training entities and companies that will train approximately 6,000 employment seekers for high-productivity technological positions in the high-tech industry.

Furthermore, in the past year a “High-Tech Human Capital Fund” program was launched to encourage innovative solutions that come from the market to meet the challenges of high-tech human capital. As part of this program, the Authority issued a call for proposals to address unemployment due to the coronavirus pandemic, to promote underrepresented populations in industry and the periphery and to integrate immigrants and returning residents with experience in local high-tech. As part of this initiative, the Authority distributed approximately NIS 19 million for the training and placement of some 2,800 participants in research and development positions.

The chronic shortage of skilled high-tech personnel has continued into this year as well. Today there are currently about 13,000 technology job openings that companies are finding difficult to fill. In light of this, the Societal Challenges division of the Innovation Authority will continue to work to address the problem with a variety of tools and in full coordination with industry and the government. In recent years we have witnessed the various efforts to diversify high-tech employees geographically and demographically through the integration of people from underrepresented populations, including women, the ultra-Orthodox population, Arab society, Ethiopians, and people with disabilities.

This is a very important channel for realizing the potential inherent in these populations and as a response to the shortage of skilled manpower. However, in recent years there has been no significant change in this trend, and therefore efforts to integrate them should be increased. As such, the Innovation Authority, as part of the programs in operation this year, emphasized the integration of people from these populations and gave financial grants totaling some NIS 26 million to training and placement programs that focus on these populations and that will train some 2,100 participants.

In addition, during the past year, as part of the Research and Development Fund program, startup companies owned by women, minorities and the ultra-Orthodox received grants amounting to NIS 54 million. We believe that, in the future, such startup companies will become employment generators that will greatly help to integrate underrepresented populations in high-tech. We hope that next year the Authority's efforts to promote these populations will bear fruit, along with the activities of other government, industry and third-sector entities active in this respect.

This year has demonstrated the importance of the Innovation Authority's activity in promoting and developing the high-tech industry in Israel and in providing a quick and flexible response to the challenges arising from the market. The Innovation Authority will continue to operate in full cooperation with the industry and various government agencies involved in increasing employment and high productivity for the continued growth of the high-tech industry and the country's economy. I would like to take this opportunity to thank the nonprofit organization Start-Up Nation Central, led by Professor Eugene Kandel and his team, and Zviran company for their joint, comprehensive, and professional work in publishing this important report for the third consecutive year. I wish us all a speedy and full recovery from the crisis and increased growth of the local high-tech industry in the year 2021.

EXECUTIVE SUMMARY

This report is based on data from the Central Bureau of Statistics (CBS); the Israel Innovation Authority; the Planning and Budgeting Committee at the Council for Higher Education; the Labor Branch of the Ministry of Labor, Social Affairs and Social Services; Start-Up Nation Central's Finder database (SNC Finder); and a survey sent to a sample of high-tech companies in December 2020, in collaboration with Zviran. Participating in the survey were 292 high-tech companies with more than 100 thousand employees, comprising about one-third of the industry's workforce. The report also incorporates data from other surveys conducted by Zviran.

Employment in the high-tech industry showed stability in an extremely challenging year. Despite the coronavirus pandemic, the number of employees in high-tech showed a moderate 0.6% annual increase. High-tech companies and employees were certainly affected in the second quarter (which included the first lockdown), amid great uncertainty and with many employees sent on leaves of absence. However, the industry quickly recovered in the third quarter and the number of employees grew once again.

The impact of the crisis was not uniform across the Israeli high-tech ecosystem – different companies and sectors were affected to varying degrees. The data shows that smaller companies were affected the most: they were more likely to have frozen recruitment, faced a decrease in the number of experienced employees, and significantly reduced their demand for tech positions in relation to their workforce.

There were also significant differences between the various technological sectors. The three sectors that showed the highest annual growth in number of employees (ranging from 3.5% to 5.2%) were software-based, while companies in hardware-based sectors such as telecommunications and manufacturing reduced their workforce by around 3% on average.

There were close to 13,000 open tech positions at the end of 2020, approximately 40% decline from July 2019 (with about 19,000 open positions). This decline is partially due to a significant decrease in the number of high-tech employees who voluntarily resigned - 2020 marked the lowest rate of voluntary resignations in the past seven years. However, the shortage of experienced employees and difficulties in recruiting employees to high-tech's core positions remained high: about 60% of the surveyed companies reported difficulties in recruiting employees for R&D

positions.

Internet and software companies, which recovered rapidly and even showed growth throughout the crisis, reported the highest demand for employees out of the overall number of open positions, and their relative share even slightly increased in comparison to the previous year.

Multinational corporations overcame the crisis more easily, with only about one-third reporting being harmed by the coronavirus pandemic, in comparison to two-thirds of Israeli-owned companies. (These figures largely correlate with the fact that multinational corporations are larger companies). In addition, multinational corporations were less likely to send employees on leaves of absence. Moreover, there are indications that they tended to replace less experienced employees with more experienced ones throughout the year.

A challenge that we have noted in previous reports is the integration of underrepresented populations in high-tech. This report presents indications that the coronavirus period halted the positive trends of recent years that had led to the increased integration of women, Arabs and the ultra-Orthodox community in high-tech. Thus, in 2020 there was an alarming decline in the number of women who founded technology companies in Israel; there was stagnation in the ratio of ultra-Orthodox employees out of all high-tech employees, following five years of continuous increase; and the share of Arab women out of the overall number of Arab high-tech employees fell by ten percentage points, from 42% to 32%.

Survey limitations prevented us from presenting a sufficiently clear picture on the employment of juniors (employees with up to two years of experience). However, it appears that the coronavirus pandemic did affect companies' willingness to employ them: along with a 24% decrease in the number of juniors employed in companies that reported being "severely harmed" by the crisis, there was a 37% increase in the number of juniors in companies that reported being positively affected by the crisis. In this matter as well, there are considerable variations between the technology sectors. In the internet and software sector, about 20% of the employees are juniors, while in more veteran sectors, such as telecommunications and industrial manufacturing, juniors comprise 4% and 7% of the total workforce, respectively.

In addition to providing an analysis of employment in the high-tech industry, this report also outlines the programs and efforts of the government and civic organizations to deal with both the chronic shortage of employees and the effects of the coronavirus pandemic on high-tech companies.

METHODOLOGY

This report is based on data from the Central Bureau of Statistics (CBS); the Israel Innovation Authority; the Planning and Budgeting Committee at the Council for Higher Education; the Labor Branch of the Ministry of Labor, Social Affairs and Social Services; Start-Up Nation Central's Finder database (SNC Finder); and a survey sent to a sample of high-tech companies in December 2020, in collaboration with Zviran. Participating in the survey were 292 high-tech companies with more than 100 thousand employees, comprising about one-third of the industry's workforce. The report also incorporates data from other surveys conducted by Zviran.

Unless otherwise stated, all data presented in the report are based on analysis of the human capital survey performed by Start-Up Nation Central and the Innovation Authority. We did not include in the report findings based on questions to which the response rate was very low. Conclusions drawn from the sample regarding the high-tech population were weighted based on the CBS' quarterly averages of number of employees in high-tech; employees on unpaid leave were not counted in these calculations.

Although we made efforts to filter out questions for which the composition of the answers did not reflect the population of high-tech companies in Israel, it should be taken into account that the survey includes a built-in "survival bias" – only companies that were active at the end of the year participated in the survey. As a result, the survey does not reflect the situation of companies that did not overcome the crisis (these are naturally mainly small companies). Moreover, as shown in Table 1, which compares the degree of representation of the survey sample and the population of high-tech companies in the Finder database, the survey sample underrepresents small and local companies.

It should also be noted that high-tech definitions are not always uniform and different entities use different definitions. Thus, there are some differences in the data presented by different organizations. In this report, we will refer to the 6,500 companies listed in the SNC Finder database as the population of high-tech companies, excluding communication services. But in diagrams based on data from the labor branch of the Ministry of Labor, Welfare and Social Services (in the chapter on underrepresented populations), the definition of high-tech includes communication services.

Table 1: Survey Sample Representation by Sector, Size, and Ownership

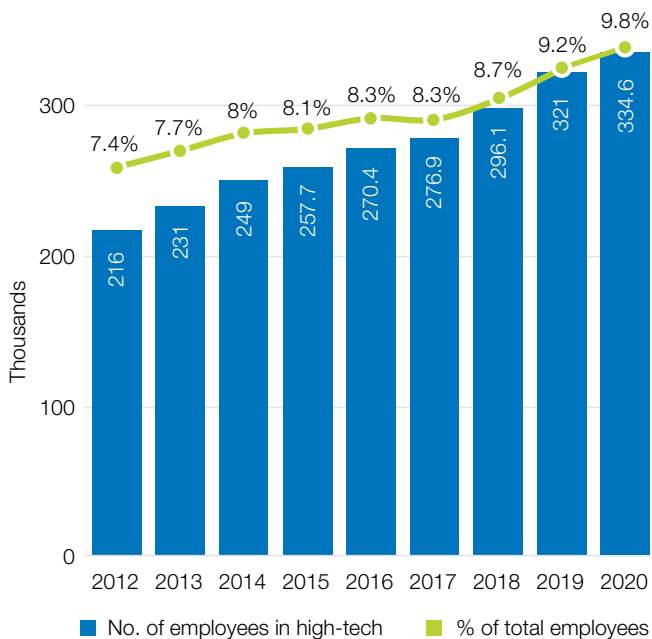
		Number of Companies		Number of Employees	
		Population (Finder)	Sample	Population (Finder)	Sample
Sector	Internet / Software / Enterprise Solutions	49%	50%	43%	36%
	Life Sciences – CleanTech	32%	24%	19%	7%
	Manufacturing – Industrial	14%	18%	31%	49%
	Telecommunications	5%	8%	7%	8%
Size	1-10	53%	24%	4%	0.4%
	11-50	31%	21%	13%	1%
	51-200	12%	26%	22%	8%
	201-500	3%	15%	16%	13%
	500+	1%	14%	45%	77%
Ownership	Standalone Local Firm	93%	76%	74%	65%
	Multinational Corporation	7%	24%	26%	35%
	TOTAL	100% (4,666)	100% (292)	100% (256,444)	100% (109,355)

MACRO OVERVIEW: STABILITY IN A TURBULENT YEAR

Employee headcount – a moderate increase throughout the year

Despite the coronavirus crisis, the number of employees in Israeli high-tech increased and held at an average of approximately 334 thousand in 2020. The rate of high-tech employees out of all employees in the workforce continued to increase, reaching a peak of 9.8%. However, part of the increase in the rate of high-tech employees in relation to the workforce can be attributed to a decrease in the “denominator” – the total number of employees in the workforce.

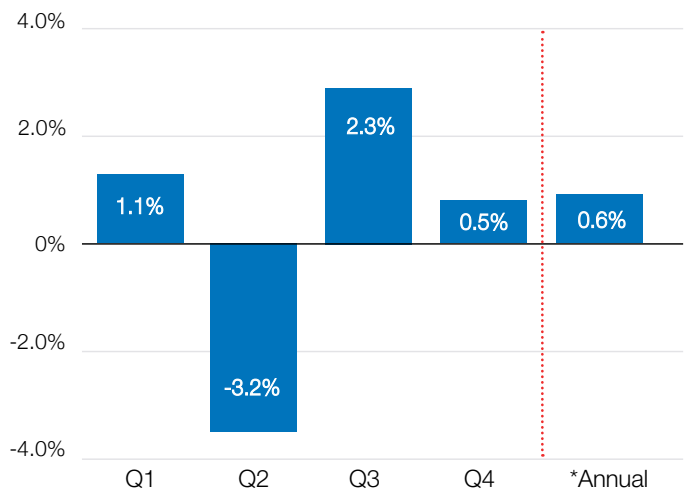
Figure 1: Number of High-Tech Employees and Their Share of the Labor Force



CBS data after adaptation by the Israel Innovation Authority, in thousands, excluding telecommunication services

However, looking at averages in such a volatile year can be misleading. A comparison between the number of employees in the fourth quarter of 2020 and the fourth quarter of 2019 shows only a moderate increase of 0.6% throughout 2020, indicating that despite the high-tech industry’s relative strength, it was not spared by the coronavirus crisis. The quarterly analysis (Figure 2) shows that the second quarter of 2020, with the application of social distancing restrictions and the first lockdown, was particularly severe and characterized by the transfer of many employees to unpaid leave, though at a much lower rate than for the entire Israeli workforce. However, immediately in the following quarter, most of the employees on unpaid leave were reinstated and the number of employees in the industry increased again.

Figure 2: Growth in Number of Employees in 2020



*The annual rate is a comparison between Q4 2019 and Q4 2020.

Source: CBS, QoQ

Employee turnover – more layoffs, fewer voluntary resignations

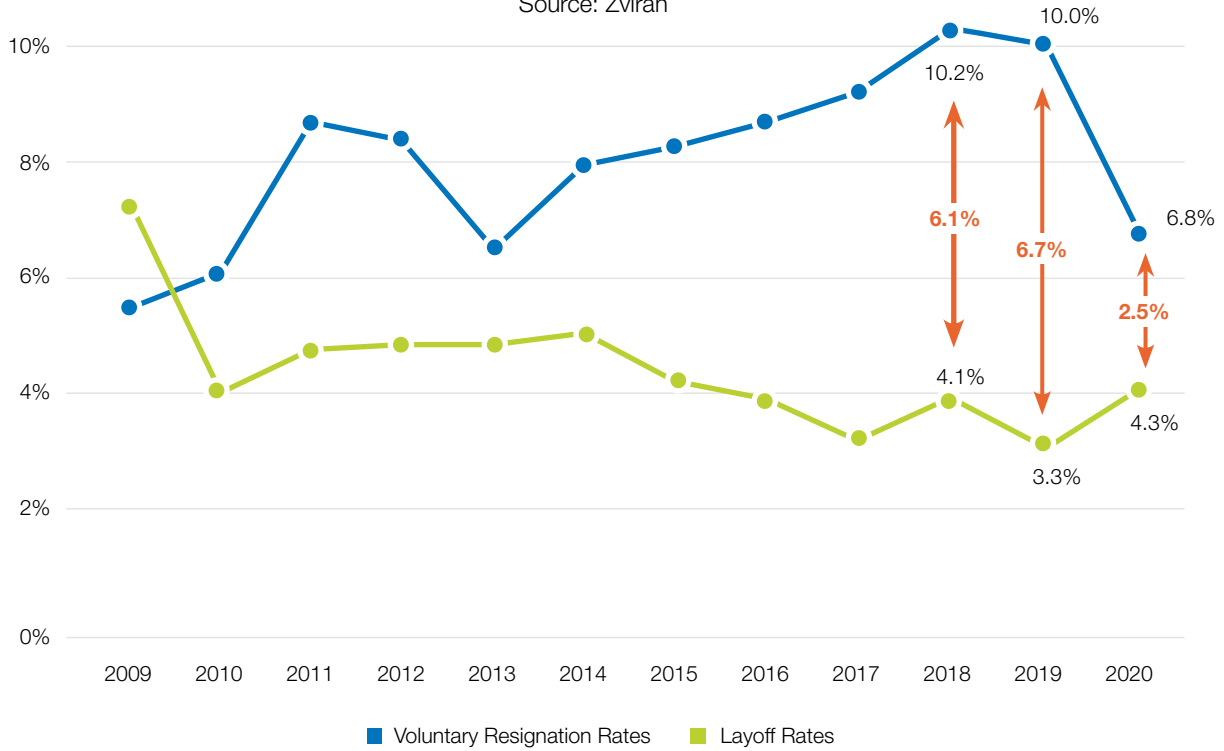
A significant change compared to recent years was the decrease in the rate of voluntary resignation. This change explains part of the decline in demand for employees, which is divided between the will to increase the workforce and the need to replace an employee who was fired or chose to resign. During periods of prosperity in high-tech, employees who choose to resign and move to another company are a significant driver of recruitment. In contrast, in a year in which uncertainty is high, as was the case in 2020, employees are less likely to resign.

Accordingly, the rate of voluntary resignation has been at its lowest level in the last seven years, falling by more than three percentage points compared to 2019. The rate of layoffs increased by one percentage point compared to last year but did not significantly exceed the average figure for recent years. It should be noted that this figure is biased downward, both because the survey data do not take into account companies that closed and laid off all their employees, and because there is an over-sampling of large companies that were less affected by the crisis, as will be further examined below.

1 This figure compares the fourth quarter of 2020 against the fourth quarter of 2019, compared to the data in Figure 1, which shows the rate of change between the average number of employees throughout 2020 compared to the average number of employees throughout 2019.

Figure 3: High-Tech Turnover - Voluntary Resignations vs. Layoff Rates

Source: Zviran

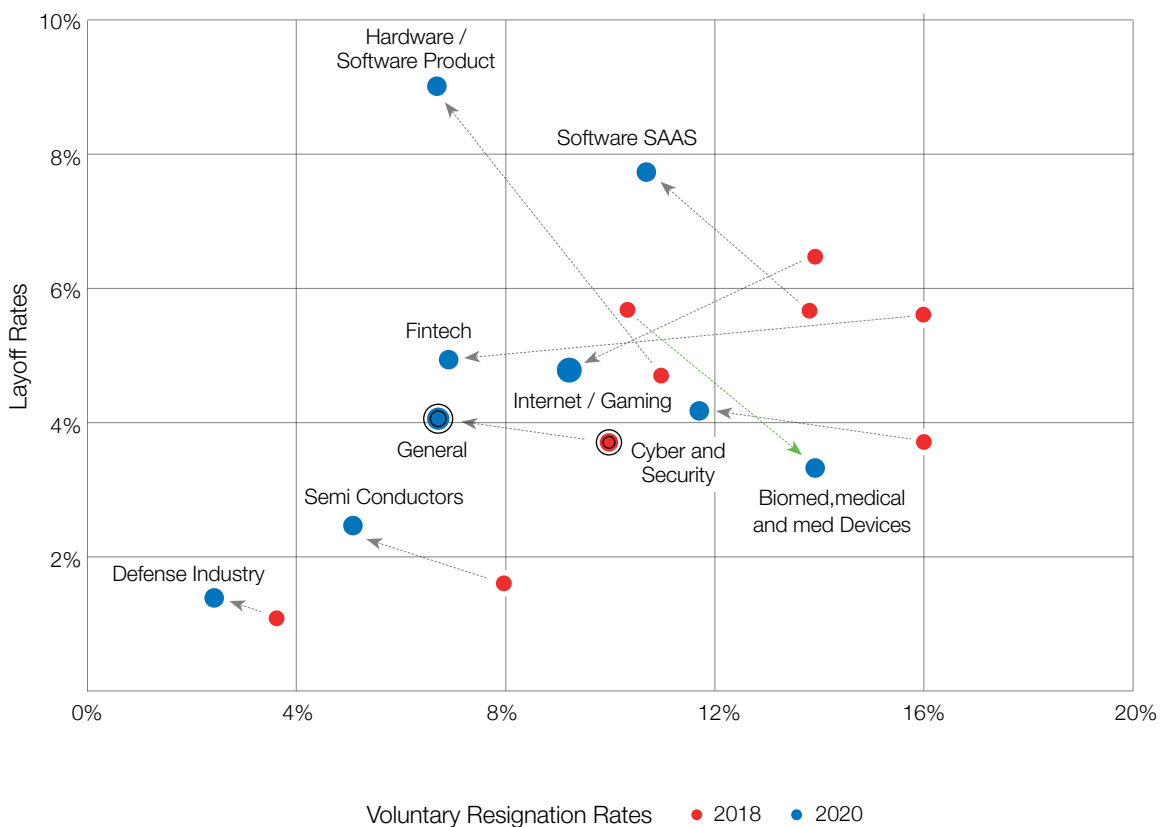


An examination of these data by sector is presented in Figure 4, which compares the rate of voluntary resignation against the rate of layoffs between 2018 and 2020. In most sectors, the proportion of employees' resignation decreased in the face of an increase in the rate of layoffs (shifting left and up in the graph). A notable exception to this trend is the biomed, medical and

medical devices sector, which shows signs of an "employee's market" in which a decline in the layoff rate exists alongside an increase in the voluntary resignation rate (shifting right and down in the graph). This trend may be due to increased demand for solutions to the global medical crisis and the shift of employees to companies providing such solutions.

Figure 4: Turnover - Voluntary Resignations vs. Layoff Rates by Sector

Source: Zviran, Zviran Categories



THE IMPACT OF THE COVID-19 PANDEMIC ON COMPANIES

The impact of the crisis was not uniform across the high-tech sector. Different companies and sectors were affected differently and hence reacted in different ways. In general, large companies, multinational companies and companies in software-driven sectors were less affected, which was reflected in their higher demand for employees and higher growth in the number of employees.

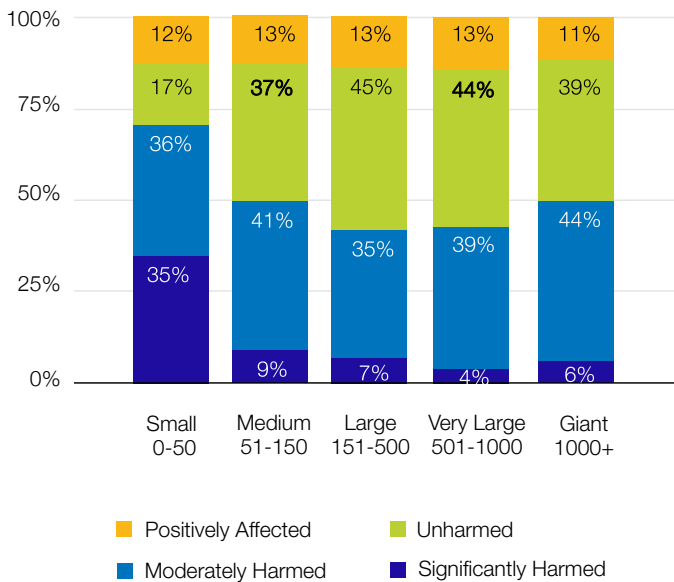
Company size – small companies suffered the most

Small companies were the ones primarily affected by the coronavirus crisis in the Israeli high-tech. Startups, especially in the early stages, rely on investment rounds and access to first clients, usually overseas. In the first months of the coronavirus pandemic, these two channels of activity were hampered, contributing to the difficulties experienced by many small companies.

In response to the question regarding the extent of impact of the coronavirus on business activity, all companies with more than 50 employees reported being negatively affected by the crisis at similar rates (40% to 50%), compared to 70% in small companies (Figure 5). The significant difference is in the percentage of companies that reported being significantly impaired: 35% of small companies compared to 4% to 9% of other groups.

Figure 5: Impact of Crisis on Company by Size

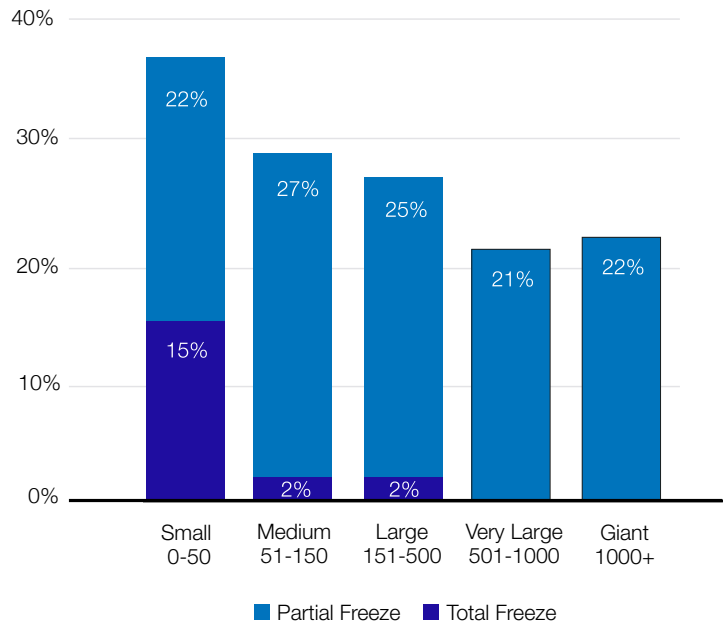
No. of companies that responded: 286



This distress manifested in, among other ways, the freezing of recruitments during the crisis. While in all size groups from medium and up, there were almost no reports of completely freezing recruiting (Figure 6), 15% of the small companies were forced to choose this path in the wake of the pandemic.

Figure 6: Changes in Recruitment Policy Due to Crisis by Company Size

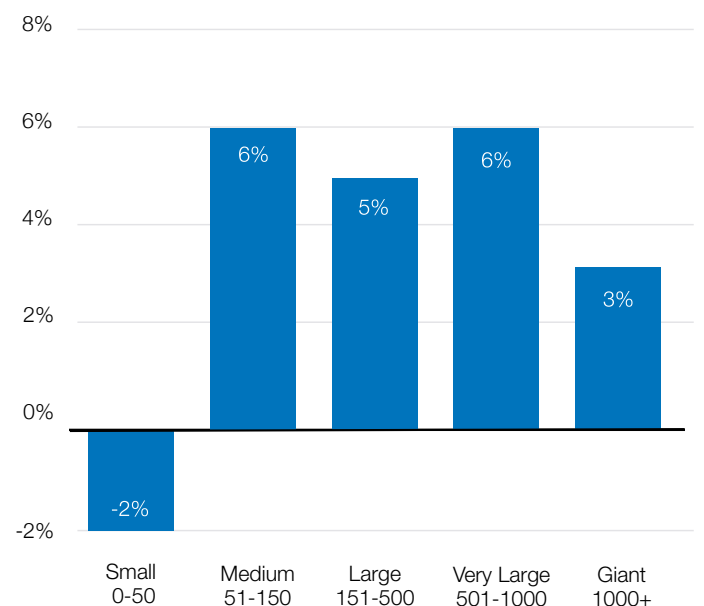
No. of companies that responded: 289



Small companies were also the only group to reduce their number of experienced technology employees (Figure 7). Due to the survival bias (see explanation in the Methodology section), it is likely that these data regarding small companies constitute an underestimation of what actually happened, as they do not take into account companies that were forced to shut down altogether (and therefore did not reply to the survey).

Figure 7: Annual Growth in Number of Experienced Tech Employees by Company Size

No. of companies that responded: 233



*Tech employees with over two years of experience.

Sectors – Software-based sectors gaining momentum

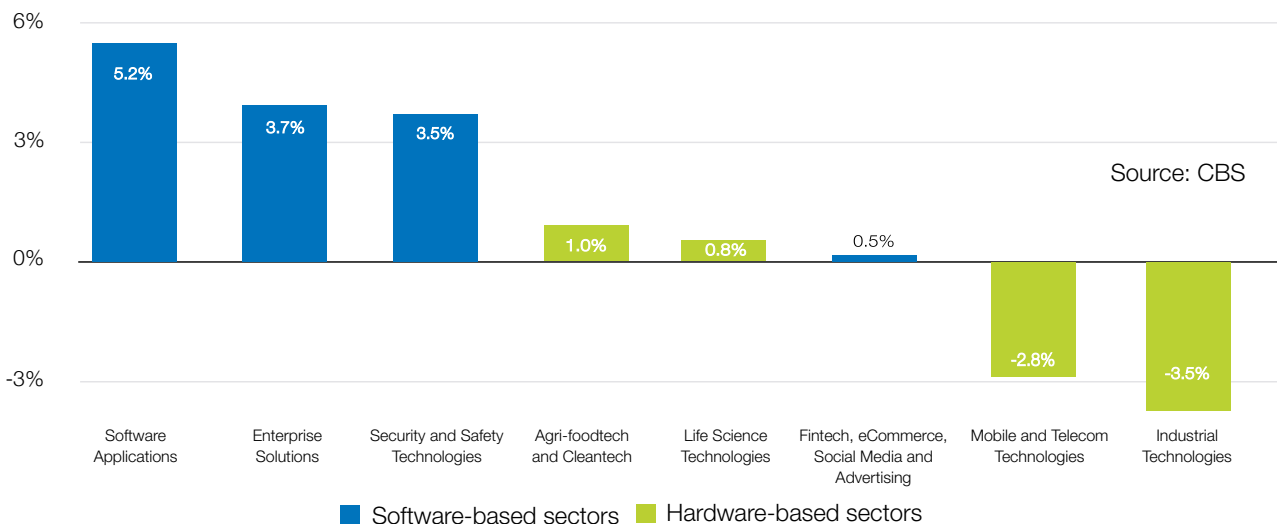
Social distancing restrictions due to the coronavirus pandemic separated between companies whose primary focus is software and companies with hardware-based products. As presented in [The New Digital Age report](#) published by Start-Up Nation Central in September 2020, the coronavirus crisis accelerated digitization processes in many sectors at the expense of physical activity. This acceleration was reflected in an increase in demand for software-based products and higher investments in these companies, and therefore they performed better during the pandemic.

In contrast, hardware-based companies suffered both from difficulty in maintaining work continuity during lockdown periods and from a limited ability to deliver and integrate physical products to customers abroad. To illustrate, in 2020 equity investments in software-based

sectors² increased by \$1.5 billion, representing 27% growth YOY. In contrast, in the hardware-based sectors³ investment increased by \$450 million, representing 19% growth compared to 2019.⁴

The employment consequences of this trend were that the three sectors with the most significant workforce growth were software-based, while the two sectors that showed a significant decrease in number of employees were communications and industrial technologies sectors, that mainly offer solutions that include physical components (Figure 8). Moreover, the discrepancy in favor of software-based companies occurred even though the companies in these sectors were smaller on average. This should, as we explained, have reduced on average, their business performance and therefore their number of employees.

Figure 8: Annual Growth in Number of Employees by Sub-Sector

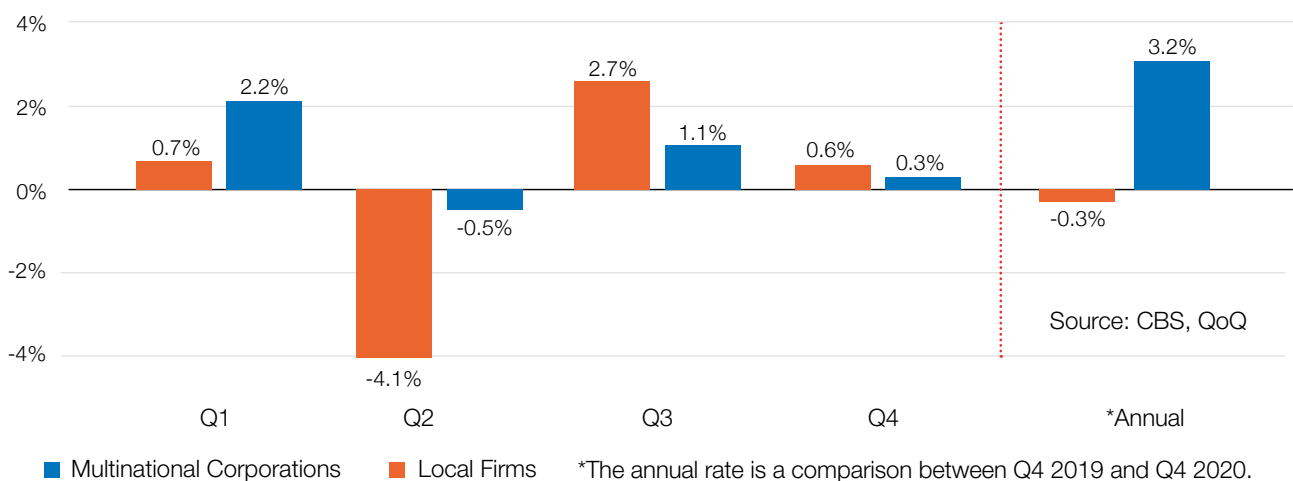


*The annual rate is a comparison between Q4 2019 and Q4 2020.

Type of ownership – multinational companies were more stable than Israeli-owned companies

As shown in Figure 9, multinational companies demonstrated greater stability in 2020. Even during the second quarter, when many employees were placed on unpaid leave, much of the decline was in locally owned companies, while multinational companies recorded only a minor decline (yet in the following quarter the “adjustment” reported by multinational companies was also smaller). This result is not surprising as multinational companies are usually larger and enjoy solid financial backing from parent companies, which enables them to survive such difficult times. In contrast, some Israeli companies (mainly start-ups), did not survive the first months of the coronavirus pandemic.⁵

Figure 9: Growth in Number of Employees in 2020, by Company Ownership



*The annual rate is a comparison between Q4 2019 and Q4 2020.

² Software applications, enterprise solutions, security technologies (cyber), FinTech, eCommerce, social media and advertising.

³ AgriFood-tech, CleanTech, life sciences, mobile and telecom, industrial technologies.

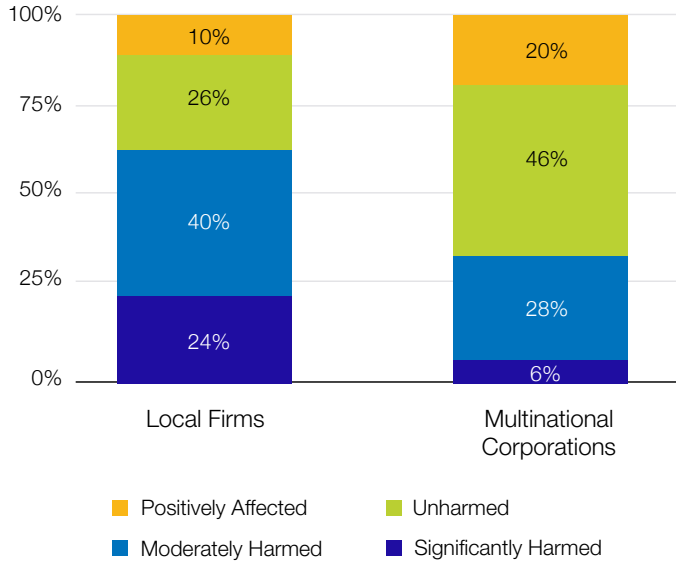
⁴ Source: SNC Finder data after adaption by SNC.

⁵ In the survey data, it is not possible to distinguish between the effect of the type of ownership and the effect of small companies (most of which are Israeli-owned).

Support for this finding can be found in the answers to the survey question regarding the extent of the effect of the coronavirus. Only about one-third of multinational companies reported being negatively affected, to either a large or small extent, compared to about two-thirds of Israeli-owned companies (Figure 10).

Figure 10: Impact of Crisis, by Ownership Type

No. of companies that responded: 286



There is also data to support the claim that multinational companies have replaced less experienced manpower with experienced employees this year. The survey shows that in 2020 these companies increased their number of experienced technological employees by 2% but reduced the number of technological juniors (employees with up to two years' total experience) by 3%.

Another indication of this phenomenon is the comparison between unpaid leave policies and layoffs (Figure 11). The multinational companies used the option to send employees on unpaid leave very modestly, but fired relatively more employees. In contrast, about a third of Israeli companies used the option of placing employees on unpaid leave. Naturally, layoffs in companies that are not in financial distress are made in order to improve the workforce and so this figure is another indication of a deliberate strategy. It should also be noted that the percentage of companies that laid off employees is largely explained by the size of the company – small companies were the only size group that laid off employees at relatively low rates (29% compared to over 77% in other size groups).

Figure 11: Percentage of Companies that Laid Off or Placed Employees on Leave of Absence, by Ownership Type

No. of companies that responded: 287



THE DEMAND FOR EMPLOYEES IN THE HIGH-TECH INDUSTRY

In the human capital report published last year, we presented a variety of indications of a shortage of skilled high-tech personnel. In light of this unique year, the question arises: does the excess demand over supply still exist? In other words, have we moved from an employee's market to an employer's market?

The indications that emerge from the survey show that, despite the coronavirus crisis, there is still a significant shortage of technological employees, but the demand for these employees has been somewhat moderated. The survey data (after weighting the sample according to CBS data), indicate that in December 2020, the number of open technology jobs stood at 13,000, a decrease of approximately 40% compared to July 2019 (with about 19,000 open positions).

Table 2: Estimates of Open Tech Positions

December 2020	July 2019	July 2018
13,000	18,500	17,000

The data in this table is based on the average number of estimates according to different weighting methods for CBS data on the Finder population (by company size, sector, ownership and occupation).



Further examination of the composition of demand by company size, indicates a decrease in the share of small companies out of the total demand, and the growth of medium-sized companies (51 to 200 employees) at their expense (Figure 12).

Figure 12: Distribution of Open Tech Positions, by Company Size

2019 & 2020 Human Capital Surveys by high-tech population weighted

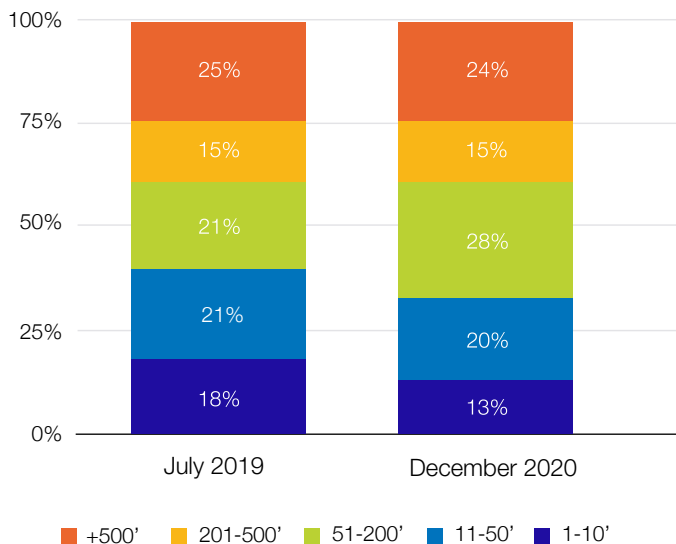
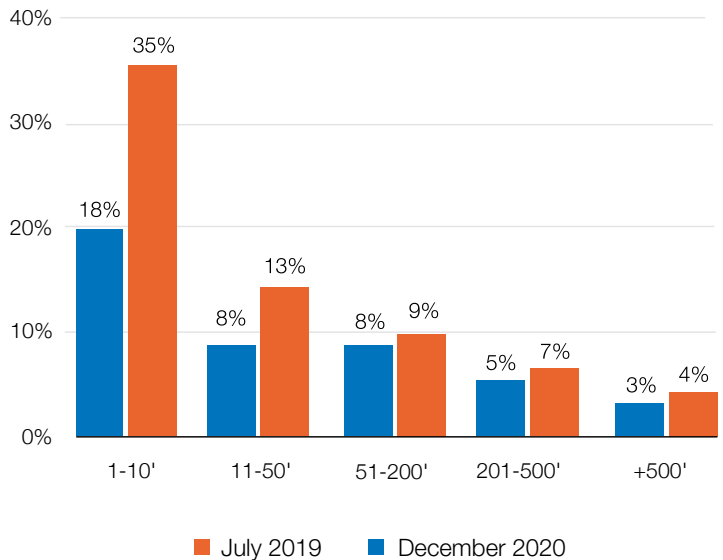


Figure 13: Ratio of Open Tech Positions to Current No. of Employees, by Company Size

Source: 2019 & 2020 Human Capital Surveys

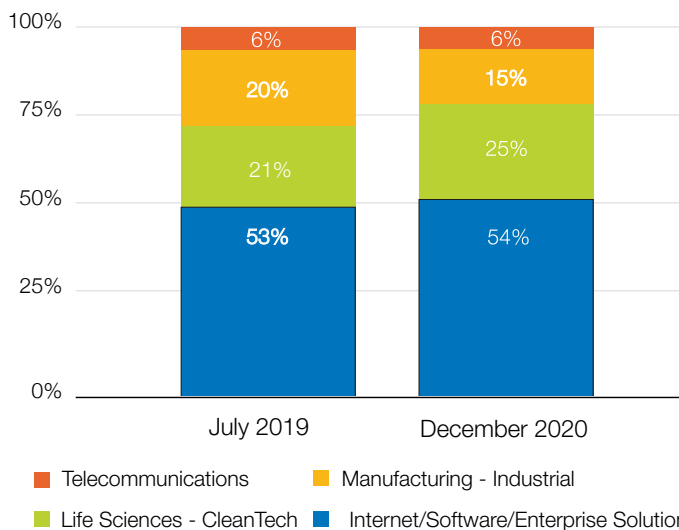


This being the case, small companies have significantly reduced the demand for technology jobs relative to their workforce. A comparison between December 2020 and July 2019 shows that the rate of open technology jobs in relation to the workforce has decreased for all company size groups, but for the smallest companies it has been cut in half, from 35% to 18%. While the overall reduction can

As explained in the previous section, software-based companies overcame the pandemic crisis more easily. Accordingly, internet and software companies retained the highest demand for employees, and their relative share increased slightly compared to the previous year. A further relative increase was recorded in the Life-Sciences and CleanTech companies, most likely due to increased demand for technologies designed to deal with the coronavirus pandemic (see Figure 4 regarding the strengthening of the “employee’s market” phenomenon in the Life-Sciences this year). The flip side is the manufacturing and industrial sector, which suffered more from the crisis, and accordingly saw its relative share fall by five percentage points.

Figure 14: Distribution of Open Tech Positions by Sector

2019 & 2020 Human Capital Surveys, by high-tech population

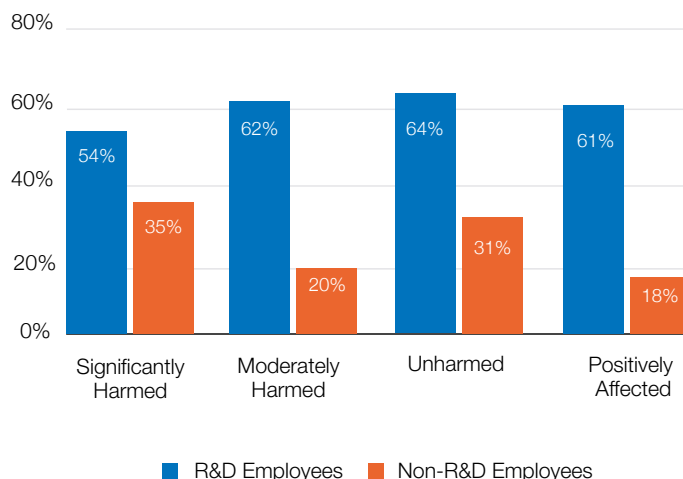


Despite the decline in the number of open jobs, the shortage and recruitment issues remain significant when it comes to the high-tech’s core - R&D. High-tech companies, which rely primarily on their technological advantage, tend to reduce recruiting of talented R&D employees only as a last resort. Indeed, about 60% of the companies in the survey reported that they had difficulty recruiting R&D employees. This rate does not change significantly based on the reported level of damage from the coronavirus crisis, an indication that the difficulty in recruiting did not stem from the company’s business situation, but mainly from a shortage of R&D employees’ talent. A comparison between locally owned companies and multinational companies reflects a similar picture, with rates of 61% and 65% respectively.

However, when we look at non-R&D recruitments, the picture changes. Only 25% of the companies reported difficulty in recruiting employees in these areas. It also appears that the difficulty in recruiting non-R&D employees was greater in companies that reported being more affected by the crisis – a possible indication that the difficulty in recruiting these employees was due to the companies’ business situation, and not necessarily a shortage.

Figure 15: Percentage of Companies that Encountered Difficulties in Recruitment by Level of Crisis Impact

No. of companies that responded: 225



It should be noted that difficulty in recruiting employees during the pandemic period may be due to reasons other than the shortage of R&D employees, such as a lower ability of companies that were hit hard by the crisis to compete for good employees, or an unwillingness of skilled employees to join companies experiencing difficulties. However, the small differences in the rate of companies reporting difficulties in recruiting technology employees indicates that the chronic employee shortage is the main reason.



POPULATIONS: A TEMPORARY HALT IN THE TREND TOWARD DIVERSITY IN HIGH-TECH

The data indicate that in 2020 there has been some slowdown in the positive trend of increasing diversity in high-tech. The representation of women, Arabs and the ultra-Orthodox community had been on a steady upward trend in recent years, however this trend halted in the past year. We hope that this is only a temporary phenomenon resulting from the limitations of the pandemic, the decline in total demand and a temporary increase in the risk aversion of companies and employees.

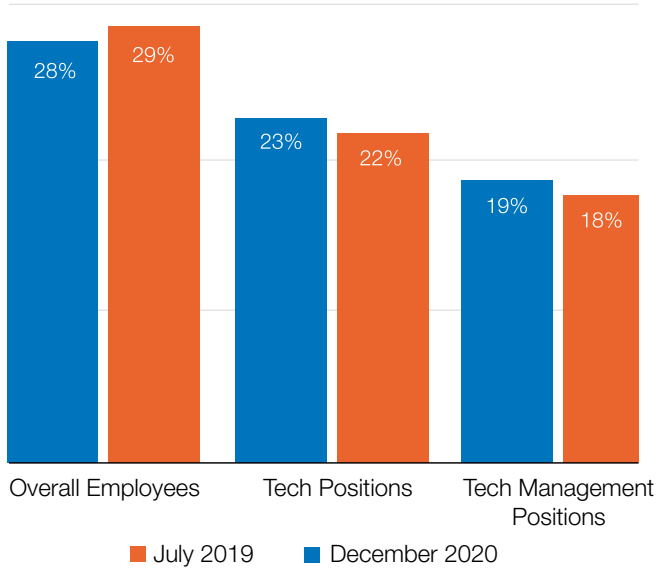
The transition to partial remote work, which has accelerated significantly following the onset of the crisis, poses a significant opportunity for the increased integration of underrepresented populations. Such models of hybrid employment will make it possible to bridge constraints arising from work-family balance, cultural barriers and geographical distance.

Women

According to the survey data, the overall share of women in high-tech was similar to the previous year and remained at 28%. There were also no significant changes in job analysis, with women accounting for 23% of all technological positions and 19% of technological management positions.

Figure 16: Representation of Women in High-Tech by Position

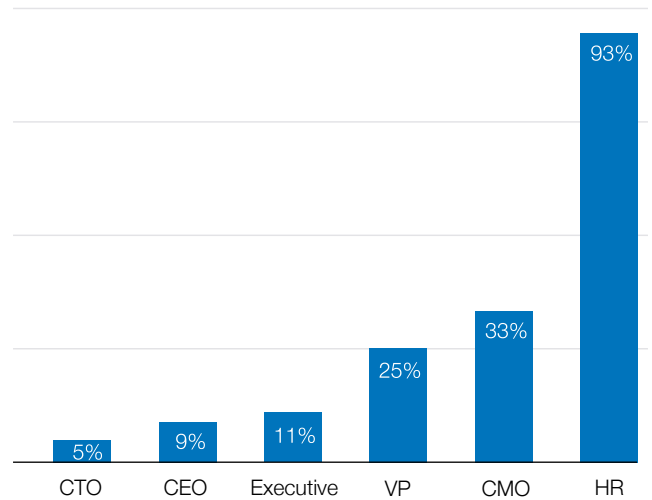
2019 & 2020 Human Capital Surveys



An analysis conducted by the Start-Up Nation Central research department of more than 20,000 key positions in high-tech companies provides additional indications of the underrepresentation of women in technology positions in general, and technology management positions in particular. For example, women made up about one-third of chief marketing officer (CMO) positions, but only 5% of chief technology officer (CTO) positions.

Figure 17: Women's Representation in High-Tech by Key Positions

Finder data after adaption by SNC, 20K management positions

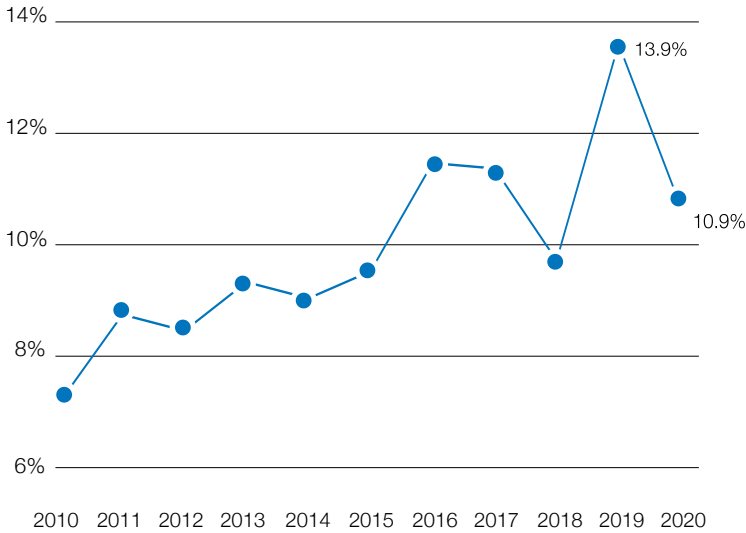


A welcomed trend in recent years has been an increase in the rate of entrepreneurship among women. Their share of all the founders of technology companies has almost doubled in the last decade, from about 7% at the beginning of the previous decade to approximately 14% in 2019. This trend was reversed in 2020 with the decline in women's representation to 10.9% of all entrepreneurs of new technology companies (Figure 18). In addition, this year just 4.5% of technology companies in Israel were founded solely by women, while 84.5% of companies were founded by men, and 11% of companies were founded jointly by men and women (at least one woman among the founders).



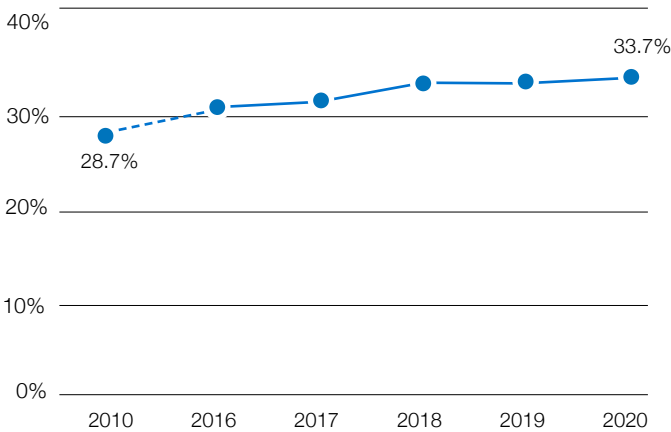
Figure 18: Women's Representation Among High-Tech Founders by Year Founded

Finder data after adaption by SNC, 7,544 founders



A notable positive trend is the proportion of women studying high-tech professions in institutions of higher education. In the last decade, the representation of women among all undergraduate students in mathematics, statistics and computer science has increased by about five percentage points (Figure 19). In absolute numbers, it has about doubled since the beginning of the last decade.

Figure 19: Women's Representation Among Undergraduates in Mathematics, Statistics and Computer Sciences

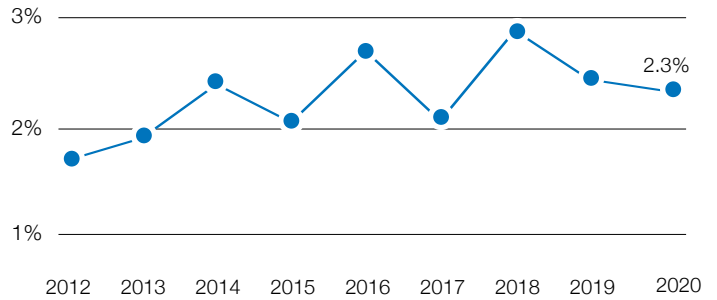


Source: Council for Higher Education in Israel

The Arab Population

The proportion of Arab high-tech employees, which had been on a moderate rise in recent years, fell slightly in 2020 (Figure 20). It is important to note that even after several years of increase, the proportion of Arab employees in high-tech is still less than 3%, while their proportion in the population stands at 21%.

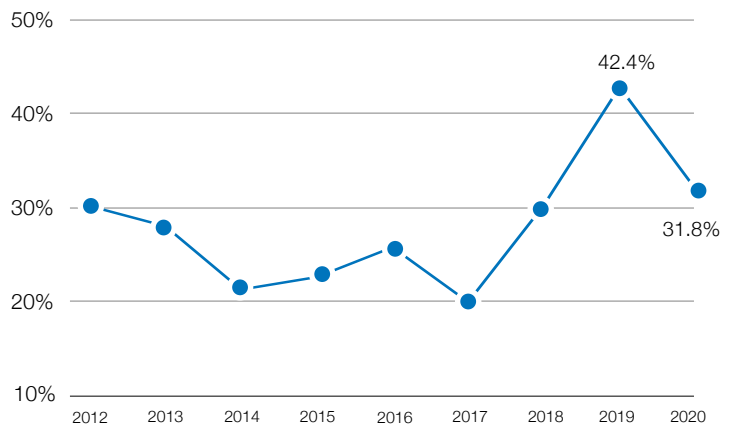
Figure 20: Share of Arab Employees in High-Tech Employment



Source: CBS data after adaption by Labor Branch of Ministry of Labor, Social Affairs and Social Services

In addition, the proportion of Arab women among all Arab high-tech employees rose from 20% to a peak of over 40% in 2019, but fell by 10 percentage points last year to approximately 30% (Figure 21).

Figure 21: Women's Representation Among Arab High-Tech Employees

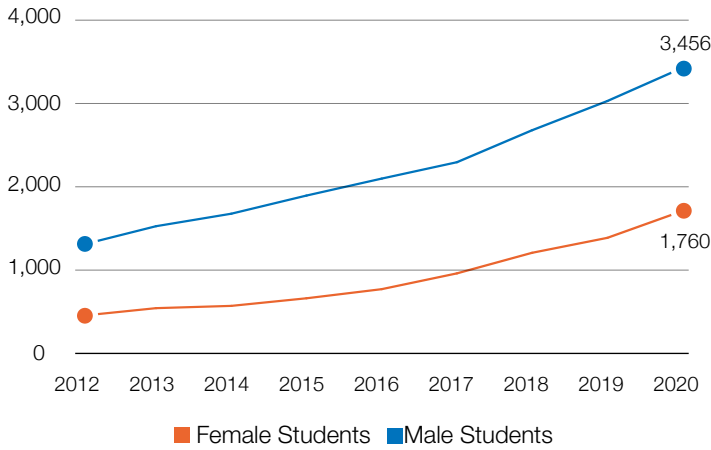


Source: CBS data after adaption by Labor Branch of Ministry of Labor, Social Affairs and Social Services



However, the potential for future growth appears high, as the number of Arab students more than doubled between 2012 and 2020 and the number of Arab female students more than tripled during these years. Moreover, the representation of Arab students in high-tech professions has increased impressively in recent years, and their share of total undergraduate students almost doubled between 2010 and 2020, from 7.2% to 12.8%.

Figure 22: Number of Arab Undergraduates in Academic High-Tech Studies



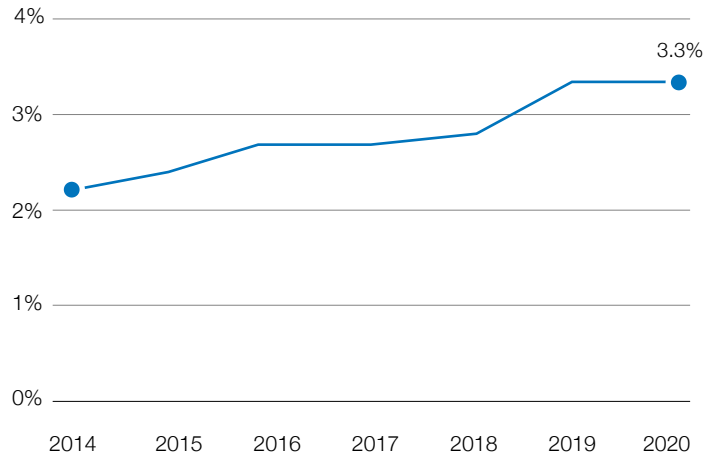
Source: CBS data after adaption by Labor Branch of Ministry of Labor, Social Affairs and Social Services

It is interesting to note, that the integration rate of high-tech industry graduates is similar between the Arab population and the Jewish population among university graduates (78% and 79% respectively). Yet there is a large gap between the populations among college graduates: 47% versus 64% in budgeted colleges and 54% versus 72% in non-budgeted colleges for Arab and Jewish graduates, respectively.⁶

The Ultra-Orthodox Population

The percentage of ultra-Orthodox employees out of all high-tech employees remained stable in 2020, after several years of continuous but moderate increase (Figure 23). The proportion of women among ultra-Orthodox employees has experienced a moderate increase in recent years, from 71.1% in 2018 to 73.5% in 2020.

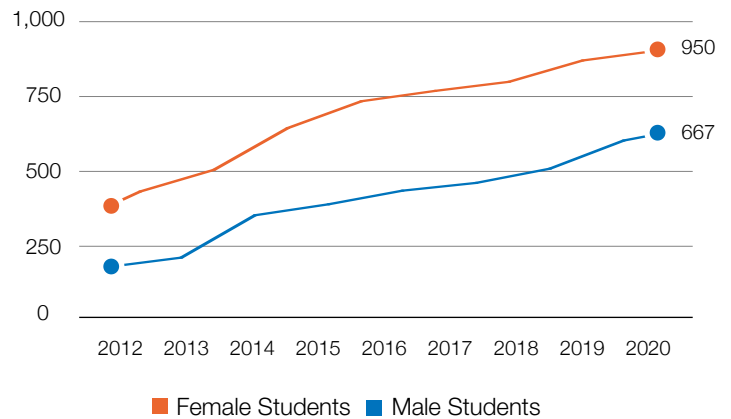
Figure 23: Share of Ultra-Orthodox Employees in High-Tech Employment



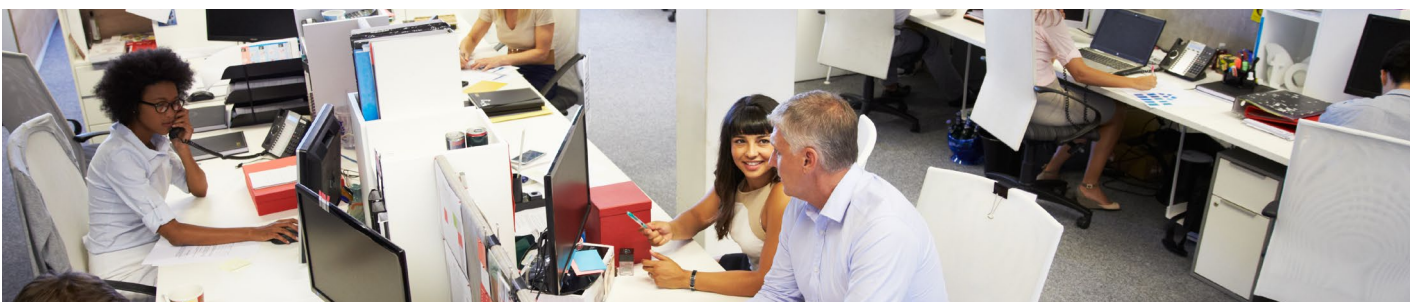
Source: CBS data after adaption by Labor Branch of Ministry of Labor, Social Affairs and Social Services

The number of male and female undergraduates from the ultra-Orthodox sector in high-tech studies has increased (Figure 24), as has their share among all students, which rose between 2012 and 2020 from 2.5% to 3.9%. Nevertheless, these rates are still low.

Figure 24: Number of Ultra-Orthodox Undergraduates in Academic High-Tech Studies



Source: CBS data after adaption by Labor Branch of Ministry of Labor, Social Affairs and Social Services

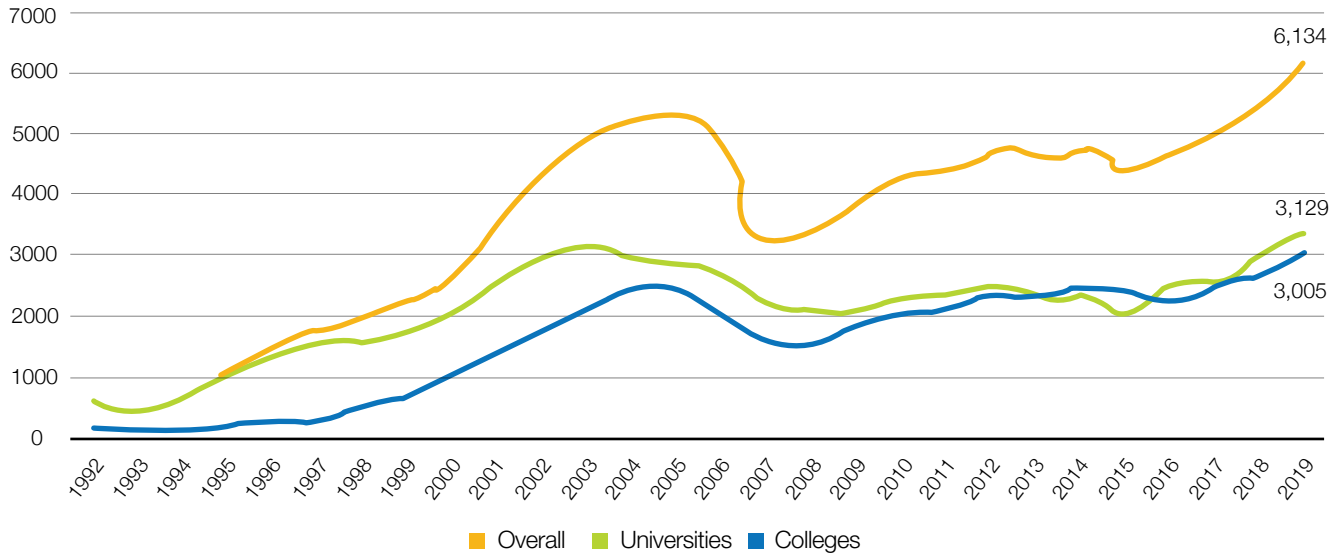


⁶ Processing by the Labor Branch at the Ministry of Labor, Social Affairs and Social Services for CBS data.

Juniors and Students

Any solution to the problem of the chronic shortage of employees requires the training and placement of new employees. Therefore, there is great importance both in the number of students graduating from academic institutions and non-academic training programs and in the willingness of high-tech companies to recruit inexperienced employees (juniors with up to two years of work experience). Indeed, while the number of high-tech students has grown impressively in recent years (Figure 25), many companies in the industry are still reluctant to recruit juniors.⁷

Figure 25: Number of Graduates from Academic High-Tech Studies
The Council for Higher Education in Israel



The coronavirus crisis has unevenly affected the employment of technological juniors. Companies that were largely affected by the crisis experienced an average reduction of 24% of juniors in their workforce, while companies that were positively affected increased their technological junior positions by about 37%.

Figure 26: Growth in Number of Junior Tech Employees in 2020 by Level of Crisis Impact
No. of companies that responded: 233

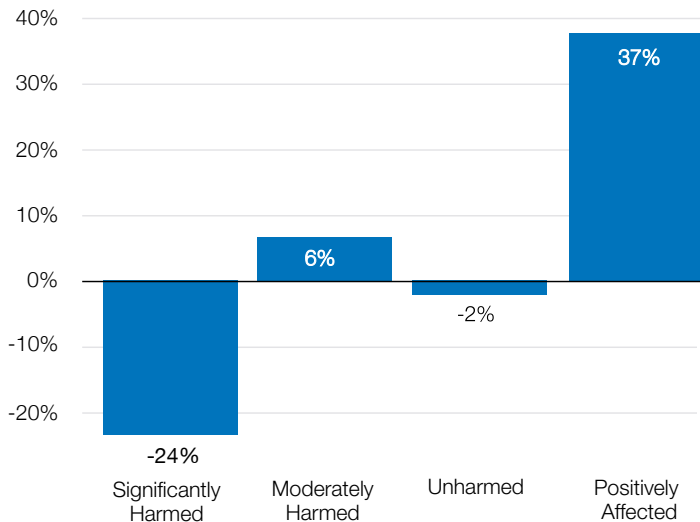
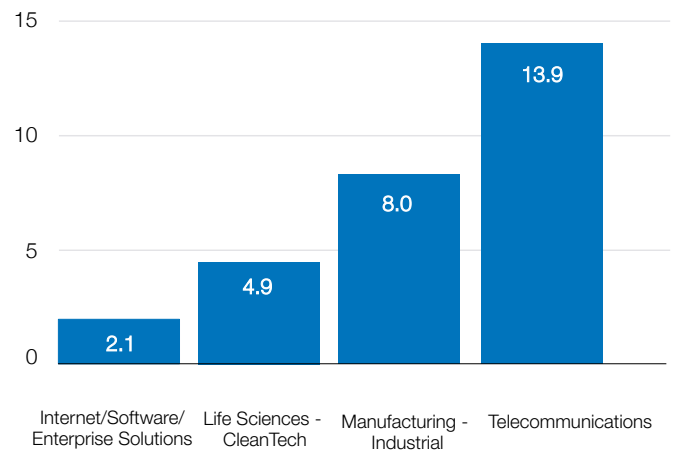


Figure 27: Ratio of Experienced to Junior Tech Employees in by Sector (as of Dec.2020)
Number of companies that responded: 233



Junior tech employees accounted, on average, for 11% of the survey's workforce, and 23% of its tech employees. The variance between these figures is low when examining by company size, or ownership type (local versus multinational). However, there is a high variance in these figures when examining them by sector.

For example, in the Internet/Software/Enterprise Solutions sectors there is a technological junior for every two experienced technological employees, while in the Telecommunications sector there are 14 experienced technological employees for every single technological junior.

⁷ An extensive analysis of this phenomenon can be found in the 2019 Human Capital Tech Industry Report.

New Activities of the Innovation Authority in the Field of Human Capital During the Coronavirus

Crisis High-Tech Human Capital Fund Program

The High-Tech Human Capital Fund is a unique program that aims to encourage the creation of innovative, field-based solutions to expand the channels of entry into high-tech and to upgrade or improve the human capital working in research and development positions in high-tech.

As part of the first call for proposals, 18 different programs were selected to promote underrepresented populations in the industry (women, the Arab population, the ultra-Orthodox sector and the periphery) along with programs for integrating immigrants and returning residents with high-tech experience in other countries. The programs were awarded a total grant of approximately NIS 19 million and will train some 2,800 participants over the next two years.

Human Capital Training Program for Industry

In response to the employment crisis that erupted in the economy due to the coronavirus pandemic, the Innovation Authority, the Ministry of Finance and the Ministry of Economy quickly initiated an emergency program to finance large-scale training and placements for a variety of positions in high-tech professions. As part of the program, grants totaling NIS 125 million were approved for training bodies and companies that will carry out a process combining training and placements for in-demand technological and business positions. In the emergency training program, more than 6,200 allocations were approved, divided between development positions and technological and business positions that support development. The trainings will also be held in peripheral areas and will be adapted to underrepresented populations, with an emphasis on the ultra-Orthodox and Arab populations, with a budget of approximately NIS 16 million. The training will be carried out by 47 companies (29 training entities and 18 employers) that have undertaken the project of training and placing the graduates. The application criteria included the scope and quality of the submitting entity's experience, the quality of the proposed program, the added value of the applicant and general impressions.

Workshop Program – Association of Advanced Technology Studies

The huge demand for experts in advanced technological professions requires innovative models for training experts in the field and for upgrading skilled professionals who are already in the high-tech industry. The "Workshop – Association of Advance Technology Studies" program is focused on supporting a joint framework for the advanced training of engineers in high-tech companies leading the industry in advanced development professions. The program supports two large groups of leading companies in the industry that will train the employees of partner companies in artificial intelligence professions. Over the course of three years, some 800 employees will be trained in both groups, with an investment of approximately NIS 10 million and a financing rate of 66%.

Women - Led Entrepreneurship Program

In March 2019, the Innovation Authority launched a dedicated program for female entrepreneurship as part of the R&D Fund program. The terms of submission and the winning criteria are the same as those for the general program, but the terms of funding are preferred: in the first year, a grant of 75% of a budget up to NIS 2.5 million is offered, and in the second year, 70% of a budget of up to NIS 5 million is offered (similar to a program that has been working successfully for ultra-Orthodox and Arab entrepreneurs for seven years). The program received a robust response to its launch, leading to a significant increase in the number of requests from women. In 2020, despite the coronavirus crisis that left its mark throughout the economy, the number of applications submitted by female entrepreneurs increased by 51% compared to 2019. For 2021, the Innovation Authority Council has set another goal: a 35% increase in the number of applications from female entrepreneurs

Additional Government Programs

As part of the response to the shortage of skilled workers in high-tech and the continued effort to integrate underrepresented populations in high-tech, the labor branch of the Ministry of Labor, Social Affairs and Social Services, provides a wide range of tools and programs, including the following:

- The National Initiative for the Integration of ultra-Orthodox in High-Tech is a joint venture of the Ministry of Labor, Social Affairs and Social services; the Coalition of Philanthropic Funds for Ultra-Orthodox Employment; and JDC Israel. Launched in 2020, the project is aimed at developing expandable tools for ultra-Orthodox integration into high-tech through activities with a variety of target audiences. As part of the project, many actions are being taken to integrate the ultra-Orthodox into high-tech, and within this framework various services, including significant technological training, will be provided to hundreds of participants from the ultra-Orthodox community.
- Pilots for the establishment of unique and dedicated coding bootcamps, which are carried out as part of the Ministry's activities with the JDC-Tevet and aimed at developing new tools for integrating target populations (who do not possess suitable acceptance criteria for programming camps of this framework) into quality technological employment.

The program for integrating interns from the Arab population in the knowledge-intensive industry (4.20) of the Authority of Investment and Development of Industry and the Economy. The program offers paid participation for an intern from the Arab population who studies technological professions and is integrated into the knowledge-intensive industry.

Scale-Up Velocity

Scale-Up Velocity (from Start-Up Nation Central) works in close partnership with high-tech companies to provide solutions tailored to the needs of the industry. Its main programs, developed in collaboration with Mobileye, Google, IBM, Ex Libris, Lightricks, IntSights, Cybereason, J.P. Morgan, 40Nuggets and elite development units in the IDF, are focused on training combat soldiers and juniors from underrepresented populations for positions in core R&D teams, with an emphasis on practical projects and skills.

In 2020, under the shadow of the coronavirus crisis, Scale-Up Velocity collaborated with CampusIL and Digital Israel with the aim of making academic level computer science knowledge accessible to the general public and creating a hybrid learning infrastructure for effective and focused training. Teimot (“a taste”) of high-tech program offers core computer science courses at the academic level in a hybrid learning environment that combines online learning and virtual small-group study. The program enables participants to experience intensive, complex study of core subjects in computer science and to examine their suitability for the field. Several hundred participants took part in the first cycle of the program, and their scores reflected effective high-level learning. The program was developed by leading Israeli universities at the initiative of the Council of Higher Education and the Planning and Budgeting Committee, and is funded by Digital Israel.

Another program implemented in response to the coronavirus pandemic is Cyber4s, which provides a springboard for female and male discharged combat soldiers to integrate into the high-tech industry. The program includes online learning, and participants undergo six months of comprehensive technological training, workshops to strengthen soft skills and practical projects with high-tech companies. Graduates of the program are integrated as Full Stack developers in high-tech companies and security branches, and graduates of the first cycle have already been integrated as developers in the industry. Concurrent with the launch of additional Cyber4s courses, the Data4s program will be launched in the second half of 2021 to train discharged combat soldiers for data analyst positions. The Cyber4s program was developed in collaboration with the IDF’s Professional Life Administration, the Cyber Network and Israeli cyber companies, and won the first Chief of Staff Award for Innovation as part of International Entrepreneurship Week.

Additional programs run by Scale-Up Velocity:

- **The Adva program** trains women in ultra-Orthodox seminaries for development positions in core teams in the high-tech industry. The program combines academic studies under the guidance of senior faculty from leading universities and hands-on training via projects led by companies in the industry. The first cycle ended in October 2020, and at the time of this report’s publication, job placement rates stand at approximately 75%. The second cycle is expected to conclude in October 2021.
- **The Excellenteam program** is designed for computer science graduates and comprises two tracks: one for ultra-Orthodox graduates and one for Arab graduates. The participants undergo an intensive four-month training program that incorporates practical projects with the industry. The success of the program has paved the way for its expansion, and this year it will already be integrated as part of the final year of the computer science program in Jerusalem-based colleges. As part of the program, which is taught as a for-credit academic course, select students are trained in software development by experienced lecturers from the high-tech industry, participate in soft-skills workshops, and develop technology projects with partner companies.



CONTACT US



רשות החדשנות
Israel Innovation
Authority

Dr. Assaf Kovo

Chief Economist,
Israel Innovation Authority

assaf.kovo@innovationisrael.org.il



Uri Gabai

Co-GM,
Start-Up Nation Central

uri.gabai@sncentral.org



Maty Zwaig

CEO,
Scale-Up Velocity

maty.zwaig@suvelocity.org