**2022 HIGH-TECH HUMAN CAPITAL REPORT**

**Executive Summary**

**Foreword: Uri Gabai**

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While we remain in the midst of an economic storm, defined by globally rising inflation and interest rates, a sharp decline in the risk appetite of investors and private capital, and war raging in Eastern Europe, alongside abundant disruption in the global economy, and consequently the Israeli economy too – the state of Israel’s high-tech industry, which was a genuine record breaker in 2021 in terms of fundraising and employee recruitment, appears to belong to an entirely different reality. Although the High-Tech Human Capital Report reflects a survey conducted over the course of the last year, we should not too readily discard the insights and changes of 2021, when facing the challenges that the Israeli high-tech industry is anticipated to confront in both the near and distant future. The COVID-19 pandemic, which many of us are already beginning to label a ‘thing of the past’, drove both the Israeli and global economies towards digital transformation in all walks of life, from retail and services, to employment methods and the education system. This digital transformation has resulted in a severe shortage in available tech employees; though, it has also served as a catalyst for growth professions that supplement such positions. This is clearly borne out by the figures: the number of tech vacancies in the high-tech industry amounts to 21,000 (compared with 18,500 in 2019 before the onset of the COVID-19 pandemic) and 12,000 non-tech vacancies (compared with less than 5,000 in 2019).

During 2021, the number of workers in the Israeli high-tech industry grew by 12% compared with an increase of only 1% in 2020, with the Israeli growth companies being responsible for the majority of the growth in the industry’s workforce. A significant statistic is that about one half of this growth in the workforce is due to workers who have made the shift to high-tech from other industries. One of the causes of this significant growth is the volume of capital injected into the high-tech industry in 2021, which exceeded the total amount of capital raised in the three preceding years, a sum of more than $27 billion. Notwithstanding, high-tech is far from being a homogenous industry and the pace of recruitment in the various sectors differs substantially – the software sectors showed high growth rates, such as Fintech, in which the number of workers grew by 17%, compared with those sectors that produce tangible products such as Life Sciences and Manufacturing & Industrial sectors, in which the workforce growth rate was in the single digits, amounting to 9% and 6% respectively.

The number of workers in the industry substantially increased, but close examination of the rate of juniors recruited for tech positions actually indicates that it recorded a significant decline. Juniors accounted for 22% of overall recruitment within the industry, compared with 32% in the preceding year. This is the result of a record increase in the rate of voluntary resignations to 12%, higher than the pre-COVID-19 situation, and this occurred concomitantly with a decline in the rate of layoffs, to less than 3%. These findings might help explain the positively trending average wage in an industry where the demand for workers exceeds supply.

Examining characteristics of workers in their first tech position reveals that 9% received their training via non-academic programs, in other words, at programming workshops (bootcamps) or practical engineering courses. The graduates of such non-academic training programs tend to find their place in the industry mainly in Israeli companies and are usually employed in programming, QA, and IT positions. The other disciplines in the world of high-tech require an academic degree – in hardware- and algorithm-related positions, the number of juniors with academic degrees from high-tech or STEM exceeds 90%.

The human capital challenges facing the Israeli high-tech industry, and above all the shortage of trained workers, results in almost half of the large companies (employing more than 200 workers) electing to run operations centers abroad, which for the most part (more than 90%) are used for development activity. About one half of the Israeli companies’ operations centers are located in Eastern Europe, and Ukraine is a key destination, hosting 20% of the operations centers of Israeli high-tech companies. This represents an opportunity to supply additional positions and employees. In order to take advantage of this specific opportunity, and to contend with the human capital challenges within the high-tech industry as a whole, there is a need for an overall policy designed to increase the flow of quality human capital, starting from the education system, army, universities and colleges, and culminating in joint ventures with the industry itself.

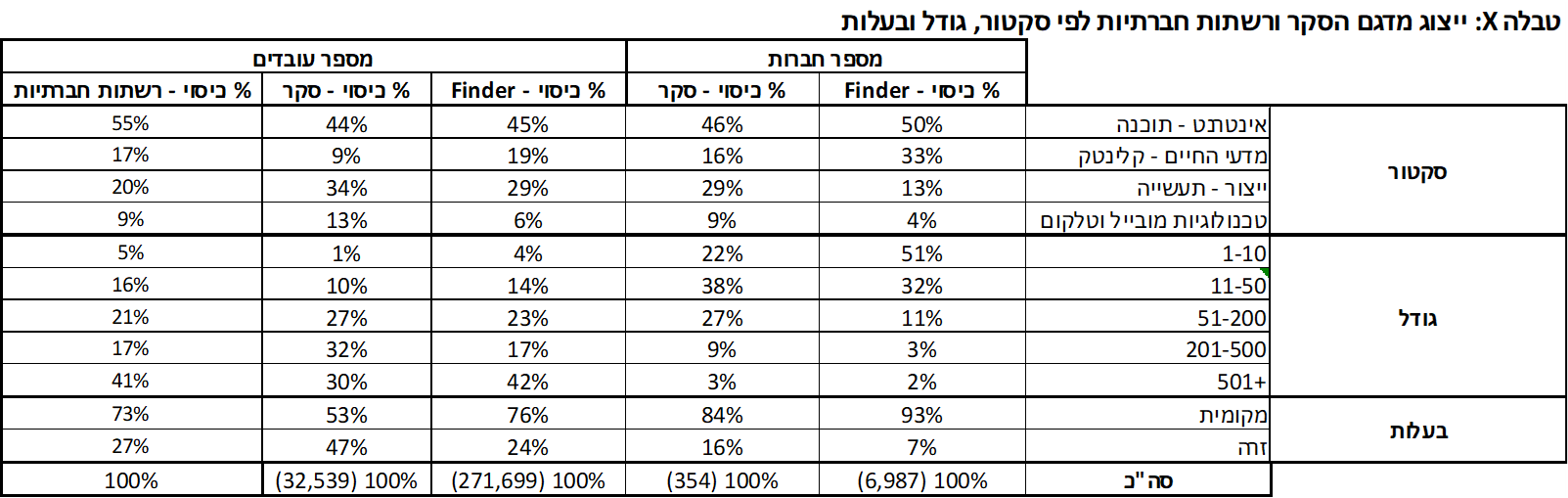
I wish to take this opportunity to thank the Start-Up Nation Policy Institute (SNPI) thinktank, as part of the Start-Up Nation Central nonprofit organization, for the comprehensive and professional joint effort to produce this important report for the fourth consecutive year. I wish us all an additional year of growth during 2022.

# **Methodology**

There are several definitions for companies included in Israel’s high-tech industry. Accordingly, for each report dealing with this specific sector, it is necessary to decide what the relevant definitions should be. In this report, the population of high-tech companies is defined as those companies appearing in the Start-Up Nation Central (SNC) Finder database.[[1]](#footnote-2)

The report is based on three sources of information:

* The Central Bureau of Statistics (CBS) provided data on the total number of employees at companies appearing in the SNC Finder database, together with a breakdown according to sector, company size, and ownership type (local/foreign). These data constitute the basis for our assessment of the size of the high-tech companies’ population and its workforce and enable weighting of the survey data for entire population estimates.
* As in every year, we conduct a survey of companies within the Finder database sample. The survey was conducted in the second quarter of 2022 by Ethosia and 354 companies replied to it. The survey includes stratification according to sector, company size, and ownership type, in order to obtain a sample that is sufficient in terms of these parameters. Table 1 illustrates the characteristics of the sample population.
* This year, for the first time, we are using data collected by SNPI from social media on a substantial sample (more than 100,000) of high-tech employees. Data were collected via social media on the education and employment history of employees at high-tech companies. We should point out that we only use those data in the public domain. Moreover, the data undergo anonymization and are used for statistical analysis only.



# Chapter 1: The increase in the number of high-tech workers in 2021

# Chapter 2: Employee recruitment and open positions

# Chapter 3: Resignations and layoffs

## Key findings

* In 2021, there was a dramatic increase in the number of resignations, reaching a figure of 10.1%.[[2]](#footnote-3)
* A concomitant sharp decline was recorded in the rate of layoffs, to a level of 2.6% – the lowest in the last decade.
* The percentage of resignations was higher the smaller the company, and this was especially damaging to small companies of 10 or fewer workers, with a 37% rate of voluntary resignations (in relation to the number of workers at the beginning of the second half of 2021, see footnote).
* The Life Science and Cleantech sector showed a significantly lower rate of voluntary resignation, amounting to 9.2%, even though most of the companies in this sector are small.
* The rate of voluntary resignation was significantly lower (7 percentage points less) in companies employing a high proportion of women.

Two trends had an impact on the percentage of voluntary resignation among high-tech workers. The first one – "the great resignation” -- intensified due to the COVID-19 pandemic, and peaked in 2021. This is a global phenomenon affecting the entire Israeli economy, and particularly the high-tech industry. At the same time, the demand for workers with relevant skillsets for high-tech continues to grow faster than the available supply, with a consequently higher frequency of worker migration from one high-tech company to another than in the past. There are a variety of reasons for this, which include a desire to improve employment terms, a shift to companies enabling remote work, or a preference for companies with whose mission the workers identify more strongly, in parallel to the understanding that for now, employees can readily find other jobs.

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While it is difficult to isolate the impact of each of these phenomena, their combination has led to a situation, whereby in 2021, the rate of voluntary resignation has returned to the levels measured in 2018 and 2019, when 10.1% of the high-tech employees elected to voluntary leave their work (Figure X). A closer look at the chart shows that this is not a one-time phenomenon but a continuing long-term trend of an increasing rate of voluntary resignations over the years, that was temporarily interrupted in 2020. It is also important to point out that this phenomenon is not unique to R&D workers, and in practice the rate of voluntary resignation among these workers was lower than the overall rate, amounting to only 8.4%. On the other hand, the rate of R&D worker layoffs also was significantly lower than that of the overall workers, amounting to 1.0%.

The percentage of voluntary resignations was higher the smaller the company size (and naturally there is a certain effect here due to the “law of small numbers”). Especially in companies with up to 10 employees, an exceptionally high average exit rate of 37% was recorded. Company size does not significantly affect on the rate of voluntary resignation among R&D workers. Small companies with more limited resources might tend to invest more in retaining their R&D workers and succeed, but are forced to give up on other workers.

Table X: Average percentage of resignations according to company size

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of workers at the start of the second half of 2021** | **1-10** | **11-50** | **51-200** | **201-500** | **+501** |
| **Percentage of resignations during the second half of 2021** | 37.1% | 17.5% | 9.9% | 7.4% | 6.6% |
| **Percentage of resignations among R&D workers during the second half of 2021** | 7.1% | 9.2% | 9.5% | 7.7% | 7.8% |

In order to isolate the influence of various factors (sector, company size, ownership type) on the rate of layoffs, we conducted linear regression (see results). We found a strong and significant effect on company size, as described above.

We found no differences in the rate of voluntary resignation among the various sectors, apart from the Life Science and Cleantech sector, in which the rate of voluntary resignation was significantly lower, amounting to 9.2%. The regression analysis shows that this difference is greater than it appears, as in this sector the companies are smaller in size on average than in the other industry sectors; therefore, we should expect a higher rate of voluntary resignations. One possible explanation for this phenomenon is that this sector employs workers with more varied scientific training (see later on the distinction between “high-tech professions” and other STEM professions), and these employees have fewer alternatives. Alternatively, it is possible that the nature of the projects in this sector generates a higher degree of employee commitment.

An interesting finding arising from this statistical analysis is that in those companies employing a higher proportion women, the rate of voluntary resignation is significantly lower (6.9 percentage points less). A key potential reason for this is that women are less likely to leave workplaces, but it is also possible that women tend to work at companies with specific characteristics, which reduce the tendency to resign, even among the men working there.

# Statistic Annex – Chapter 3

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# Chapter 4: Training for new tech workers in the high-tech industry

## **Key findings**

* Of employees in their first tech position in the high-tech industry, 80% hold academic training.
* The percentage of such workers with an academic education tends to increase along with company size.
* The R&D centers of multinational firms employ a greater percentage of employees with academic training in the high-tech professions: 68% compared with 49% in Israeli-owned companies.
* More than 60% of the new tech workers enter the high-tech industry with a university education, compared with only 36% who studied at a college.
* New employees in the hardware and algorithm professions are significantly more likely to have an academic education.

A deeper understanding of the training required for a technological position in the high-tech industry is the key to increasing the number of workers in this industry. Accordingly, we analyzed the education of tech employees upon assuming their first position in high-tech, based on a large sample of high-tech workers who reported their workplace and education on social media.

## **What and where should they study to be hired for a technological position in a high-tech company?**

The academic world is still the main entry channel into technological positions in high-tech. Close to 80% (Figure X) of employees in their first high-tech job have academic training. Moreover, 70% of employees in their first technological position in a high-tech company have a degree in high-tech or STEM professions.

Models of extra-academic training (programming workshops and professional training courses such as practical engineer diplomas) have gained considerable momentum in recent years and they comprise an additional entry channel into high-tech. Notwithstanding, they are still relatively small in scope. Some 13% of the workers entered the world of high-tech with extra-academic training in the high-tech professions: 9% reported that this was the only form of training they had undergone, while an additional 4% had undergone such training in addition to their academic studies.

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The larger the company size, the greater the proportion of employees with an academic background in high-tech professions, and the smaller the proportion of employees with non-academic high-tech training (see Figure X). The “leap forward” tends to occur mainly in those large companies employing more than 200 workers.

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Similarly, the R&D centers of multinational firms employ a greater percentage of employees with academic training in the high-tech professions: 68%, compared with 49% in Israeli-owned companies. It appears that these companies are much more attractive for academics with high-tech training, or they are better equipped to successfully draw these employees.  However, it is difficult to isolate the effect of this variable from other variables, such as the tendency of local companies to be smaller and the existence of more local Life Science companies, which by nature tend to employ more academics with STEM training (about 30%) and fewer individuals with high-tech training.

## **Universities vs. Colleges**

Given the importance of an academic education as a key gateway into the world of high-tech, the question of a university education compared to a college education assumes even greater significance. The data reveals that there are marked differences between these two types of institutions in the roles they play on a worker’s entry into high-tech. Even though the number of people graduating from university and college with a high-tech profession is similar, more than 60% of the new tech workers come with a university education, compared to only 36% entering high-tech from colleges. This statistic highlights the difficulty of college graduates assuming a technological position in a high-tech company, and apparently a high proportion of these graduates tend to find their way to tech positions outside the high-tech industry or in non-technological positions in high-tech companies.

Examination of this issue and accounting for company type underscores a significant difference between the number of university graduates and college graduates in three key parameters:

1. **The R&D centers of multinational corporations** tend to hire more university graduates – 72% compared with 56% in Israeli-owned companies.
2. **Company size** has a positive effect on the tendency to employ workers with a university education. The main outstanding difference is that at very large corporations (more than 500 employees), 66% of new employees are university graduates, while in other companies this figure ranges from 55% (1-10 employees) and 59% (201-500 employees).
3. As far as industry sectors are concerned, the percentage of university graduates in the **Life Science and Cleantech** sectors and the **Manufacturing & Industrial** sector were the most prominent, with 64% and 69% respectively.

All these parameters were found to be statistically significant in a logistic regression designed to isolate the impact of the variables (for example, to examine whether the high percentage of multinational corporations employing university graduates does not actually result from their foreign ownership but rather the fact that they simply tend to be much larger).

There is also a higher percentage of university graduates for **non-tech** workers with an academic education; though, the difference here is less marked in comparison to the tech workers. Thus, 51% of this group are university graduates, while only 37% studied at colleges (12% studied at foreign educational institutions). These data do not significantly vary over the different sectors or in relation to company size.

## **The connection between training and professions in the high-tech industry**

A closer look at employee training in their first technological position in high-tech, according to key areas, shows that there are professions, from the very first job, that clearly require an academic degree. Thus, new workers in the software, hardware, and algorithm professions display a significant tendency to have an academic education (Figure X). In contrast, most workers in data and product/project management positions are academics, but only one third of them have high-tech training. In comparison, the IT and QA professions rely extensively on alternative training.

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## **Extra-academic training**

The role of extra-academic high-tech training (programming camps) as an alternative entry channel into high-tech has solidified in recent years, but as we have shown, the key entry channel into high-tech remains that of academic education. At the same time, it is interesting to see the breakdown of first jobs taken by graduates of extra-academic training, who found work in high-tech companies.

Figure X displays the breakdown of employee positions whose training was an extra-academic high-tech course, while distinguishing between those who in addition to this training, had also engaged in academic studies. As can be seen from this, those workers without academic studies have a greater tendency to enter technological positions (only 9% of them work in high-tech companies in non-tech positions, compared with 20% of individuals with academic studies). Furthermore, they are overrepresented in the QA and IT professions. On the other hand, it appears that workers with academic training have an advantage in the data and product/project management professions that require skillsets beyond programming.

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# Statistic Annex – Chapter 4

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# Chapter 5 – Women:

# Summary

1. See the SNC Finder database definitions here: [https://finder.startupnationcentral.org/glossary\_page](https://finder.startupnationcentral.org/glossary_page.). [↑](#footnote-ref-2)
2. We define the rate of voluntary resignation as the number of workers who voluntarily left their workplace during the second half of 2021, divided by the number of workers at the start of the half-year, and similarly for the rate of layoffs. This definition was chosen due to the data limitations, and also to remain consistent with the definitions of reports from previous years. However, it is important to understand that the rate obtained by this calculation is not equivalent to the calculation of the probability that a specific worker might resign.

   For example, if a company’s workforce comprised 10 employees at the beginning of the half-year, and during the half-year it took on six workers while two workers left, the rate of voluntary resignation would then be 20% (2/10), although in practice only two out of 16 workers actually left. [↑](#footnote-ref-3)