



# **Arab Citizens' Integration into Israeli High-Tech: Achievements and Emerging Issues**

**Inter-Agency Task Force on Israeli Arab Issues**

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## I. INTRODUCTION

Israel's high-tech industry is widely considered an 'economic miracle.' Its launch is credited with putting the Israeli economy back on track, bringing annual GDP growth to 4%<sup>1</sup> and employing approximately 8-9% of the working-age population<sup>2</sup> in some of Israel's highest salaried careers.<sup>3</sup> Yet, Israel's Arab citizens, who comprise almost 21% of the population, have been nearly absent from the industry. If the high-tech boom contributed to growing economic gaps in Israel by concentrating such top-yielding production in one field, then Arab citizens, nearly as a whole, remained at the bottom.

Over the last 10-15 years, the need to close economic gaps between Jewish and Arab citizens, Israel's most economically disadvantaged population, has become a national government priority, seen as essential to preventing slowdown or even reversal of overall economic growth.<sup>4</sup> A parallel economic concern has been the high-tech industry's shortage of highly qualified domestic labor force needed to maintain its research and development excellence. An estimated shortage of 9,500-15,000 skilled tech professionals in Israel is attributed to the "demand for technological skills, which is not matched by a similar increase in the supply of programmers, scientists and engineers."<sup>5</sup> In this context, focus on integration of Arab citizens into the industry has increased for its potential to expand the domestic talent pool and contribute to Arab economic development goals.

Since 2008, a combination of civil society, government, and private sector initiatives have made significant headway towards bridging between Israel's Arab society and high-tech industry. These efforts have led to an increase in Arab high-tech engineers and computer scientists working in the industry, from roughly 350 (or a fraction of 1% of the skilled high-tech workforce)<sup>6</sup> to an estimated 5000 as of 2018 (or about 4% of approximately 120,000 skilled positions)<sup>7</sup>; a rise in the percentage of Arab students in tech fields from 2-6% in previous years to 10% in 2017<sup>8</sup>; growth in the number of Arab-led startups from zero to 90 in various stages of development;<sup>9</sup> and the emergence of Nazareth as a small but vibrant tech hub, a first for an Arab city in Israel. Moreover, these efforts have made the potential benefits of workforce diversity in high-tech, and Arab high-tech integration in particular, part of Israel's mainstream industry and economic discourse.

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<sup>1</sup> [Israel's economy is a study in contrasts](#), *The Economist*, May 18<sup>th</sup> 2017.

<sup>2</sup> [Israel Innovation Authority Report 2017](#), *Israel Innovation Authority*, Jerusalem, Israel, October 2, 2017. p. 1.

<sup>3</sup> Maayan Manela, [2017 Sees Significant Increase in Wages in Israeli Tech Market](#), *CTECH*, December 20, 2017.

<sup>4</sup> [Arab Citizen Employment in Israel: Critical Concern and Great Potential](#), *Inter-Agency Task Force on Israeli Arab Issues*, July 2013.

<sup>5</sup> High-Tech Human Capital Report—2017, *Israel Advanced Technologies Industry (IATI) and Startup Nation Central (SNC)*, 2017. Shoshana Solomon, [High-tech boom may be over, Israel's Chief Scientist Warns](#), *The Times of Israel*, June 2016.

<sup>6</sup> Kate Shuttleworth, [High-tech intervention in Israel](#), *The National*, November 2014.

<sup>7</sup> Estimates courtesy of Tsofen.

<sup>8</sup> Omri Milman, [New report: only 1.4% of high earners in high-tech—are Arab](#), *Calcalist*, August 2017.

<sup>9</sup> [The Nazareth Summit 2017](#), *Tsofen*.

**Table 1: Snapshot of Arab High-Tech Integration, 2008 to Present**

Arab Citizens	Current	2008
General Population	1.8 million / 21%	1.6 million / 20%
Students in Tech- Relevant Fields	<b>10% of all tech students /</b> 4800-5000 in 2017 <sup>10</sup>	6.79% in 2012* <sup>11</sup> 2-3% in 1985-2014* <sup>12</sup>
High-tech Professionals <sup>13</sup>	<b>5000</b> of 120,000 or 3-4%	350 or Fraction of 1%
Arab-led Startups <sup>14</sup>	<b>90</b> of 5000 / approx. 1.8% 40 of which are in Nazareth	Handful
High Tech Companies in Arab Society <sup>15</sup>	<b>50-60</b> out of approx. 6,650 / 1% most in Nazareth	None

\* Data on Arab student representation in tech-related fields comes from separate studies, each with different parameters and definitions. Comparison over time is made for broad illustration only.

Thus, many of the barriers to Arab participation that were previously nearly insurmountable are now reduced, and for many Arab citizens the industry is within greater reach than ever before. Moreover, these efforts and the resulting increases in the past decade have created unprecedented readiness and interest in high-tech integration within Arab society.

However, while in many ways a case study for successful intervention, Arab high-tech integration in Israel is still relatively small in number and very much a work in progress. For most qualified Arab candidates, breaking into the industry is still not possible without significant targeted support to overcome gaps in relevant exposure, experience, soft-skills, access and connections to the industry, to name a few. For those who have entered the industry there are now new thresholds in terms of the level of employment, moving up in the workplace, and expanding support for potential startups. Finally, unlike Nazareth, most Arab municipalities are ill-equipped to host major high-tech activity, much less house multinational companies. Therefore, high-tech integration initiatives today are looking to continue efforts begun over the last decade, and build on them to cultivate a deeper and more organic process of integration and expansion of the industry in Arab society.

At the same time, the industry itself is changing. In 2017, Israel's Innovation Authority (formerly the Chief Scientist's Office) expressed sweeping concerns about the high-tech industry's overall sustainability and economic impact<sup>16</sup> and issued a ten-year plan to double its economic footprint and take the domestic industry to the next level.<sup>17</sup> This includes more investments in growing the skilled workforce, encouraging growth companies, and expanding the industry into the

<sup>10</sup> Courtesy of the Council for Higher Education (CHE). Number includes students in the following majors: computer science, mathematics, engineering, civil, chemical, materials, industrial, and electronics and computers engineering.

<sup>11</sup> Courtesy of Tsofen, based on CHE data.

<sup>12</sup> Ministry of Finance data indicates that between 1985 and 2014, the total number of Arab students in tech subjects was 1598, only 2-3% of total students in these majors, and rose to 9.5% of students in 2016 alone. However, MoF and CHE define tech studies differently and therefore should be used for broad comparison only.

<sup>13</sup> Courtesy of Tsofen.

<sup>14</sup> Tsofen report on the Nazareth Summit, 2017.

<sup>15</sup> Ruti Levy, [Israeli High-tech Is Maturing, Study Finds](#), Haaretz, January 25, 2017.

<sup>16</sup> [Innovation Authority Strategy and Structure](#), Israel Innovation Authority, Jerusalem, Israel, 2017.

<sup>17</sup> [Israel Innovation Authority Report 2017](#), Israel Innovation Authority, Jerusalem Israel, 2017.

geographic periphery as well as into other industries.<sup>18</sup> Achievements over the last ten years of efforts mean that today, Arab citizens are already seen as an integral component of this plan.

The first part of this paper provides insights into the economic context behind efforts to advance Arab high-tech integration. It then outlines the major barriers to integration and the dominant strategies that developed over the last decade to address them. The second part delves into a more detailed description of the current status of integration to date to provide the insight behind numbers: how have barriers been reduced, which new ones have emerged, and what are the new goals for integration efforts as a result? The third section looks at how government efforts to take the industry to the next level incorporate Arab integration and stand to boost integration efforts to the next level as well. This is followed by a description of the types of programs being implemented in the field that are propelling all of these developments forward. Finally, the paper concludes with suggestions for follow up and further learning.

## II. CONTEXT: HIGH TECH SUSTAINABILITY AND GROWTH

“It is easy to be dazzled by Israel’s high-tech firms,” states a May 2017 *Economist* report. “In fact, the country has two separate economies. The dynamic, globalised [sic] startup nation accounts for only about a tenth of employment, whereas nine in ten Israelis work in something more akin to a left-behind nation...”<sup>19</sup> High-tech is indeed responsible today for approximately 45% of Israel’s industrial exports,<sup>20</sup> and is credited for the country’s overall global competitiveness.<sup>21</sup> But the lack of penetration into other parts of the economy means much of the per capita gains are not actually reaching most of Israel’s citizens. Eugene Kandel, former economic advisor to the government and CEO of Startup Nation Central, has described “the high-tech industry as a Zeppelin floating above the rest of the economy and only loosely connected to it.”<sup>22</sup>

### Economic Footprint

If Israeli high-tech is a floating island, there are also growing concerns that it may be a shrinking one. Israel continues to boast one of the highest concentrations of science and technology researchers internationally (17.4 per 10,000 employed persons in 2015),<sup>23</sup> but overall, “the percentage of [Israelis employed] in high-tech lies at only 8% for over a decade now.”<sup>24</sup> The issue, according to the country’s Innovation Authority, is that “the Israeli innovation system is still in the initial stages of developing efficient mechanisms to capture the economic value resulting from the technological value it produces.”<sup>25</sup>

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<sup>18</sup> Israel Innovation Authority, [Israel Innovation Authority Report 2017](#).

<sup>19</sup> *The Economist*, [Israel’s economy is a study in contrasts](#).

<sup>20</sup> Central Bureau of Statistics numbers from December 2014 through December 2015 as found in: *Ministry of Economy: Research & Economics Administration, The Israeli Economy at a Glance; 2016*, p. 2 and 32.

<sup>21</sup> According to the IMD World Competitiveness Center, Israel ranked 22<sup>nd</sup> in overall competitiveness in 2017 and 13<sup>th</sup> in digital competitiveness —rankings pulled by the country’s high marks for scientific infrastructure despite far lower marks on other factors. IMD World Competitiveness Israel Profile: (IMD World Competitiveness Center, [IMD World Competitiveness Israel Profile](#), 2017).

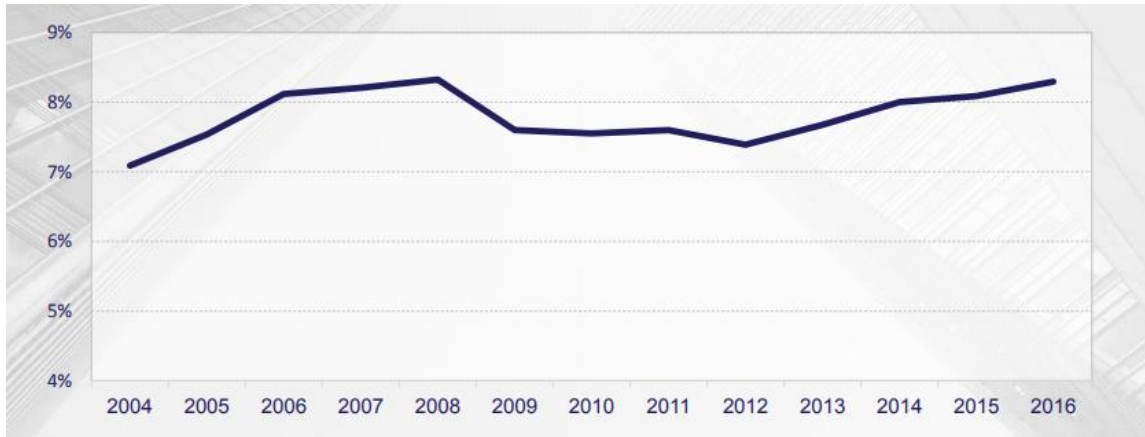
<sup>22</sup> *The Economist*, [Israel’s economy is a study in contrasts](#)

<sup>23</sup> Central Bureau of Statistics and Ministry of Economy: Research & Economics Administration, [The Israeli Economy at a Glance](#), p.26.

<sup>24</sup> Israel Innovation Authority, [Israel Innovation Authority Report 2017](#), p. 1.

<sup>25</sup> [Innovation in Israel 2017 Overview](#), *Israel Innovation Authority*, Jerusalem, Israel, 2017.

**Figure 1 - Percentage of the Israeli Workforce Employed in the High-Tech Industry**



Source: Innovation Authority calculation of Central Bureau of Statistics Data

In part, this is because the strength of Israeli high-tech is based heavily in research and development (R&D), particularly in Information and Communications Technology (ICT), which has lent itself more to the export of technological solutions than to service or manufacturing companies employing a wider variety of labor and having a larger impact and spillover into the rest of the economy.<sup>26</sup> In part it is also because of the limited expansion of the industry's unique growth engines—its core innovative workforce capacity and bustling startup ecosystem—into Israel's peripheral communities<sup>27</sup> and other industries.<sup>28</sup>

### Human Capital Shortage

According to the Innovation Authority, the first step in preserving and strengthening Israel's innovative leadership while increasing its economic-yield at this point is to address "the significant shortage of skilled personnel that serves as the central element fueling the innovation engine . . . [and] constitutes an obstacle in the face of future growth and may even harm this field's competitiveness versus parallel systems around the world."<sup>29</sup>

The R&D-focused Israeli high-tech industry depends heavily on a steady supply of a highly qualified computer science and engineering workforce able to sustain the level of innovation, productivity and excellence that has given Israel its competitive edge. Despite a longstanding estimated shortage of some 9,500-15,000 skilled high-tech professionals,<sup>30,31</sup> the number of Israeli students in computer sciences and engineering dropped from 13% to 8.5% between 2005 and

<sup>26</sup> "R&D activity in the Israeli economy, especially in multinational R&D centers and startups, is a basis for creating technological value in Israel, but the economic value is enjoyed outside Israel's borders." [Ibid](#), p2.

<sup>27</sup> Viva Sarah Press, [Conference calls for more minority startups](#), *Israel 21c*, September 10, 2015.

<sup>28</sup> Israel Innovation Authority, [Israel Innovation Authority Report 2017](#).

<sup>29</sup> Israel Innovation Authority, [Innovation in Israel 2017 Overview](#), p. 25.

<sup>30</sup> A shortage of 5,000-25,000 qualified engineers was already discussed in 2002 and seen as a strategic problem for the industry going forward. Lesha R. Chaifetz, [The Promised Land: An Examination of the Israelis High-Tech Industry](#), University of Pennsylvania, 2002, p. 394-397.

<sup>31</sup> High-Tech Human Capital Report-2017, *Israel Advanced Technologies Industry (IATI) and Startup Nation Central (SNC)*, 2017. Shoshana Solomon, [High-tech boom may be over, Israel's Chief Scientist Warns](#), *The Times of Israel*, June 2016.

2014.<sup>32</sup> Though enrollment has since gone up,<sup>33</sup> some economists are concerned that degree programs are not preparing students for the job market,<sup>34,35</sup> and that given dropout rates and international competition for the best talent, even elevated numbers in the academic pipeline will not adequately meet demand.

“The lack of skilled human capital, particularly in the software and internet sectors, continues to be the largest challenge of the local industry” writes Dun & Bradstreet’s Chief Economist in Israel.<sup>36</sup> A number of high tech companies have been transferring activities offshore due to the difficulty and cost of recruiting engineers in the local market,<sup>37</sup> with recent estimates suggesting a loss of 20,000 domestic jobs at an annual cost of approximately \$1 billion to Israel’s economy.<sup>38</sup> Additional data shows that between 2005 and 2015, wages for highly skilled engineers in Israel rose by 38%, indicating that more companies are pursuing fewer qualified candidates.<sup>39</sup> Offshoring hurts Israel’s economy as a whole, discourages international investment, and limits the ability of Israeli startups—the source of most of the industry’s job growth<sup>40</sup>—to compete for the best talent given the hike in salaries.

### **Focus on Arab Society**

Already in the mid-2000s, a number of industry leaders began looking to Arab society as a potential source of domestic talent and industry expansion. Arab citizens are a young and sizeable population (today 21% of the total population and 27% of the K-12 demographic<sup>41</sup>) who study core subjects in school and have every incentive to participate in Israel’s advanced economic opportunities.

Arab society is by far the most disadvantaged of Israel’s populations, with poverty rates nearly three-times that of the Jewish majority, and over-representation in low-wage and low-quality labor.<sup>42</sup> Since the mid-2000s, as well, these economic gaps and Arabs’ under-participation in the

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<sup>32</sup> Asaf Gilad, [Israelis are not studying Hi-Tech? We should consider backup from abroad](#), *Calcalist*, February 2016.

<sup>33</sup> The Council for Higher Education indicates a 12% increase in the number of first-degree tech students from 2016 to 2017. Exact comparison with prior data however is not possible since variables and parameters differ across measuring organizations. Courtesy of the Council for Higher Education.

<sup>34</sup> Ruti Levy, [Israel’s High-tech So-called Labor Shortage May Not Really Exist](#), *Haaretz*, April 26, 2017.

<sup>35</sup> “According to the hi-tech sector, for every three computer-related positions, there’s only one applicant,” Ben-David said. “Yet when we look at the number of college graduates, the numbers should be enough. The implication is that for two out of three graduates... many of the degrees aren’t worth the paper they’re written on.” (Max Schindler, [OECD: Failure to Integrate Ultra-Orthodox and Arabs Weaken Hi-Tech](#), *The Jerusalem Post*, March 11, 2018.)

<sup>36</sup> “In a convention last year Or Offer, the CEO of SimilarWeb, disclosed that the company already transferred a part of its R&D activity to Ukraine, because of the difficulties to recruit engineers in the local market. SanDisk also transferred unmanned jobs abroad, and other companies are contemplating similar moves.” Alon Shtrasman, [Workforce Diversity: The Next Challenge of the HighTech Industry](#), *Dun’s 100*, Dun & Bradstreet, December 12, 2016, p. 21.

<sup>37</sup> [Ibid.](#)

<sup>38</sup> Ruti Levy, [High-Tech Jobs Lost: Israel's locomotive of growth is traveling overseas](#), *The Marker*, February 5, 2018.

<sup>39</sup> Inbal Orpaz, Ora Coren, [Startup Nation Losing Its Competitive Edge, Israeli Economy Ministry's Chief Scientist Warns](#), *Haaretz*, June 24, 2016.

<sup>40</sup> “The demand for human capital comes mainly from the “roots” – from start-ups and growing companies, while mature companies have been streamlining their human resources in recent years, with large layoffs.” Tzah Berki, [High Tech Industry Snapshot](#), *Dun’s 100*, Dun & Bradstreet, p. 7.

<sup>41</sup> Central Bureau of Statistics, [The Future Generation of Israel: Children and Youngsters under 24](#), Jerusalem, May 2016.

<sup>42</sup> As of 2016, poverty rates in Arab society stand at 49.4% compared to 13.8% in Jewish Israeli families, IATF [Condensed Fact Sheet on Arab Citizens of Israel](#), June 2018; The [2017 Diversity Index of the Equal Employment Opportunity Commission](#) (Hebrew) showed that Arabs continue to be underrepresented in all high paying sectors relative to their population size, and overrepresented in some of the lowest paying such as employment and maintenance services, food production, and car sales.

GDP have been recognized by the government as among Israel's most pressing socio-economic concerns.<sup>43</sup> Since, increasingly large and sophisticated government and civil society initiatives have been launched to boost Arab workforce participation and overall Arab economic development—from career training and placement centers throughout Arab society to infrastructure development in Arab municipalities.<sup>44,45</sup>

While these government efforts initially focused on more traditional industries, small business development and the public sector, in recent years there has been increased focus on advanced opportunities and high-tech in particular. Advanced employment is essential for growing the Arab middle class and creating precedent for Arab participation in a wider range of industries, thus increasing opportunities and the standard of living for Arab citizens.<sup>46</sup> For the industry, Arab integration into “the Israeli cycle of innovation”<sup>47</sup> presents an untapped source of domestic workforce talent, a slate of potential entrepreneurs with access to the fast-growing Arabic-speaking internet market, and additional communities for potential industry expansion.

Arab high-tech integration has come to be recognized, in the words of outgoing Chief Scientist Avi Hasson, as a “rare convergence of two national missions: solving the shortage of skilled human resources by realizing the unfulfilled potential of growing minorities on one hand, and mitigating socio-economic gaps between sectors and increasing economic welfare and social mobility among minorities on the other.”<sup>48</sup>

### III. THE CHALLENGE: BARRIERS TO INTEGRATION

While Arab integration into high-tech is today seen as a difficult but viable and realistic opportunity, this was not the case when efforts first began ten years ago. At the time, not only was Arab employment in the industry practically negligible (350 individuals out of a skilled workforce of roughly 100,000 with an Arab population of about 1.6 million), but Arab exposure to high-tech developments and culture, related academic studies and career tracks, and even access to Israel's advanced economic opportunities, in general, was so limited that for the majority of industry leaders and Arab citizens it did not enter the realm of possibility.

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<sup>43</sup> Arabs in Israel, comprising roughly 21% of the population, contribute an estimated 8% to the national GDP. The unrealized economic potential of Arab society is estimated to cost Israel NIS 31 billion every year (see IATF [Condensed Fact Sheet on Arab Citizens of Israel](#), June 2018). In 2013, the [National Economic Council warned](#) that Israeli economy will become unsustainable by 2050 if Arabs and ultra-Orthodox are not integrated more fully into the labor market. This projection is also supported by recent studies, including: Taub Center for Social Policy Studies in Israel, [State of the Nation Report](#), *The Herbert M. Singer Annual Report Series*, 2017; Dan Ben-David, Ayal Kimhi, [Overview of Israel's Education System and its Impact](#), *Shores Institute for Socioeconomic Research*, December 2017. For more, see, [Arab Citizen Employment in Israel: Critical Concern and Great Potential](#), *Inter-Agency Task Force on Israeli Arab Issues*, July 2013, p 18-20.

<sup>44</sup> *Ibid.* p. 33-39.

<sup>45</sup> i.e., Government Resolution 922, [Historic Economic Development Plan for Arab Sector: Overview and Key Allocation Areas](#), *Inter-Agency Task Force on Israeli Arab Issues*, January 2016.

<sup>46</sup> Asaf Malachy and Gili Lim Gili, [Representation and Occupational Diversity in the Business Sector in Israel: Employment of Workers from the Arab and ultra-Orthodox Populations](#), *Ministry of Economy*, April 2017.

<sup>47</sup> Viva Sarah Press, [Conference calls for more minority startups](#).

<sup>48</sup> [Israeli Innovation Authority: Status Report 2016](#), *Israel Innovation Authority*, Jerusalem, Israel, p. 30 (Hebrew).



Pursuing Arab integration into the industry required overcoming the barriers that had kept Arab society out of the industry's natural evolution even as it boomed. Most of the barriers fall into three sets which, though since reduced in some important ways, still comprise the main challenges to integration today. These are geographic distance, socio-economic gaps, and the industry's insularity:

- **Geographic Distance:** Israel's high-tech industry and ecosystem (meetups, workshops, conferences, professional networks, accelerators, incubators, investors, etc.) developed and remain to this day geographically concentrated almost entirely in Israel's central region. Yet, more than 70% of Arab society resides in Israel's periphery (the Galilee and the Negev), far from high-tech activity, culture and employment opportunities. Arab citizens, most of whom come from a more traditional family-centric culture, usually continue to live in their hometowns and do not relocate for work. This, coupled with the fact that until recently there was little public transportation in Arab society,<sup>49</sup> has made geographic distance a major barrier to industry exposure and participation.
- **Socio-economic Gaps:** Socio-economic gaps are behind both resource and cultural barriers. The majority of Arab citizens live in Israel's most disadvantaged communities (80% of Arab municipalities are in Israel's three lowest socio-economic clusters<sup>50</sup> and contain only 3% of the country's industrial zones). This means most Arab citizens have had little exposure or access to advanced economic activity, or even to basic technology such computers and the internet. As recently as 2015, for example, only a third of the Muslim population in Israel had internet at home,<sup>51</sup> and in 2011, it was reported that there was one computer for every 20 pupils in Arab public schools while Jewish schools offered one computer for every nine.<sup>52</sup> Furthermore, "disparities in budget, buildings and equipment, teacher education level, and class size"<sup>53</sup> have historically yielded lower educational achievement among Arabs and less participation in higher education—especially in high-tech related fields, which are among the most demanding. High-tech fields also require proficiency in English and strong Hebrew language skills, which is a major barrier for Arabic speakers for whom Hebrew is a second language and English third. High rates of poverty and low-quality employment in Arab society also mean there are few role models involved in Israel's advanced industries, few opportunities to develop the networks and the soft-skills needed to break into and succeed in advanced professional settings, and reluctance to pursue professions with little precedent of Arab employment. The same barriers apply to high-tech entrepreneurship, with the addition of greater difficulties accessing financing since Arab investors are less familiar with high-tech and are more risk averse, and Arab citizens have fewer connections to the existing ecosystem.

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<sup>49</sup> [Ministry of Transportation launches 35 new bus lines in Arab localities](#), *Inter-Agency Task Force on Israeli Arab Issues*, October 6, 2016.

<sup>50</sup> On a scale of 1 to 10 as defined by the Ministry of Interior.

<sup>51</sup> Most Arab towns also lack public facilities like community centers and public libraries that can provide relevant resources. Central Bureau of Statistics Data, 2015, source: Israel Internet Association, [Only a Third of the Muslim Population in Israel has Internet in the Home](#), *CBS Findings*, 2015; Israel Internet Association, [Trends of Internet Use in the Arab Sector](#), *Israel Internet Association Survey*, 2016.

<sup>52</sup> Neta Achitov, [The Arab education system is short on classrooms and computers](#), *Haaretz*, February 2015.

<sup>53</sup> Nachum Blass, [The Academic Achievements of Arab Israeli Pupils](#), Taub Center for Social Policy Studies in Israel, Sept. 2017, p. 4.

- **Industry Insularity:** For Arab citizens, lack of connections to the industry are in part due to the socio-economic and geographic gaps described above, but they are also a result of the industry's insular nature. "[R]ecruiting," writes Experis CEO Alon Shtrasman, "is mostly done through closed networks or referrals, this is why social homogeneity in the industry is so present, jobs are kept within a relatively small circle."<sup>54</sup> Even in cases in which a recruitment company is involved, lack of diversity is a barrier in itself since most recruiters and human resource personnel are neither familiar with nor trained to account for cultural, language and experiential differences of Arab candidates that might make them apply and interview differently from most Jewish applicants (i.e. lack of army background, discomfort with self-promotion in an interview, generally younger, Hebrew as a second or third language).<sup>55</sup>

In addition, Israel's high-tech industry has deep roots in security and military defense. While this no longer comprises nearly as much of the industry today, there is a history of restricting Arab participation in companies and projects related to security issues, and an ongoing reliance on IDF units such as the elite 8200 intelligence unit as a primary talent pipeline and training resource.<sup>56</sup> For employers, not only do Arab candidates lack the unparalleled on-the-job training that Jewish candidates receive in the IDF, but this history has created lasting associations and explicit concerns about, at the very least, how integrating Arab employees might affect office dynamics, particularly in times of political and security tensions. The same lack of familiarity and comfort applies to the access and interactions between Arab entrepreneurs and the startup ecosystem, whose supports and investors have developed along with the industry and are part of the same culture and professional networks.

#### IV. DOMINANT STRATEGIES AND APPROACHES

The first organizations created to advance Arab integration into Israel's high-tech industry were established in Nazareth in 2008. [Tsofen](#), an NGO, set out to train and place Arab professionals, as well as bring branches of high-tech companies into Arab municipalities. [Galil Software](#), a for-profit company, opened with the specific intention of employing Arab high-tech professionals. These, and the additional civil society organizations and companies that opened shortly thereafter, established the dominant strategies to Arab high-tech integration that define the field to this day.<sup>57</sup>

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<sup>54</sup> Shtrasman, [Workforce Diversity: The Next Challenge of the HighTech Industry](#), p. 21.

<sup>55</sup> Ahmad Mawasi, [The door to high-tech is shut to Arabs](#), *The Marker*, October 2017; Tzachi Sadeh, [Arabs' integration in high-tech: more students but still very few employees](#), *Ynet News*, August 2017.

<sup>56</sup> Inbal Orpaz, [The Secret to High-tech Success? This Elite Israeli Army Unit](#), *Haaretz*, April 18, 2014.

<sup>57</sup> I.E. [It Works](#), a placement organization for populations in the socio-geographic periphery, began collaboration with JDC-TEVET in the [ExcelHT](#) program for Arabs' integration into high-tech in 2009. In 2011, the Ma'antech initiative established by then-President Shimon Peres and tech conglomerate CISCO Systems advanced integration by coordinating the activity of [Tsofen](#) and [ITWorks](#) as well as [Kav-Mashve](#) and [Appleseeds](#), with each NGO working on a different aspect of placement vis-à-vis candidates and private sector companies. [NGT3](#) – an early stage incubator had already been operating in Nazareth since 2002 as a partnership between the Israeli government and private investors. See [Mapping in the Appendix](#) for others.

- **Workforce Integration:** This strategy encompasses efforts to encourage, support and prepare Arab citizens for careers in high-tech, as well as to promote workforce diversity among high-tech employers—addressing socio-economic barriers and industry insularity. These initiatives recruit and connect qualified candidates with employment opportunities, and provide them with training in both in-demand industry skills and soft-skills needed to get hired. Many accompany their candidates not only through the hiring process, but subsequently to support their success and retain them as role models and mentors for new candidates. On the other end, these initiatives run campaigns and work with high-tech companies to raise awareness and cultural sensitivity, and develop their capacities to reap the benefits of a diverse workforce, and of Arab employees in particular.
- **Industry Expansion:** This strategy encompasses efforts to bring high-tech companies, jobs and culture into Arab society, and to foster home-grown high-tech entrepreneurship in Arab society. The idea is not only to close geographic and socio-economic gaps by creating greater access to the entire high-tech ecosystem for Arab society, but also to bring companies within reach of the sizable potential labor force that could meet their need for a skilled domestic workforce—often at lower costs than the competitive salaries and overhead in Israel’s center. This strategy addresses all three sets of barriers, and includes efforts ranging from development projects that enable Arab municipalities to host advanced industry; bringing high-tech networking and learning events to Arab society (meetups, hackathons, conferences, workshops); to startup support programs with designated financing and guidance for Arab entrepreneurs (accelerators, incubators, venture capital).
- **Higher Education:** In parallel, a third major strategy developed focused on higher education. Historically, the near absence of Arab students in the high-tech academic pipeline in Israel has been one of the major socio-economic barriers to integration. A complex and large-scale set of issues, Arab underrepresentation and difficulty integrating into Israel’s universities and colleges has become a national economic priority in its own right. In 2011, the first of two multiyear [national plans by the Council for Higher Education](#) aimed to remove barriers and increase the number of Arab students entering and completing higher education in Israel. These plans include incentives and supports for Arab students pursuing science and technology as in-demand fields that would help boost and diversify Arab employment and bring more Arab citizens into Israel’s advanced economy.<sup>58</sup>

Largely as a result of these efforts, the number of Arab students pursuing higher education in Israel went up significantly from 2010-2017—with first Arab degree students increasing from roughly 10% to over 15%, MA students from 6.5% to over 11%, and PhD students from under 4% to nearly 6%.<sup>59</sup> Moreover, in conjunction with increased

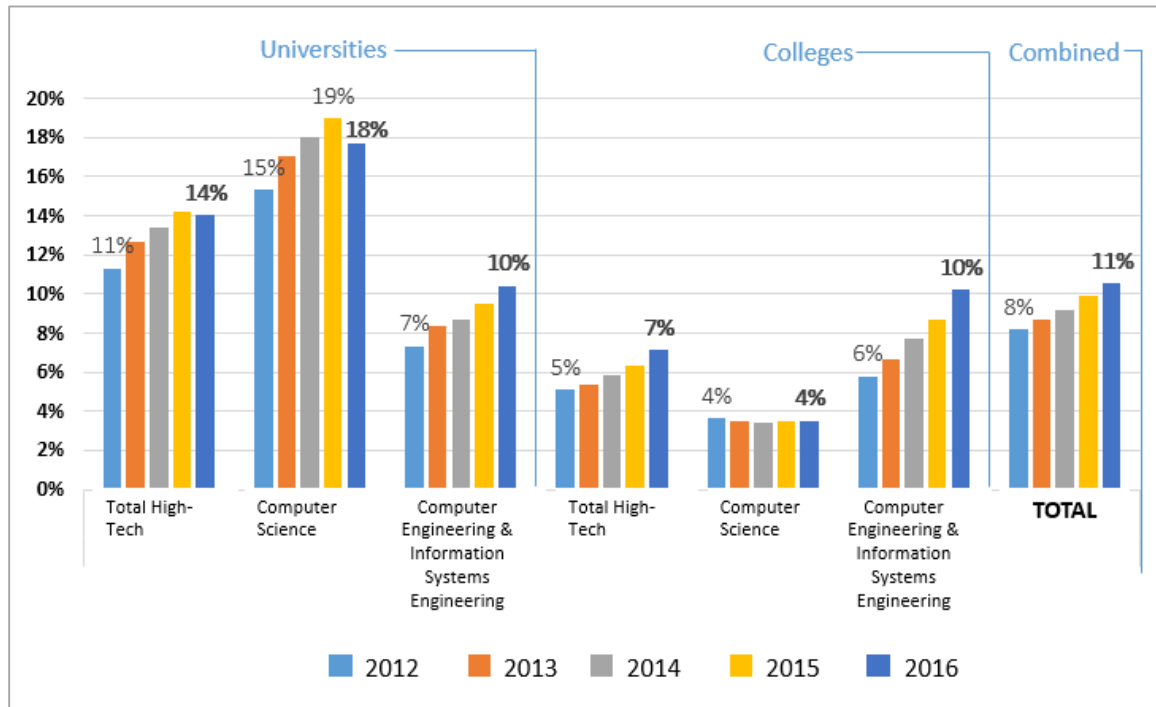
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<sup>58</sup> For instance, the *Irteka* scholarship fund established as part of the first CHE plan awards scholarship to Arab first-degree students with priority to those who study engineering or computer science. Also through the plan, 'career centers' providing consultation, training, and placement support for Arab students and graduates have been established in 24 higher education institution since 2014, including colleges with tech/engineering focus such as the Technion, ORT Braude and Azrieli College of Engineering in Jerusalem, and Hadassa Academic College, as well large universities such as Hebrew University, Tel-Aviv University, and Ben-Gurion University.

<sup>59</sup> [The Council for Higher Education's Plan to Enhance Arab Citizens Access to Higher Education: Progress and New Priorities](#), *Inter-Agency Task Force on Israeli Arab Issues*, September 2017.

awareness about high-tech opportunities in Arab society, these efforts have led to a dramatic increase in the number of Arab students in high-tech fields. Today, Arab citizens make up 10% of all Israeli students in all tech-related higher education, where they were almost entirely absent only 10 years ago.<sup>60</sup> For example, **Figure 2** below presents the rise of Arab students studying core high-tech majors since 2012.

**Figure 2: Percent of Arab Students in Core First-Degree High-Tech Studies**



Source: Council for Higher Education

## V. DETAILED STATUS: ACHIEVEMENTS AND EMERGING ISSUES

Together, the three strategies described above have led to important strides. As **Table 1** in the beginning of this paper shows, the last ten years have seen significant increases in the number of Arab citizens in the high-tech workforce, and the emergence of high-tech companies and culture in Arab society. However, actual integration is still in early stages. A more detailed look at the current status, see **Table 2** below, reveals not only that Arab participation is far from proportional, but that new barriers have emerged and that the level of integration is uneven at best, and in most cases not very deep.

<sup>60</sup> Courtesy of the Council for Higher Education.

**Table 2 - Detailed Snapshot of Arab High-Tech Integration Status**

Arab Citizens	Current	Comparison
<b>Higher Education</b>		
Arab Students in Tech Relevant Fields	<b>10% of all tech students /</b> 4800-5000 in 2017	6.79% in 2012*
Computer Science	<b>Increase of 50% since 2012 /</b> 1600 students in 2017	General population: 30% increase since 2012
Universities / Colleges <sup>61</sup>	60% / 40% in 2017	About 50% / 50% among Jews
<b>Workforce Integration</b>		
Employed coders & engineers	<b>5000</b> or 3-4%	350 or Fraction of 1% in 2008
Type of employer	Most in large multinationals, few in startups <sup>62</sup>	N/A
Top-earning positions	1.4% (2014 data) <sup>63</sup>	N/A
Women in high-tech <sup>64</sup>	0.1% (2017 data)	Jewish women: 23.8%
<b>Industry Expansion</b>		
Arab-led startups	<b>90</b> / approx. 1.8% 40 of which are in Nazareth	Handful
Incubators <sup>65</sup>	1 in Arab society	19 gov't subsidized incubators overall
Accelerators <sup>66</sup>	8 have run in Arab society	Approx. 90 overall
Venture Capital <sup>67</sup>	2 for Arab society	143 VC Firms overall
Exits	No major Arab-led startups; several senior professionals involved in major exits	None in 2008
High-tech companies in Arab cities	<b>50-60</b> of approx. 6,500 / 1% Most in Nazareth	None in 2008

\* Data on Arab students comes from separate studies, each with different parameters. Comparison is for broad illustration purposes only.

<sup>61</sup> Courtesy of the Council for Higher Education.

<sup>62</sup> Max Schindler, [How Thousands of Arabs are Getting Into Hi-Tech](#), *The Jerusalem Post*, November 20, 2017.

<sup>63</sup> Finance Ministry, Weekly Economic Report, August 27, 2017; Milman, [New report: only 1.4% of high earners in high-tech are Arab](#).

<sup>64</sup> Finance Ministry, Weekly Economic Report, August 27, 2017. Applies to Arab and Jewish citizens born 1975-1985.

<sup>65</sup> [Technological Incubators in Israel](#), *Israel Innovation Authority*, 2018.

<sup>66</sup> Rinat Corbett, [Snapshot: Israel's accelerators and incubators rated](#), *Geektime Research Channel*, April 2016 (Hebrew).

<sup>67</sup> Start-up Nation Central [VC Finder](#).

## Higher Education: Completion and Employability

The exponential rise in the number of Arabs pursuing academic studies in tech is one of the extraordinary success stories of high-tech integration efforts. On one hand, it shows the effectiveness of academic and government programs in beginning to address resource and achievement gaps in the Arab public education streams,<sup>68</sup> as well as other barriers to higher education. On the other, it reflects greater interest and the reduction of cultural barriers among Arab families and their children to pursue higher education in Israel and willingness to enter fields that have been historically out of reach for Arab citizens. For example, the rate of Arab students studying computer science has grown by 50% since 2012. This is compared to a rate of 30% in the general population. Moreover, of these (roughly 1,600 Arab students today), 40% are women versus 31% in general population.<sup>69</sup> However, the rise in participation rates does not yet say much about successful graduation or transition to employment.

Academic studies in tech fields are among the most competitive and challenging higher education tracks. For Arab students, this is compounded by challenges such as studying in Hebrew or English for the first time, or the fact that they are fresh out of high-school compared with Jewish students who attend university after serving in the military and often travelling for a year. Arab students enter higher education at 18 years old, while their Jewish peers are 23 to 25. According to the Council for Higher Education, between 2008 and 2014, 26% of all students in math, statistics, and computer science did not graduate within the 6-year, and only 56.5% graduated in the fields they started (17.4% graduated in non-tech fields).<sup>70</sup> Within this, Arab students present some of the highest rates of dropout and prolonged studies.<sup>71</sup>

For Arab students who successfully graduate with market-relevant degrees, the next few years will reveal how well they fare as job candidates including the rate and level at which they are able to integrate into the workforce. For the generation born between 1975 and 1985, Arab tech graduates had an employability rate of 58% compared to 75% for Jewish tech graduates, a difference of 17%.<sup>72</sup> One limiting factor on Arab employability rates may be the number of Arabs entering Israel's colleges rather than universities. Today 60% of Arab tech students are enrolled in universities. While this is a significant increase,<sup>73</sup> the fact that 40% of the nearly 5000 students are in colleges significantly diminishes the pool that will be brought into highly skilled positions. A

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<sup>68</sup> Though significantly improved in recent years, the Arab public school stream has long suffered from major resource and achievement gaps compared to the Jewish stream. On the recent status of gaps see Taub Center, [The Arab education system in Israel: are the gaps closing?](#), November 2017; Hadas Fuchs, [Education and Employment Among Arab Israelis](#), Taub Center, December 2017; on long-standing barriers to higher education access see IATF, [Higher Education for Arab Citizens of Israel](#), December 2012; on informal education gaps see IATF, [Informal Education in Israel's Arab Society](#), July 2017.

<sup>69</sup> Announcement on Council for Higher Education website [here](#) (Hebrew).

<sup>70</sup> In other fields, completion rates are as follows: 77.4% in engineering and architecture, 57.6% in physics, 66.1% in biological science, 81.2% in medical aid, 94.4% in medicine, 84.4% in agriculture. Courtesy of the Council for Higher Education.

<sup>71</sup> Though interventions and supports for Arab students have helped mitigate dropouts and prolonged degrees, Arab students still have higher dropout rates compared to Jewish counterparts overall. See [The Council for Higher Education's Plan to Enhance Arab Citizens Access to Higher Education](#), *Inter-Agency Task Force on Israeli Arab Issues*, September 2017.

<sup>72</sup> Milman, [New report: only 1.4% of high earners in high-tech—are Arab](#).

<sup>73</sup> A particularly striking example of this success has been the integration of Arab students into the Technion – Israel's leading tech institute, which provides some of the highest-level degrees in the high-tech sphere. According to reports by Technion President, Peretz Lavie, in 2016-17 the percentage of Arab students has surpassed 20% of all first-degree students, and of these 61% are Arab women, while dropout rates have plummeted from 73% in the mid-80s to 15% in recent years. Peretz Lavie, [Simply Equality at the Technion, That's All](#), *Haaretz*, November 2016 (Hebrew).

university degree is a prerequisite most companies have for Jewish and Arab candidates alike. On top of the [barriers outlined](#) above, this further limits the chances of college-educated Arab candidates to integrate into the skilled workforce.

Other factors include the percentage of high-tech jobs still centered in security and defense industries. While this is becoming less of an issue as the industry grows and diversifies, it still puts some large employers off-limits to Arab citizens. In addition, Arabs' persistent lack of connections and experience in the industry, as well as language and cultural barriers described above, continue to affect employability. Today, many Arabs graduating from elite universities still require placement support, mentoring and training programs to break into the employment market. Most also integrate into the large multinational companies that are more likely to prioritize diversity and have affirmative action policies than into small companies or startups that rely more heavily on personal connections for their hiring networks.<sup>74</sup>

### **Depth of Workforce Integration**

Another aspect yet to be seen is whether more Arab professionals will move up into the most in-demand, skilled and growth-oriented positions in the industry. Today, many of the industry's 5000 Arab engineers are in low to mid-level positions, with relatively few in core development or managerial positions at the upper echelon of the industry. Lack of Arab professionals in management roles means a shortage of role models for others, and that few Arabs are part of hiring processes in high-tech companies.

A 2015 study that included tech companies such as Amdocs, Checkpoint, HP, and Matrix, along with companies from other sectors, found that Arab professionals at the time comprised an average 0.3% of management and headquarters positions.<sup>75</sup> One year earlier, a study showed that Arab citizens comprised only 1.4% of the top earning positions in the high-tech industry.<sup>76</sup> Placement, accelerator, and incubator programs confirm as well that Arabs in high-tech struggle to assume management roles or move up to more senior positions in their place of work. As of now, this underrepresentation can be partly attributed to the fact that the majority of Arab high-tech professionals have fewer than 5 years of experience in the field. It may also be affected by the fact that most Arab candidates apply for work with only academic experience or training, while Jewish candidates are more likely to have worked or interned during their studies and gained advanced experience through their army service.<sup>77</sup>

Culturally, Arab professionals are also less inclined to take professional risks or leadership initiative, and are less likely to push for promotions. On the industry side, cultural barriers also impact Arab employees' capacity to move up. A 2016 study of Arab high-tech employees found that 56% felt "difficulty integrating," 26% said their work did not match their skill level, and 18% reported feeling "uncomfortable" in their place of work.<sup>78</sup> According to a recent qualitative study

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<sup>74</sup> Schindler, [How Thousands of Arabs are Getting Into Hi-Tech](#).

<sup>75</sup> [Study for Collective Impact Initiative: Employment of Arab Society in the Private Sector in Israel](#), 2015. Study performed by Shaldor, commissioned by the [Collective Impact Partnership for a Breakthrough in Arab Employment](#).

<sup>76</sup> Finance Ministry, Weekly Economic Report, August 27, 2017; Milman, [New report: only 1.4% of high earners in high-tech—are Arab](#).

<sup>77</sup> Schindler, [How Thousands of Arabs are Getting Into Hi-Tech](#).

<sup>78</sup> Shiri Dover, [Survey: 18% of Arab hi-tech employees feel "uncomfortable"](#), *Globes*, January 2016 (Hebrew).



by the Israel Democracy Institute, Arab high-tech employees feel that despite a company's diversity policies, upward mobility often hinges on the openness of a given manager.<sup>79</sup>

A related emerging issue may be income disparities between Arab and Jewish professionals. Recent reports show that as of 2017, salaries among Arab men with high-tech relevant degrees in the computer programming industry, who comprise 1.6% of degree-holders in this sector, were reportedly 66% the average salaries of Jewish men with academic degrees in the same industry.<sup>80</sup> This is likely due to a combination of factors, including that Arabs are overrepresented in lower level positions, are employed primarily in the periphery where salaries are lower across the board, and may be culturally reluctant to ask for raises.

### **Industry Expansion – Tech Hubs and Startups**

Many in the field look to the promise of Arab startups and tech hubs (concentrations of companies and culture) to create deeper workforce integration, provide greater and more diverse exposure to high-tech in Arab society, and create more organic integration processes. Today, there are 90 Arab-led startups whereas there were almost none in 2008.<sup>81</sup> While this is a reflection of the success of high-tech integration efforts and the growing interest and willingness to take risks within Arab society, this number still represents less than 2% of Israel's roughly 5000 startups.<sup>82</sup>

Most Arab citizens—even those in tech professions—still view high-tech entrepreneurship as too risky and untenable and Arab investors are less likely to finance high-tech than traditional industries. At the same time, Israel's mainstream startup scene, supported by a robust ecosystem that is decades deep, is largely out of reach for Arab citizens. This ecosystem encompasses both accelerators, incubators and investors looking to foster new startups; knowledge-sharing, learning and networking activities nurturing the innovative capacity of the talent pool; and personal networks from which many startup teams are made.

Over the last ten years Israel's largest Arab city, Nazareth, has emerged as the country's first, and so far only, Arab high-tech hub through the combined efforts of civil society, government and private sector initiatives. Today the city is home to 50-60 high-tech companies including local startups, domestic and multinational companies (i.e. Intel, Microsoft, Amdocs, Broadcom and SanDisk), together employing more than 1,000 Arab and close to 200 Jewish professionals.<sup>83</sup> Though it houses less than 1% of the industry, even this concentration has been sufficient to turn Nazareth into a dynamic networking, development, and learning center accessible to Arab society. Today, nearly half of all of Israel's Arab-led startups are based in the city, earning it the nickname "Silicon Wadi."<sup>84</sup>

There is growing interest in creating tech hubs in other Arab cities, but currently most Arab municipalities lack the local governing capacities, available land, and infrastructure to manage this level of industrial growth and activity. Recent government tenders aiming to replicate Nazareth's

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<sup>79</sup> Pending publication. Courtesy of the Israel Democracy Institute.

<sup>80</sup> [Diversity Index: Representation and Wages in the Private Labor Market and Academia, 2017](#), Central Bureau of Statistics, 2017 (Hebrew).

<sup>81</sup> Tsofen report on the Nazareth Summit, 2017.

<sup>82</sup> [Israeli Innovation Authority: Status Report 2016](#), Israel Innovation Report, Jerusalem, Israel 2016.

<sup>83</sup> Berki, [High Tech Industry Snapshot](#), p. 7; Meir Auerbach and Niv Yorek, [Aharon Aharon: "We are in a good shape in terms of entrepreneurship, there are 5,000 active start-ups in Israel"](#), *Calcalist*, May 17, 17. (Hebrew).

<sup>83</sup> Yoav Hirshhorn, [Silicon Wadi: This is what the growing Arab high-tech scene in Israel looks like](#), *Forbes Israel*, July 2017.

<sup>84</sup> [Nazareth – The Israeli-Arab Tech-Hub](#), *Israel*, April 18, 2017.



success in two additional Arab cities are currently pending, as well as tenders to build 45 co-working spaces for budding startups across Israel's periphery, in which 70% of Arab society resides (See in [GOVERNMENT FRAMEWORKS AND PROGRAMS](#) below).

Outside of physical tech hubs, there has also been a significant rise in the number of accelerators, learning and networking activities taking place in Arab society, and for Arab students on campuses, which aim to support and encourage potential entrepreneurs. On the investment side, there are now also two venture capital firms ([Takwin Labs](#) and [Al-Bawader](#)) investing in Arab-led startups explicitly, as well as significant government financial support established for new Arab-led companies.

Beyond the range of supports becoming available for potential Arab entrepreneurs, many believe that more Arab startup success stories would go far in boosting interest and reducing fear of high-tech entrepreneurship among Arab citizens. As of yet, there have been no major exits by all-Arab companies, but startups with senior Arab management or scientists have had some notable successes. For example, the Jewish and Arab led Annapurna Labs sold to Amazon in 2015 for approximately \$350 million, Arab-Jewish led JASPER Design Automation sold to Cadence Design Systems in 2014 for \$170 million, Jewish-Arab startup MindoLife signed a major contract with the Indian SAR Group, and Parlor, which made the largest exit in life-sciences in Israel's history, was based on the innovation of a Druze scientist.<sup>85</sup> Many of these successful figures work with the various NGOs today to help and encourage the next generation of Arab entrepreneurs.

### **Arab Women in High-Tech**

Today, Arab women comprise only 0.1% of the entire high-tech workforce compared to nearly 24% among Jewish women. While Arab women's education and employment levels have been on the rise in recent years (up to 35% today from 21% in the early 2000s, and as much as 75% for Arab women with academic degrees),<sup>86</sup> Arab women still face higher barriers to entering the job market, and especially advanced and competitive industries, than Arab men.<sup>87</sup>

In Nazareth, however, Arab women account for 25% of the city's roughly 1000 high-tech professionals. This percentage also holds for the Nazareth-based [Galil Software](#). Additionally, three of the startups established at Nazareth incubator [NGT3](#) have been founded by women, including the biotechnology company Metallo Therapy by Dr. Amal Ayoub, which successfully raised \$4 million in 2012.

This local point of success shows not only the viability of greater women's participation, but suggests some of the main barriers.<sup>88</sup> As primary caregivers in the family, Arab women are far less likely to commute far for work, and especially not on top of the demanding hours of most high-tech jobs. Geographic distance is then exacerbated by relatively limited childcare facilities and transportation in many Arab municipalities, along with cultural barriers stemming from the generally patriarchal, traditional nature of Arab society.<sup>89</sup>

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<sup>85</sup> Eliran Rubin, [The Jewish-Arab start-up from Nazareth arrives in India: signed an agreement for \\$20 million](#), *The Marker*, July 17, 2017 (Hebrew).

<sup>86</sup> Hadas Fuchs, Tamar Friedman Wilson, [Arab Israeli Women Entering the Labor Market: Higher Education, Employment, and Wages](#), *Taub Center for Social Policy Studies in Israel*, March 2018, p. 9.

<sup>87</sup> [Diversity Index: Representation and Wages in the Private Labor Market and Academia, 2017](#) (Hebrew).

<sup>88</sup> Nehama Almog, [Arab Women in Israeli High-Tech: A Snapshot](#), *PC*, March 2018.

<sup>89</sup> [Arab Citizens Employment in Israel: Critical Concern and Great Potential](#), *Inter-Agency Task Force on Israeli Arab Issues*, July 2013.

Currently, Arab women also exhibit a significant drop-off in higher-education studies. Despite presenting strong achievements and representation in STEM tracks through the end of high school (71-84% compared to 39% among Jewish women), only 3-6% of Arab women higher education students pursue engineering, math, statistics, and computers majors.<sup>90</sup> Many in Arab society attribute this to the fact that, in addition to the barriers to high-tech listed above, excelling Arab women are encouraged to pursue more 'stable' and accessible professions, specifically medicine. According to Israel's National Equal Employment Opportunity Commissioner, Adv. Mariam Kabha, "It should be made clear to young Arab women, many of which are in 5-unit math matriculation tracks, that there are other avenues besides medicine. And it is our mission to work with employers and show the... advantage and necessity of employing Arab women in high-tech."<sup>91</sup>

### **Wider Reach, Greater Depth**

Today many of the initiatives advancing Arab high-tech integration are adding these new thresholds to their efforts. This means they are working in parallel on increasing the number of Arab high-tech professionals and entrepreneurs at any level, while also aiming to raise the level of Arab employment, further expansion into Arab society, include Arab women and more. Doing so not only deepens integration, it also stands to generate more organic processes of inclusion going forward.

As the next section discusses, achievements over the last ten years, and in particular the readiness in Arab society to pursue high-tech education and careers, has already positioned Arab society as an integral component of government plans to advance the industry as a whole.

## **VI. GOVERNMENT FRAMEWORKS AND PROGRAMS**

High-tech integration efforts developed within the context of rising national emphasis on economic development of Arab society in general. Government investments into closing economic gaps between Arab and Jewish citizens have been growing since the mid-2000s. While few such investments focused on high-tech integration, many have become increasingly instrumental and complementary to these efforts. In parallel, the government has more recently identified the longstanding shortage of skilled personnel and plateau in industry growth (in terms of workforce) as indicators that it is time for renewed intervention in the high-tech industry, to steward it to the next stage of domestic development.<sup>92</sup> The government of Israel is credited with successfully cultivating the domestic high-tech industry with effective policies and investments since as far back as 1969 (when the Office of the Chief Scientist was created), withdrawing when the private sector was able to continue on its own.<sup>93</sup>

Today, government frameworks relevant to Arab high-tech integration include a comprehensive plan for overall economic development of Arab society in Israel, **Government Resolution 922**, and two frameworks for strengthening and expanding Israel's high-tech industry: the Innovation Authority's **Ten Year Plan to Double the High Tech Workforce**, and **Government Resolution 2292**

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<sup>90</sup> Hadas Fuchs, Tamar Friedman Wilson, [Arab Israeli Women Entering the Labor Market: Higher Education, Employment, and Wages](#), *Taub Center for Social Policy Studies in Israel*, March 2018.

<sup>91</sup> Almog, [Arab Women in Israeli High-Tech: A Snapshot](#); Hila Weisberg, [Meet Four Arab Women Techies](#), *The Marker*, February 2012; Eliran Rubin, [Up Until Ten Years Ago, Arabs and High-Tech Did Not Belong in the Same Sentence](#), *The Marker*, November 2016 (Hebrew).

<sup>92</sup> ["Innovation Authority Strategy and Structure"](#) Innovation Authority, 2017.

<sup>93</sup> Dr. Daphne Getz, Dr. Itzhak Goldberg, [Best Practices and Lessons Learned in ICT Sector Innovation: A Case Study of Israel](#) *World Bank*, World Development Report 2016, Digital Dividends Background Paper. P. 5, p. 15.

**to Increase Skilled Manpower for the High-Tech Industry.** While these frameworks are not focused on Arab high-tech integration specifically, each includes budgets and programs that further this effort directly and indirectly.

## NATIONAL FRAMEWORKS

**Government Resolution 922: The Five Year Economic Development Plan for Arab Society (GR-922):**<sup>94</sup> This historic plan put forth unprecedented budgets (NIS 10-15 billion) and a framework to address barriers to Arab economic development and begin closing economic and budgeting gaps on a comprehensive and national scale. Given the size of overall economic gaps in Arab society, and the scale of the program, initially no programs under GR-922 addressed high-tech integration specifically. Rather, this plan targeted a range of infrastructural deficiencies in Arab society, access to higher education (encompassing the Council for Higher Education's plan described above), overall workforce integration needs, and municipal planning and management capacities vital to local industrial activity of any kind. In 2018, a program was incorporated into GR-922 to fund development of two high-tech industrial parks in Arab society:

**Related Program - Government Decision to Establish High-Tech Parks in Two Arab municipalities:** In April 2018, the Knesset Committee for Arab Affairs<sup>95</sup> passed a decision to invest NIS 25 million over the coming two years in incentivizing the establishment of two high tech parks in Arab localities—the first ever in Arab society.<sup>96</sup> The decision allocates NIS 10 million for each year per park, and another NIS 5 million for building transportation infrastructure to the selected locations to improve accessibility. Each park is projected to generate approximately 1,500 tech jobs, with related services and construction generating additional jobs and income. Exact locations have not yet been announced.

**Innovation Authority: Ten-Year Plan to Double the High-Tech Workforce.** According to Israel's Innovation Authority, the lull in high-tech's workforce expansion over the last ten years and longstanding shortage of skilled personnel are indicators that it is time for renewed government efforts to steward the industry into its next stage of domestic development and better capture the economic value of Israel's technological innovation system.<sup>97</sup> To do so, the Innovation Authority seeks to double the high-tech workforce to 500,000 (skilled and unskilled, ICT and beyond) by increasing the number of skilled professionals, encouraging growth companies that retain more of the technological value chain onshore (as opposed to lucrative exits which sell technological solutions that are then implemented and manufactured elsewhere), and expanding the industry into the geographic periphery as well as into other industries (i.e. life sciences, pharmaceuticals, agriculture, etc.)<sup>98</sup> Some aspects of this plan, such as increasing the number of skilled professionals as part of the GR-2292 programs described below, refer to Arab citizens

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<sup>94</sup> [Historic Economic Development Plan for Arab Sector: Overview and Key Allocation Areas](#), *Inter-Agency Task Force on Israeli Arab Issues*, January 2016.

<sup>95</sup> Shoshana Solomon, [Israel earmarks NIS 20 million for new tech parks in Arab towns](#), *The Times of Israel*, April 26, 2018.

<sup>96</sup> The establishment of designated high tech parks requires specific permits and processes, primarily vis-à-vis the Ministry of Economy and Industry. While industrial parks, such as the Nazareth Park, may host high-tech companies, they are not by definition high-tech parks.

<sup>97</sup> Israel Innovation Authority, [Innovation Authority Strategy and Structure](#).

<sup>98</sup> Israel Innovation Authority, [Innovation Authority Report 2017](#).

specifically. Others, like expanding the industry into the periphery, provide supports and have immediate relevance for industry expansion into Arab society, but are not solely geared for this purpose:

**Related Program - Government incentives for high-tech industry development in the periphery:** In partnership with the Ministry of Industry and Economy, the Innovation Authority launched a new grants and subsidies program for high-tech companies wishing to build and expand in the periphery. The joint program, which applies to companies in renewable energy, nanotechnology, biotechnology and IOT (*Internet of Things*), gives entrepreneurs and investors a grant of 20-30% of their investment when opening in or expanding to the periphery. This adds to an existing 7.5% tax subsidy under the Capital Investment Incentive Law. The new program also aims to create continuity between companies' R&D stage and production stage by encouraging companies to establish advanced production facilities in the periphery instead of selling to international companies.

**Government Resolution 2292: National Plan to Increase Skilled Manpower for the High-Tech Industry (GR-2292):** This Resolution stipulates that approximately NIS 900 million would be invested over the course of 6 years through the Council for Higher Education, the Innovation Authority, the Ministry of Economy, the Ministry for Social Equality, and others, to address the shortage of skilled professionals.<sup>99</sup> GR-2292 includes several components relevant to or with specific provisions for Arab society, including access to higher education in tech, non-academic training, and job placement.

**Related Programs:**

- **Non-Academic Training via Bootcamps** (2018-2021): Bootcamps provide an alternative to academic programs that allow graduates in exact sciences to become skilled in market-relevant technological capacities within 6-12 months. Emphasizing elite training for in-demand jobs, the program includes commissions for the training organizations per every graduate entering the workforce at a monthly rate of more than NIS 14,000. **The highest commissions are given for Arab graduates.** The goal is to integrate 450 skilled graduates into the workforce by 2021. The first round of seven organizations selected to run the bootcamps was announced in April 2018, and includes two organizations, Appleseeds and Kav Mashve, which have worked intensively in the training and placement of Arab high-tech candidates over the past decade. The additional selected bodies include Infinity Labs, ITC, Experis Kickstart, and Elevation Academy.
- **Support for Minority Populations in High-Tech Training and Placement:** Additional funds for the ongoing cooperation between the Ministry of Labor and Social Welfare and the Innovation Authority to enhance the integration of minorities into high-tech with professional training and placement supports for students and graduates from the minority sectors. NIS 4.83 million are being allocated for this program annually since 2017 and until 2022.

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<sup>99</sup> [Government Resolution 2292: National Plan to Increase Skilled Manpower for the High-Tech Industry](#), Prime Minister's Office, January 15, 2017 (Hebrew).

- **Higher Education:** The overall growth rate of students in high-tech is not considered adequate for industry needs today, much less targets set for 2027. GR-2292 includes a plan by the Council for Higher Education and Ministry for Social Equality to increase the number of first-degree tech students by 40% (with emphasis on university rather than academic college enrollment) by 2022.<sup>100</sup> Though Arab students are not an explicit focus of this plan, they stand to benefit from budgets, supports and incentives. Thus far, implementation of the plan includes free, online courses in computer science and data science for the general public by higher-education institutions (in partnership with the Digital Israel program of the Ministry of Social Equality), beginning October 2019. There are no academic pre-requisites to participate in courses, and all must have Arabic, English, and Hebrew subtitles. Courses will be worth up to 50% of credits needed for first-degree attainment, pending in-person exams at participating institutions. High-tech companies including Intel, Google, and the Israel Aerospace Industries will cooperate with higher-education institutions to provide market-relevant content.<sup>101</sup>

## GOVERNMENT PROGRAMS

Prior and in addition to these frameworks, government bodies have been involved in promoting Arab high-tech entrepreneurship and workforce participation through more targeted programs.

**Ministry of Economy: Placement Tenders and Salary Subsidies.** The Ministry of Economy has put forth two major types of initiatives, placement tenders and salary subsidies, to advance high-tech workforce integration. Tenders were first issued in 2014 and again in 2017 for placement organizations to significantly scale up their work training and integrating Arab professionals into the workforce. Salary subsidies issued by the ministry to incentivize employment from certain population groups have been used for Arab high-tech integration since 2009. However, the first subsidy specifically targeting non-entry-level Arab professionals in high-tech was launched in 2017 and renewed in 2018. Following are the related tender and subsidy programs relevant to Arab society currently in effect:

- **Tenders for the Placement of Arab Society in the High-Tech Industry**<sup>102</sup> (2014-2017, 2017-2020): In 2014, the Ministry of Economy created a NIS 10 million, 3-year tender, for the recruitment and placement of Arab professionals into high-tech. The goal set for recipients was a placement rate of at least 60% within 6 months. The tender was won and operated by Tsofen in the northern part of Israel and by IT Works in the center and south. In total over 900 new Arab engineers were placed over the three years. The tender was re-issued in 2017, this time by the Ministry of Labor, Social Affairs, and Social Services<sup>103</sup> and given to Tsofen again for the north of Israel and Maof, a private sector human-resources company, for the center and south regions.

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<sup>100</sup> The baseline for this initiative is the number of students pursuing their first degree in tech related fields as of 2016, or 25,600, as calculated by the Council for Higher Education. This means the 40% increase would be approximately 36,000. The support does not set a definite timeline for this goal.

<sup>101</sup> The tender for digital high-tech courses is the fourth to be offered by CHE and Digital Israel since 2016, with three previous tenders for digital courses in other subjects. See [full tender here](#) (Hebrew).

<sup>102</sup> Ministry of Labor, Social Affairs and Social Services, Tender Number 1003/17, Committee for Employment Tenders [Placement of Arab Society in the High-Tech Industry](#) (Hebrew).

<sup>103</sup> As all labor and employment issues were transferred from the Ministry of Economy to its responsibility in 2016.

- **Subsidy program 4.20 for high-tech companies employing Arab professionals (2017-2018, 2018-2019):** This program is the first of its kind, subsidizing 40% of the salaries of Arab employees for their first two years in a high-tech company (with a salary cap of NIS 13,000). Employers receive a NIS 10,000 bonus for integrating over five Arab employees.
- **Subsidy program 4.18 for high-earning high-tech employees in the periphery (2009-current):** This program subsidizes 40% of salaries for employees earning NIS 16,000 – NIS 30,000 a month for the first 4 years. While this subsidy program does not have a designated budget for Arab society or minorities, it caters specifically to companies in Israel's periphery and government experts report that high-tech employers use it to bring on experienced, high-earning Arab professionals.
- **Subsidy program 4.17 for entry-level employees in under-represented communities (2009-current):** Many high-tech companies use the 25% salary subsidy available for the first 30 months of employment for new entry-level Arab hires. Amendments to the subsidy in 2009 aimed to further boost Arab employment have been effective. The number of Arab employees subsidized by the program grew from 200 in 2008 to over 900 in 2016. The budget for this track changes yearly, but 50% of it is always allocated to employers of Arab professionals. In 2016, the budget was approximately NIS 45 million and was incorporated within GR-922, the five-year economic development plan for Arab society.

**Ministry for the Development of the Negev and Galilee: Entrepreneurship Co-Working Spaces.** In mid-2017, the Ministry for the Development of the Negev and Galilee passed a NIS 90 million (\$25.5 million) plan for the establishment of 45 co-working spaces, or "hubs," in the periphery with work stations, offices, support staff, workshops and other resources to support companies with a yearly profit under NIS 2 million. While the co-working spaces are open to all small businesses, the plan aims to focus on high-tech specifically. Three Arab municipalities so far have been approved for these spaces—Kafr Qasim and Taiybe in the Triangle Region, and the Bedouin city of Rahat in the Negev, though all are still in initial development stages. Participants are to pay no more than NIS 500 per month for a shared space and NIS 1,300 for a private office.

**Innovation Authority: The "New Companies" Program Minority Track.** The "New Companies" program was established in 2013 by the Chief Scientists' Office (now Innovation Authority) to help new high-tech entrepreneurs attract investors for their startups by financing their research and development costs at a rate of 50% for two years (up to NIS 10 million per company). However, raising the remaining 50% proved especially challenging to Arab and Haredi minority communities. A program was therefore created for startups with at least 1/3 minority leadership that provides financing at a higher rate of 85%. Innovation Authority professionals report that the number of Arab entrepreneurs applying for and utilizing the program has grown significantly in the past three years, with a few dozen companies applying annually. A substantial number also manage to raise the remaining funds from private investors, but still significantly fewer than Jewish entrepreneurs.

**Government Incubators:** Technological incubators are long-term programs (2-3 years) that help startups progress from their initial stage, in which they have established a viable concept, into a startup company. They provide technological and business consultation as well as financial investment. In Israel, government-licensed tech-incubators are supported by the Innovation Authority (previously the Chief Scientists' Office), which invests in the incubator startups at a rate

of 85% (for costs up to NIS 2.1 million), with the incubator itself investing the remaining 15% by raising private capital. Israel currently has 19 tech-incubators, several of which are in peripheral and development areas.<sup>104</sup> One incubator, NGT3, was established in Nazareth in 2002 and remains the only government incubator in Arab society. While it caters to both Arab and Jewish biotech startups in the region, it has played an important role in Nazareth's emergence as a tech hub specifically.

## VII. CIVIL SOCIETY PROGRAM MODELS

The government frameworks described above build on programs and strategies developed predominantly by the civil society and private sectors over the last decade. Though there are dozens of organizations and institutions today that are involved in closing high-tech participation gaps, they generally do so through one or more of the programs and methods below. Links to descriptions of specific program detailed in the Appendix of this paper are included for each category below.

### Workforce Integration

Workforce integration programs target the barriers Arab citizens face in accessing relevant training outside of academic frameworks, connecting with companies and getting hired, and moving up in the workplace.

- **Non-academic Training – Bootcamps and Tech Courses:** Bootcamps and tech courses are an increasingly common means of immersive learning and practical experience with market-relevant skills. **Bootcamps** are intensive short-term software training often created in collaboration with high-tech companies. These offer a direct and practical path into the industry, which sidesteps many academic barriers, and are open to trainees of diverse ages, education, and experience. **Tech courses** on various specialty areas (e.g. Quality Assurance, software development, web and mobile application, automation, Java, and others) have also become increasingly available to Arab candidates in recent years, helping them attain market skills to enter and to advance in the industry.

**Program Implementers:** [Tsofen](#), [ExcelHT by ITWorks](#), [Appleseeds-STARTECH](#), Kav Mashve, [Startup Nation Central](#), [Founders & Coders](#), [She Codes](#), [Arab Women in Science and Engineering](#), [Starting Up Together](#), [We Code](#)

- **Talent Placement and Diversity Hiring:** Placement programs prepare and support candidates in entering the job market and work to promote diversity hiring among companies. These programs generally accompany candidates through the job search and hiring process and provide training in both soft skills (i.e. building a CV and interviewing) and in-demand technological skills. Candidates are introduced to a range of industry professionals through activities such as company tours, lectures, and interview simulations. They are also mentored by Arab high-tech professionals, who serve as role models for overcoming barriers to success. Certain programs continue to accompany candidates after they have been hired, helping them with challenges and growth in the workplace. In parallel, they educate companies about the various government subsidies available for hiring Arab candidates as well as on the other advantages to diversity, such as greater creativity and problem solving, increased employee loyalty, improved intra-

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<sup>104</sup> Israel Innovation Authority, [Technological Incubators in Israel](#).



organizational communication, enhanced access to new markets (i.e. the Arab-speaking world), and others.<sup>105</sup> They also provide workshops and strategies for effectively integrating a diverse workforce.

**Program Implementers:** [Tsofen](#), [ExcelHT by ITWorks](#), [Appleseeds-STARTECH](#), [Unistream - Fast Forward to ICT](#), [Maof HR](#)

- **Gateway Companies:** Three domestic companies have been established with the specific aim of employing Arab professionals: [Galil Software](#), established in 2008 in Nazareth, and [SadelTech](#) and [Siraj Technologies](#), established in 2013 and 2017 in the Negev. They create important entry-points to high-tech for Arab professionals and have extended high-tech opportunities to Bedouin in the Negev, far from Nazareth. For the most part, these companies are service providers that subcontract to larger clients, not startups advancing innovative engineering.

### Industry Expansion and Entrepreneurship

Civil society and private sector leaders recognized early on that training and placement alone would not address some of the more fundamental barriers high-tech to the high-tech ecosystem that limit Arab participation in the industry. Bringing the networking culture, startup scene, high-tech companies, and investors, and growing startups from within, would allow a more organic process of integration and job growth in Arab society to take root.

- **Financing and Venture Capital for Arab Entrepreneurs:** Israel is home to roughly 143 Venture Capital firms investing in high-tech startups and entrepreneurs, 23 of which raised over \$1.4 billion in 2016 alone.<sup>106</sup> In efforts to address the significant barriers that make capital mostly inaccessible to Arab entrepreneurs, two venture capital funds (VCs) have been established in the past 7 years specifically for Arab-led or co-led companies. These two Israeli VCs, [Takwin Labs](#) and [AlBawader](#) specifically focus on Arab entrepreneurs and Jewish-Arab led startups, and have raised close to NIS 200 million combined from both private investors and governmental support.

**Implementers:** [AlBawader](#), [Takwin Labs](#),

- **Accelerators, Incubators, R&D:** In recent years, several accelerator programs have been designed to address Arab startup needs.<sup>107</sup> Like traditional accelerators, these are generally short-term programs that offer technical and professional support for promising entrepreneurs as they develop their concept from initial state to pitch or demo (i.e. product, team, fundraising strategy, and more). Most host around 10 startups in each cycle. There are numerous [incubators](#) in Israel but only one, NGT3, located within Arab society (Nazareth) and supports Arab entrepreneurship as part of its mission. It is focused on biotech and helps advanced-stage startups develop and secure financing. Likewise, there is only research and development center, The Applied Research Institute in the Arab town of Shefa-Amr, which provides support for tech R&D by Arab researchers and entrepreneurs.

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<sup>105</sup> Shtrasman, [Workforce Diversity: The Next Challenge of the HighTech Industry](#), p. 21.

<sup>106</sup> Meir Orbach, [Venture capital funds raised \\$1.4 billion in the 2016](#), *Calcalist*, January 2017.

<sup>107</sup> Judy Maltz, [Poor Arab-Jewish Town in Central Israel Gets It First High-tech Accelerator](#), *Haaretz*, July 29, 2016.



**Civil Society Accelerators:** [Hasoub](#), [Hybrid](#), [PresenTense](#), [Starting Up Together](#), [NGT3](#), [Galilee Society Institute for Applied Research](#)

- **Meetups and Networking Culture:** Tech and innovation workshops, conferences, festivals, and competitions or "hackathons," commonly referred to as "meetups," are inherent to high-tech culture in Israel and around the world. These events facilitate networking between professionals and companies, provide an educational platform for cutting-edge technologies, give entrepreneurs a stage to pitch their startups and ideas, and include lectures from renowned experts in diverse categories of technological innovation. Hundreds of "meetups" take place in Israel yearly, but much like the rest of Israel's tech scene, these are largely concentrated in central cities and rarely in Arab towns. Experts also report that the informal nature of these events in largely Jewish towns and the fact that some take place in bars and pubs and serve alcohol, also deters some Arabs from participating. In the past decade or so, several initiatives have worked to bring the "meetup" culture into Arab and mixed towns such as Nazareth, Kfar Kassem, Jaffa, Haifa, and others, and have encouraged Arabs to engage in Israel's existing meetup culture. Meetups in Arab towns also often include Arab speakers who serve as role-models for aspiring Arab citizens in high-tech. Such events attract dozens to hundreds of participants, which include not only high-tech candidates and professionals but families, youth, and children, exposing Arab communities at large to an otherwise inaccessible aspect of high-tech culture.

**Implementers:** [Hasoub](#), [Tsofen](#), [Mobile Monday](#), [Arab Women in Science and Engineering](#), [MIT Enterprise Forum / GEN](#), [Starting Up Together](#), [Arab Tech Port](#)

## VIII. CONCLUSION AND IDEAS FOR FOLLOW UP

The issue of Arab high-tech integration has come a long way over the last decade. From a worthy but improbable vision in 2008, the value and potential to succeed has gained traction within the industry, government, and importantly, Arab society, as an opportunity to meet a host of socio-economic goals. While the concept is now part of mainstream economic discourse and a number of important barriers have been reduced, serious challenges to integration remain and the process of entering the industry is far from parallel for Israel's Arab and Jewish citizens. The strategies, frameworks and emerging issues described in this paper outline some of the key areas of activity. Areas for further learning and follow up beyond these were suggested by sources and experts in our research:

- **Gaps and Bottlenecks in the Integration Pipeline:** Like other economic integration initiatives, bringing Arab society into high-tech requires addressing barriers at every step of the integration pipeline, from exposure, proximity and access, to education, employment, entrepreneurship and more. Often, investments in one component of the pipeline can highlight barriers and other issues elsewhere. This is especially the case when government budgets are involved which scale up one area of intervention. For example, significant government investment into Arab access to higher education highlighted achievement gaps in the public education system. The same investment also highlighted the need to further address barriers to employment as more Arab graduates sought to integrate into the workforce. Civil society organizations generally aim to fill these gaps, often in partnership with the private sector and academic

institutions. They are often able to identify areas that need additional support at a given time, but are also usually unable to address the issue on a national scale. Today, for example, many civil society organizations are encouraging earlier exposure to high tech, for ages 18 and under, and greater efforts to close related educational gaps in the Arab public school stream.

- **Data Collection:** Currently data about Arab high-tech participation is not tracked consistently across government bodies and civil society organizations. Definitions of what constitutes high-tech related studies, highly skilled versus skilled positions, and viable startups (Arab led or co-led) are not standardized. Neither are the mechanisms for collecting such data coordinated across institutions. Therefore, while available data is adequate for providing a broad picture of achievements, more precise tracking would benefit more precise program development and evaluation going forward. This will be especially critical as tracking depth of integration (i.e. level of employment following higher education, upward mobility in the workplace, Arab entrepreneurship) becomes central to generating more organic processes of integration, since the numbers get smaller at the top of the pyramid and the acceptable margin of error, narrower.
- **Beyond ICT (Information and Communications Technology):** The Innovation Authority's plans to double the high-tech industry total workforce include efforts to bring high-tech innovation and applications to other industries. Some civil society organizations like Hasoub, for example, have begun to bring Arab professionals from life-sciences, biomedicine, agriculture and more, into their conferences and meetups to foster this kind of collaboration and expansion. However, this aspect of high-tech integration is still nascent and inclusion of Arab society is not an explicit part of national plans to expand the industry into other fields. Yet, given the relatively high representation of Arab citizens in medicine and life sciences, for example, exposing Arab professionals from non-high-tech fields to high-tech innovation and opportunities may be a valuable direction for future exploration.
- **Arab women in high-tech:** Arab women are significantly underrepresented in high-tech despite displaying strong proficiencies in STEM studies in junior high and high-school education. Since integrating Arab women into the workforce, in general, is a government priority, better understanding and reducing barriers to high tech for Arab women may be an area of untapped opportunity. Currently a few civil society organizations—[She Codes](#) and [AWSC](#), to name a couple, are supporting Arab women already pursuing or in STEM fields. Follow up on efforts to recruit Arab women into these fields post high-school could yield valuable insights.
- **Developing “Shared Workplace” Capacities:** Some civil society leaders are concerned that government investments into economic integration are not coupled with efforts to develop capacities for living and working in shared spaces on a similar scale. The Council for Higher Education's plan to increase Arab access to higher education [described above](#) has placed great emphasis on creating 'shared campuses' that create a sense of belonging and reduce the experience of alienation for Arab students. Many placement programs work with companies to create welcoming workplaces in the private sector, (i.e. multicultural skills for managers, culturally adapted employee benefits, a multicultural

calendar) and a number of high-tech placement initiatives advance diversity training to leveraging the benefits of a diverse workforce. In addition, some government-backed accelerators and incubators make a point of showcasing Arab startups and Jewish-Arab collaborations. Today there are companies choosing to partner with placement programs and implement these changes in their culture, but this is far from an industry standard.

- **Veteran Arab Entrepreneurs:** A number of organizations working to grow the field of Arab startups spoke about differences in the Jewish and Arab pools of potential entrepreneurs. Compared with Jewish high-techists, few young Arabs have the necessary experience to become entrepreneurs—notwithstanding all the other barriers to launching startups. Arab high-techists tend to enter the industry at a lower level, with mostly only academic background, and gain professional experience in large companies on the job. Some civil society organizations have suggested targeting older and more experienced Arab professionals, and finding ways to encourage them to participate in accelerator programs. The barriers for these professionals are different; they have the professional experience, but are less likely to leave their jobs and risk their financial stability. Yet, these organizations suggest, establishing incentives or financial assistance to mitigate this risk could add a more professional, experienced echelon of participants to the Arab startup scene.
- **Career Support for Tech Students:** Especially given the growth of Arab students in high-tech relevant studies, supports that mitigate dropouts, raise grades, offer channels for internships and employment opportunities during school, exposure to industry, and more are recommended by civil society organizations and within the government framework to [increase the number of high-tech students by 40%](#) (not yet budgeted). While some of these services are offered in certain institutions through the Council for Higher Education's career centers,<sup>108</sup> it is the Arab students who must seek help in order to access services, and many do not. The career centers are also not specifically focused on support for high-tech students. Civil society organizations currently offer the majority of such supports, and recognize they are not able to reach all students or provide a complete envelope of support.
- **Awareness:** Finally, the current level of integration of Arab society into Israel's renowned high tech industry adds an important, complex, and interesting layer to the "start-up nation" brand. Yet this aspect is not well-known. Raising awareness by making these issues part of Israel study tours or community education events, for example, can provide important insight into the realities of economic integration and industry development, and the impact of onboarding the most disadvantaged of Israel's minorities into its most advanced industry. The deeper such integration efforts go, the more opportunities there will be to showcase this side of the "start-up" nation.

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<sup>108</sup> See footnote 58.

## APPENDIX: MAPPING OF PROGRAM IMPLEMENTERS

The following mapping is divided into civil society, private sector, and educational program implementers. It is listed in alphabetic order by organization, each with their respective programs.

### Civil Society Organizations

#### Appleseeds-STARTECH

The STARTECH program, which began in 2016, is a "social tech school" offering training courses taught by experts from some of Israel's leading high-tech companies such as WIX, Outbrand, Sears Israel, Zooz, and Brightcom. With the pedagogical support of Appleseeds professionals, reps from Israeli companies in the STARTECH coalition teach courses for candidates from the socio-geographic periphery. Courses are based on the current needs of the companies, from Ops, to coding, to online marketing and data engineering. The STARTECH coalition includes over 20 companies to date, and each course syllabus is planned and taught by a team of 3-8 companies, at the respective company offices, with the support of Appleseeds. Each course numbers approximately 14 participants, about 50% of which are Arab, and graduates of the course are then invited to interview for an entry-level position at participating companies. STARTECH launched its third course in 2017 and has 30 program graduates thus far.

#### Arab Women in Science and Engineering (AWSC) **Networking, meetups, workshops, and education**

The AWSC forum was established in 2014 by a group of female Arab students in tech-related subjects, in order to advance the participation and success of Arab women in STEM-related (science, technology, engineering, mathematics) academic programs and industries. It offers a range of courses and activities to Arab women nationwide—primarily high-school students, undergrads, and grads—which impart vocational and soft skills and introduce students to industry leaders and role models, primarily women. Completely volunteer-run by female Arab students and professionals in STEM fields, AWSC conducted its first conference in 2015 at the Technion following a year of research on the integration of Arabs into high-tech with consultation from Shatil. Today, AWSC cooperates with a range of bodies in the industry and academia, which enables them to offer regularly offer diverse workshops and events in various locations:

- **"Science on the Bar"**: for instance, offers lectures in Arabic by top-tier Arab professionals and entrepreneurs in high-tech and bio-tech.
- **"Let's Talk Science"**: a monthly seminar, invites STEM experts to introduce both their vocational experience in their field and personal journey in an intimate setting, where audience members are encouraged to ask questions and engage in discussion.

- **"Tech it Forward"**: a bimonthly workshop launched in 2017 in cooperation with Microsoft and Tsofen, offers meetups on soft-skills such as presentation, management and leadership, negotiation, English, and more.
- **Technical Courses**: AWSC also offers 2-4 technical courses a year, such as an intensive course for high-tech professionals on product management in cooperation with Star Vision, which was hosted by Bar-Ilan University. The forum garnered partial funding for the course, enabling participants to join at a highly reduced price.
- **"Think Science" high school program**: In high schools, AWSC offers the "Think Science" program, whose main goal is exposure through hands-on activity. Participants are taught about the industry and the current status of Arabs and Arab women's integration within it, and then engage in interactive learning with experts from tech and bio-tech fields, who also share their personal and professional experience with the groups. "Think Science" is offered by AWSC independently and also as part of Tsofen's educational program "Lessons in Science."
- **Entrepreneurship**: Finally, AWSC also offers entrepreneurship workshops on how to detect needs, think critically, and innovate, such as a workshop on "creativity and ideation" in 2016, in cooperation with the Technion's Bronica Entrepreneurship Center.

#### [ExcelHT by ITWorks](#)

#### **Placement and professional development**

ITWorks was founded in 2005 as a high-tech placement program for communities in the socio-economic and geographic periphery. In 2009, ITWorks established ExcelHT, a placement program for Arab society, with the support of JDC-TEVET. Today, ExcelHT comprises 50% of ITWorks' activity. The organization reports an 87% placement success rate with over 200 placements a year. In 2017, when the government tender for placement was re-issued to a different organization, ExcelHT began charging companies for its services. Since making the shift, ExcelHT has signed 100% of its core 25 companies to placement contracts, meaning companies compensate ExcelHT per candidate hired, much like other HR companies. ExcelHT offers two basic tracks for its candidates:

- **Direct Placement**: This track caters to candidates with adequate technical skills and education who are unable to find employment, assisting them with soft skills such as interview etiquette, language classes, resume building, and career planning.
- **Training, Mentorship and Support**: The second track focuses on vocational training through courses in some of Israel's leading technological colleges (i.e. John Bryce and Ness Technologies) along with soft-skills support. Candidates are paired with mentors from the Arab community, usually those with one year experience in the high-tech workforce who can relate to candidates, share how they have overcome challenges in the industry, and help integrate them into a high-tech company.

In addition, ExcelHT runs the following programs:

- **Orientation Days:** ExcelHT conducts orientation days with companies during which suitable candidates visit and meet with development and recruitment professionals, and often Arab employees who have been integrated there. ExcelHT staff facilitate roundtables where the candidates can ask questions. Some companies have their own staff guide the orientation and integration process.
- **AT-LINK Arab Engineers Forum:** In addition to doing outreach for Arab candidates in universities, ITWorks established an Arab engineer's forum in 2015 that convenes potential high-tech candidates in Arab communities nationwide. The forum encompasses over 300 Arab engineers who share their experiences and interview high-tech "success stories" during forum events. They also bring recruiters to educate on the inner-workings of their company and what they look for in candidates.
- **Promotion Track:** In 2017, ITWorks established a track to help Arab high-tech professionals progress to managerial positions. ITWorks engages employees recommended for managerial potential and interest in upward mobility in a 6-month management and career counseling program. Roughly 15 employees participated in the first round of the track with 60% eventually promoted.

### Founders & Coders

#### Tech courses

Founders & Coders Nazareth was launched in September 2017 as the first international branch of the UK-based Founders & Coders, a non-profit offering tuition-free "coding boot camps" for participants from a variety of backgrounds, with the goal of making such training accessible to diverse individuals with or without tech or computer science backgrounds. The Nazareth branch, established with the support of the British Embassy's UK-Israel Tech Hub and the Nazareth Cultural Tourism Association, offers three intensive, 4-month long courses each year for local and international university graduates with a first or second degree who are seeking better employment opportunities. Each course is conducted entirely in English, and includes approximately 16 participants who work on software development projects for Founders & Coders clients. They are guided by a team of volunteer mentors, mostly program graduates themselves, in a "democratic," peer-led framework. The first weeks of the program are dedicated to group development projects, with emphasis on working as a team and establishing connections with mentors, while in the second part of the course participants create a portfolio of projects and ideas, and on some occasions develop prototypes with the help of Founders & Coders staff. Program graduates can continue to work for the organization as freelancers, or go into the job market as web developers. In its pilot year Founders & Coders Nazareth also offered a course for recent high school graduates, mostly aspiring engineering and computer-science students, who use the training as preparation for university.

### [Galilee Society - Institute for Applied Research](#)

The Institute, founded in 1995, is the first R&D center established in Arab society in Israel. Located in the northern Arab town of Shefa-Amr, the Institute focuses on applied research in the spheres of health, water conservation, molecular biology, environmental and applied biotechnology, renewable energy, and medicinal herbs, with emphasis on issues affecting Arab society in Israel and the northern region in particular. The Institute supports a team of in-house researchers, of which there are now 10, and outside entrepreneurs from Arab society to conduct research, develop proof of concept and eventually products, at its state of the art facilities, which include seven fully equipped labs. Since its establishment, seven start-ups have been created through the Institute, including the highly successful [Enzymotec](#) company (sold), and the Agrobex company for wastewater treatment that has attracted investment from Mekorot, Israel's national water company and management agency. Additionally, ten doctoral students are currently conducting research at the lab under the advisement of some of its researchers with certification from the Council for Higher Education. The Institute also conducts educational tours and activities for students in the public education system, engaging approximately 5,000 students in 2017 alone. The Institute is partly supported by the Ministry of Science and Technology in Israel.

### [Hasoub](#)

#### **Access to high-tech ecosystem, in-depth learning and startup development**

Established in 2014, Hasoub is a grassroots organization for high-tech education in Arab society. Hasoub began as an informal non-academic training and networking group holding technology workshops for Arab peers. As demand has grown, they have become a largely volunteer-run platform exposing and fostering tech-entrepreneurship within Arab community through networking, learning events and competitions, non-academic in-depth training, startup support, and a physical tech-hub in development in Arab society:

- ***Educational events and competitions:*** Through Hasoub Talk, Hasoub Festival, the HackaDream hackathon for high schools, and Campus Hacknights at the Technion—Hasoub has held more than 200 activities with over 10,000 participants in three years. Hasoub Talk, a two-day festival, includes one day of presentations, startup competitions and lectures by leading entrepreneurs and investors. The second day, open to the wider public, has dozens of booths by major tech companies and organizations such as Marvel, Intel, Voicelt, the Technion, and more. Hasoub Talk 2017 was held in Tira for 2,000 attendees. The 2017 HackaDream program for high-school students brought 120 pupils from more than 20 towns to Nazareth for tech education activities and competitions, including meeting mentors from companies like Microsoft, PayPal, and Apple. Also in 2017, Hasoub cooperated with a healthcare entrepreneurship organization on a two-day health and tech event in with 150 participants. The event included innovation contests, with winners awarded either a trip to [StartupIstanbul](#) or prize money from partnering companies.



- **Tech Innovation Center in Ar'ara:** Hasoub received approval in December 2017 from the Ar'ara municipality in Wadi Ara to establish an entrepreneurship and tech innovation center that would offer courses, accelerator programs, and a range of high-tech focused community and educational events. The Ar'ara municipality has agreed to designate a former school campus for these purposes, and the initiative is now fundraising to establish the center. Hasoub is working to raise funds and open the center in 2018.
- **Hasoub-Accelerator:** Hasoub began offering accelerator programs in 2016 and has run two accelerators programs since. First cycle participants were primarily students comprising 12 startups, and the program functioned as a more of a "pre-accelerator" and was primarily introductory. The second cycle, which ran in 2017, catered to high-tech, business, and health professionals comprising 8 nascent startups. During its 4-month accelerator program Hasoub offers technological and business consultation, connects the entrepreneurs to experts and mentors in their respective fields, and offers weekly lectures by high-tech experts and investors. Three startups from the accelerator are selected each year to present in StartUp Istanbul. The Hasoub accelerators were hosted by the Google Campus in Tel-Aviv, Samsung Next in Haifa, and Microsoft Haifa, among others.

### Hybrid

#### **Program for early-stage ventures**

Hybrid is a collaboration between Nazareth Business Incubator Center (NBIC), which is supported by the Ministry of Economy, and the 8200 Organization. It was established in 2015 as an accelerator for joint startups between Arab entrepreneurs and Jewish graduates of the 8200 elite intelligence unit, and is supported by a government tender. The 7-month long accelerator program accompanies 10 such start-ups in each of its cycles, providing professional and technical services and consultation, matching startups with mentors, and connecting the entrepreneurs to companies and investors, with the goal of accompanying them until they gain investment. The startups under the accelerator are often hosted by various companies throughout Israel that are part of the 8200 Organization's network. Participants are therefore exposed to the high-tech ecosystem in different areas of Israel, participate in meetups, and meet a variety of professionals, investors, and private sector representatives. The companies hosting the startups become familiar with the entrepreneurs and their initiatives, increasing the potential of their absorption into the industry or connection to investors. Company representatives and investors are also part of the screening committee for the accelerator, and therefore have access to the startups that succeed.

- **Scale-up:** Established in 2017 with the support of an additional government tender, Scale-up helps Hybrid accelerator graduates maintain momentum in the industry and successfully launch their startups. Scale-up provides mentoring, connection to investors, regulation experts, and design partners, consultation on A-round funding, and more.



**[MIT Enterprise Forum / GEN](#)  
Meetups and education**

MIT Enterprise Forum Israel was established in Israel in 1994 as a chapter of the global MIT Enterprise Forum founded by MIT graduates in the 1970s. Since establishment, the largely volunteer-run Forum has conducted hundreds of events and workshops on tech-related subjects and has partnered with various private and public sector entities working in high-tech, including Tsofen, Hasoub, and Nazareth-based Alpha-Omega. In 2016-2017, the Forum conducted the courses at the Tsofen Entrepreneurship School in Kafr Qasim. In 2008, the MIT Enterprise Forum began working with [Global Entrepreneurship Network \(GEN\)](#), to conduct entrepreneurship events in the Israeli periphery, bringing speakers who grew up in the periphery and became 'success stories' to inspire and expose peripheral populations. In partnership with GEN, the organization has conducted multiple events of this kind in Arab towns including Nazareth, Shfar'am, Tira (in partnership with Hasoub), and others.

**[Mobile Monday](#)--meetups**

Established in 2008, Mobile Monday is an open community platform for discussions on tech innovations and initiatives. It provides an opportunity for networking and meeting role models in the tech community, attracting top experts in the field, from both Israel and abroad, to speak at its events. Mobile Monday events mainly took place in Tel-Aviv until 2012, when the event was brought to Nazareth for the first time under the initiative of tech-expert and professional Hans Shakur. In the years since, at least one Mobile Monday meetup takes place each month in the Arab community, 80% in Nazareth and the rest in Haifa and the Triangle region. Each meetup attracts 60-120 participants, which include both young and veteran engineers, students and recent graduates, investors, and entrepreneurs. Audiences at the events in Arab towns are 30% Jewish on average, and last year "Mobile Monday Nazareth" came to Tel-Aviv. The initiative is supported in part by Tsofen, Microsoft, and Al Bawader.

**[PresenTense](#)—startup support and tech education**

PresenTense was established in 2007 to promote social change through entrepreneurship and works with communities in the socio-economic periphery generally, with 40% of its work focused on Arab society. PresenTense believes that entrepreneurship is an essential tool in the 21st century. As such, it needs to be made accessible to all groups within society. PresenTense runs accelerators in Arab society, runs the Made in Jaffa entrepreneurship program, and initiated the MasarUp council in 2016 now operating under the public council for the promotion of high-tech in Arab society established by Tsofen.

- **Accelerators**— Through PresenTense accelerators entrepreneurs engage in a four month intensive program to develop a nascent idea, build technical and soft-skills, meet role models from the field, grow their network, and receive business consultation from PresenTense experts. PresenTense currently runs nine accelerators

simultaneously, four of which are in Arab towns. The first accelerator in Arab society, "Naztech," was established in 2013 in Nazareth with the support of Cisco and in cooperation with the Nazareth Business Incubator Center (NBIC), and produced seven graduating startups. Presentense also launched accelerators in Baqa Al Garibyye and Hura, each of which ran for two cycles, and in East Jerusalem. Accelerators generally include an average of 10 startups. In 2017, Presentense launched an accelerator in Jaffa and another in Haifa for more advanced-stage startups that already had an established idea or initial funding, by the name of "Leap Haifa. One of the participating companies in Round 1 of Leap Haifa, Innosphere headed by CEO Rami Shacour, has already won several international awards and closed a successful seed round of \$2.5m. In 2017, Presentense partnered with Tsofen at its Kafr Qasim accelerator, with its experts designing and instructing courses for the budding entrepreneurs.

- **"Made in Jaffa"—Meetups and education:** Established by Presentense in 2017, this program aims to bridge the divide in "startup cities," a worldwide problem in which a developing, creative "startup community" stimulates a higher cost of life in an urban environment, creating a deep gulf between itself and poor neighborhoods that end up further left behind. Made in Jaffa works to address this problem in Tel-Aviv—Jaffa, as, while Tel-Aviv represents the primary high-tech hub of Israel, the number of high-tech professionals in the adjacent Jaffa remains scarce. The program recruited Facebook, Google, Microsoft, and Fiver as partners to send trainers and mentors to Jaffa to run skills workshops and inspiration sessions, and host visits to their campuses for Jaffa residents and young adults. In 2017-2018, the program will run in every high school in Jaffa. Made in Jaffa also conducts community events such as the first "entrepreneurial festival" in Jaffa, which are attended by hundreds. The program is supported by Citi Foundation and the Tel-Aviv-Jaffa municipality.

### [She Codes](#)—coding courses

Founded in 2013, She Codes is a female-run, volunteer-based organization with approximately 20,000 members and 35 branches nationwide working to advance an equal number of female and male software developers in Israel, partly by offering computerized coding courses at its branches. In 2017, She Codes opened its first two branches in Arab society—one in Nazareth, hosted by Microsoft, and one in Daliyat el-Karmel, hosted by the Sonya Community Center. Volunteer instructors, students and professionals in high-tech fields, accompany the She Codes courses. Most courses are for beginners and focused on subjects such as web development, Python, Java, and others, chosen according to market needs. Courses convene once a week in the evening to accommodate most women's schedules. The length and pace of the program can vary between branches and participants, with the longest course being 38 weeks. The age range of participants varies greatly, some are students seeking to gain more practical skills, and some are older, seeking to pursue employment in high-tech. The new branches in Arab towns include approximately 30 participants each and are at full capacity, with no dropouts reported thus far. She Codes was a recipient of the WeWork Creator Award for scale in 2017.

### [Starting Up Together](#) – Entrepreneurship Development

The program was launched in 2017 with the goal of providing an "entry ramp" into the Israeli startup ecosystem for budding entrepreneurs in Israel's socio-demographic periphery, including Arabs. The holistic program integrates several models of entrepreneurship training and experience, and does so in a multicultural setting in order to encourage cooperation between different social groups. Select participants are placed into "venture teams" and work together to develop their ventures over the course of the program. The stages of the program include a two-day introductory workshop for team building and exposure, business training and mentoring sessions (workshops on market research, product-market compatibility, business plans, legal status), skill-building workshops in IT development and business English, and a two-day bootcamp focused on environmental scans, business model development, and presentation skills. Finally, the program culminates in a launch event and venture competition that showcases the teams' different ventures to a panel of expert judges including reps. of Israeli investors, leading entrepreneurs, strategic partners, civil society reps., and more. The three winning initiatives gain automatic entry into the second application round for the [MassChallenge Israel Accelerator](#). The program's pilot year included 42 participants (43% women) who formed 13 venture teams, among them five Arab-Jewish teams. Starting Up Together is a joint initiative of The [Edmond de Rothschild Foundation](#) (Israel), [The Peres Center for Peace and Innovation](#), [MassChallenge Israel](#), and Tel-Aviv University's [TAU ventures](#).

#### **[Startup Nation Central](#) (SNC)**

##### **Bootcamp training for top-tier professional development**

SNC, an NGO working with a network of approximately 6,000 companies that facilitates tailor-made cooperation between international companies and Israeli high tech companies, will launch its first coding bootcamp for Arabs and Haredi women in Jerusalem in October 2018. The SNC bootcamp model targets those with a first degree in computer science only, and is focused on detecting and cultivating excellence in its participants, striving not only to integrate them into the industry but to do so at the highest possible level and salary, simultaneously raising awareness of their value in the private high-tech sector. SNC has partnered with several private and civil sector bodies toward the project, each with expertise in a different aspect of the program. Mobileye, Lightricks, ExLibris, and 40Nuggets will participate in building market relevant content for the courses and provide real examples from development processes at the companies to create learning simulations. The Feuerstein Institute will help select optimal candidates, based primarily on learning and problem solving capacities as opposed to transcript grades. The Elevation Academy will conduct the technological training itself through intensive 3-month courses, building technical as well as professional and personal skills necessary to working on an elite development team. Finally, ITWorks will provide support throughout, helping to find candidates, providing soft-skills training, and accompanying new-hires at the initial integration phase. The first bootcamp cycle will include 20 Arabs and 20 Haredi women. The goal is to conduct 12 cycles in 3 years, which will eventually produce a minimum of 240 Arab graduates. Candidates in initial cycles will receive full tuition funding as well as scholarships for living expenses.

## [Tsofen](#)

### Placement, Industry and Ecosystem Expansion

Tsofen, the first placement program for Arabs in high-tech and among the major drivers of high-tech development in Arab society, was founded by high-tech entrepreneur Smadar Nehab, former Amdocs executive Yossi Coten, and current Tsofen Co-Director Sami Saadi in Nazareth in 2008. Today, the organization strives to ensure that by 2025, Arabs will comprise 10% of the core high-tech workforce. In light of the industry's need for workers and increased competition for talent at the time it was established, the organization sought to offer Arab high-tech professionals as a domestic alternative to offshore recruitment. Since, Tsofen has developed recruitment, training, and placement capacities for workforce integration; runs several highly regarded conferences, meetups and competitions; and has been key for expanding the industry in Arab society.

- **High Tech on Campus:** Tsofen conducts its outreach to Arab students primarily through a network of universities in which it holds its annual "High-Tech on Campus" program, which brings Arab high-tech professionals to discuss their experience with the students, offer information on the demands of the industry, and provides interview simulations and tours of high-tech companies. Through the campus program, potential candidates become acquainted with Tsofen and its services.
- **Placement:** By forging connections with a network of high-tech companies and ongoing partnership with the Nazareth-based company [Galil Software](#), Tsofen has placed approximately 1,200 Arab candidates since its establishment, and now averages over 200 placements a year, with a success rate of 85%. Candidates in the Tsofen network are offered an average of five technical courses a year on a range of specialty high-tech skills, and assistance with soft-skills such as interviews and resume building. As of 2017, Tsofen has conducted 35 training courses. Each year, Tsofen partners with one of the more than 100 Israeli high-tech companies in its network to help run its courses, campus and mentoring program. Experts from the company serve as speakers on the campuses and course lectures, and are paired with candidates to assist them through the training and application process over the course of six months. Additionally, Tsofen bases its courses for that year on the needs presented by the thereby aligning its training with the industry needs. Tsofen was the recipient of the government tender for the placement of Arabs in high-tech from 2014-2017.
- **Meetups and education:** The Tsofen organization offers several events on innovation and entrepreneurship every year, which cater specifically to the Arab community but attract significant Jewish participation as well. The events include high-tech industry experts, professionals, and ecosystem stakeholders from educators to government representatives, and include events for specific populations such as high school students and women. Among Tsofen's flagship events are:
  - **Makeathon**—a 36-hour competition between innovators, coders, designers, and engineers, who come together to develop prototypes for innovative hardware and software products. Winners are awarded a range of prizes including a trip to tech conferences abroad. The event is held in Nazareth with the support of companies and organizations such as the Nazareth Business Incubator Center, Mobile

Monday, Alpha Omega, Intel, Google, Amdocs, Microsoft, and others. 2017 marked the 6<sup>th</sup> year of the event, with over 140 contestants, and an audience of over 300 participants in the Makeathon's final event.

- *Nazareth Summit*—For the past six years, Tsofen has also conducted the Nazareth Summit, an annual event focused on a different aspect of the high-tech industry each year. In 2017, the event centered on the encounter between entrepreneurs and investors, bringing startups together with venture capital fund representatives and angel investors. The Nazareth Summit is attended by 300-500 people annually.
- *Qasim Tech Unconference*—In 2017, Tsofen also hosted the Qasim Tech "unconference," attended by over 600 participants including both technological innovators and experts and social and municipal leadership. One of the goals of the event was to introduce Kafr Qasim as the next high-tech hub in an Arab town in Israel and showcase the potential of the Jewish-Arab collaboration in the industry.
- *Day of Failure*—A fairly new annual Tsofen event, Day for Failure, began in 2016 with the goal of turning challenges, mistakes, or "failures" shared by Arab entrepreneurs into learning lessons and growth opportunities. During the event, attended in the past two years by approximately 100 participants, high-tech professionals share failures they have faced and reflect on how they became opportunities.
- *Coffee with Entrepreneurs*—A series of monthly talks with leading high-tech entrepreneurs that began in January 2018 in the Triangle Region. The events take place in a different location each time with approximately 20-50 participants per session, many of whom are women. The success of these events, and the interest shown by community members from diverse professional backgrounds, has motivated Tsofen to establish the new Ideation Accelerator model (*see next bullet*) which is open to participants outside of traditional high-tech fields.
- ***Accelerator Kafr Qasim***— This accelerator was established in Kafr Qasm in 2016 as part of a school for tech and entrepreneurship and as part of Tsofen's efforts to establish a high-tech hub in the Arab city of Kafr Qasim. Running a combination of technological, entrepreneurship and technical courses and in its first two years, the program partnered with both the MIT Enterprise Forum and Presentense to test various models. In June 2018, the accelerator ceased offering courses and launched the **Ideation Accelerator**, run with Presentense, open to participants from all educational and professional backgrounds interested in entrepreneurship. Its 10 weekly sessions included introductory workshops on developing ideas and beginning a startup, talks and meetings with high-tech mentors, and tours of leading high-tech companies. After this cycle, the accelerator will likely return to the classic model. The initiative is supported by the Middle East Partnership Initiative (MEPI).
- ***Industry development:*** Tsofen works with government, municipalities, and the private sector to establish new companies and branches of existing companies in Arab towns, as well as to expand business for companies already located in and around them. For private companies, Tsofen provides services ranging from consultation on government and municipal benefits to assistance with human capital mapping, training, and

recruitment. In parallel, Tsofen works with local government, acting as a bridge with private companies on the one hand, and lobbying government ministries for high-tech development in Arab localities on the other. Tsofen has been a driving force in the establishment of Nazareth as a tech hub, and for the past two years, has been working to develop a high-tech hub in Kafr Qasim. Tsofen was also instrumental in the creation and approval of the government plan to establish two high-tech parks in Arab towns in 2018.

- **Advocacy: The public council for the promotion of high-tech in Arab society**—The Council was established by Tsofen to advance programs and campaigns involving civil society, government, and private sector stakeholders advancing integration of Arabs into the industry. Its goal is for Arabs to comprise 10% of the high-tech workforce by 2025. The Council is co-chaired by General Managing Partner at Eucalyptus Growth Capital David Perlmutter and VP of Cadence Design System Ziyad Hanna. The Council, includes roughly 30 government, municipal, civil and private sector professionals and experts and runs numerous sub-committees on various aspects of Arab high-tech integration. One of its primary sub-committees, *MasarUp* (first established by Presentense in 2016 and later absorbed into the Council), addresses the issue of entrepreneurship in Arab society. Based on MasarUp's research, the Council developed promotional campaigns and interventions to advance awareness and acceptance of entrepreneurship as a viable career-path among Arabs. It has a goal of reaching 500 Arab-led startups with comparable success statistics to Jewish society in the coming years. The Council meets at least twice a year, and part of its activity is marketing the success of Arab-led startups and the existence of vocational and educational opportunities for Arabs in high-tech, as well as to generate awareness about the potential of high-tech in Arab society in government and the private sector.

#### [U.K.—Israel Tech Hub – Arab Tech Port](#)

Part of the U.K. Embassy in Israel, the Tech Hub was established in 2011 to connect high-tech entrepreneurs in Israel with British companies seeking innovation. It has had an 'Arab Sector' division since inception. In October 2018, the Tech-Hub will officially launch an English website dedicated entirely to Arab entrepreneurs in Israel (soft launched in July 2018) called the "**Arab Tech Port**," which will serve as a networking and educational platform. The website will include a database of Arab-led startups in Israel, a video library with classes by experts on different aspect of the startup process, as well as panels on different issues such as women in tech. Additionally, the site will include information on relevant news, events and integration programs for Arabs in tech. A tech-focused podcast in Arabic will also be launched with the site, which will feature conversations and interviews with entrepreneurs and experts in different tech sectors. From 2015-2017, the Arab sector of the Tech Hub ran the "Go Global" program, which supported and prepared Arab entrepreneurs for networking and marketing in the U.K. It yielded several contracts between Arab startups and U.K. companies including the NHS and Penguin House. "Go Global" no longer conducts the preparation program but continues to send Arab entrepreneurs for networking events in the U.K. along with general Israeli delegations. The Tech Hub conducts networking events for Arab entrepreneurs in Israel on an ongoing basis.

### Unistream

#### **Fast Forward to ICT**

This program is offered to graduates of the 3-year Unistream tech-education program for high-school students in the socio-geographic periphery. Fast Forward helps participants find employment in high-tech, exact sciences, and financial industries, as well as to connect tech-entrepreneurs with sources of capital. The program piloted in 2016 with 40 graduates ages 18 and up, about 25% of which were Arab, using its network of over 300 cooperating companies to help its candidates find employment. With the help of Unistream professionals in the search and application process, all 40 graduates were placed within the year.

### We Code

#### **Labor and Social Services Ministry and JDC-Tevet**

We Code is a high-tech training and placement program for populations in the socio-economic periphery including Arabs, Ethiopians, ultra-Orthodox and people with disabilities. It aims to provide an entry-ramp into a high-tech career to unemployed or underemployed participants from diverse populations ages 25-30. The program was launched in 2018 in partnership with the Inter Disciplinary Center in Herzliya (IDC) and the Experis human resources agency, which will offer 8-months of training in programming and computer science along with career guidance and job placement support. There are no academic pre-requisites for participants, which are primarily selected based on potential and motivation. Upon completing the program, participants are qualified to be integrated into entry-level programming positions. After a year of employment, they may enroll in a computer-science degree program at IDC and use the credits they have earned toward degree completion. A 50/50 matching scheme between the Labor and Social Services Ministry and JDC-Tevet, the program offers a full scholarship as well as a NIS 2,000 a month stipend for participants. The first program cohort includes 30 participants, only two of which are Arab due to barriers in reaching Arab candidates. The program aims to have at least 6 Arab participants in its next cohort.



## Private Sector

### Al-Bawader

The first venture capital fund established specifically for the Arab society, Al-Bawader (Arabic for "sprouts") was founded in 2010 as a joint venture between the Government of Israel, specifically the Authority for Economic Investment, and the private sector, namely in partnership with Chemi Peres, son of former President of Israel Shimon Peres and managing partner in the VC fund Pitango.<sup>109</sup> The fund was established with a NIS 80 million tender from the Israeli government, to be allocated on the condition that a private company would match the sum. The venture capital fund Pitango exceeded the NIS 80 million requirement, raising a close to NIS 100 million for a total of NIS 77 million in the fund. Al-Bawader seeks to capitalize on the connection of Israel's Arab entrepreneurs to the expansive Middle-East market and Arab world, investing in manufacturing, services, and technology companies. Its goal is to utilize its funds by 2020, investing in up to 20 companies.<sup>110</sup>

### Galil Software

The software services company was established in Nazareth in 2008 by a group of roughly 15 leading high-tech professionals who acted as investors. Part of its mission was to absorb Arabs with high-tech relevant degrees who were unable to find work, simultaneously providing employment and sending the message that high-tech is a viable career path within Arab society. The company, working closely with Tsofen, grew to 100 employees within five years, and 200 by 2017. Galil Software professionals provide services primarily to major high-tech companies in Israel, with over 40 companies as clients as of 2018. Its expertise is in QA automation, DevOps, and Web Full Stack. Initially, the company offered a cheaper workforce to its clients, but as the size, quality, and capacity of its employee base has grown, Galil Software employees now earn salaries commensurate with industry standards. In 2015, Galil opened a second branch in the Nazareth-adjacent Arab town Yafa an-Naseriyya and in 2018, a third branch in the mixed city of Akko. Approximately 26% of Galil Software employees are Arab women and roughly 10% are Jewish. A substantial margin of the company's employees gain upward mobility in the industry and go on to work for additional companies in Israel and abroad. About 80% of Galil Software employees are programmers, developers, and software engineers, with a smaller percentage working as team leaders and VP's. A start-up company in its own right, Galil Software awards its employees stock options in the company. In 2018, Galil established a start-up by the name of Shield 34, for a QA automation product, which is supported by the Innovation Authority and employs Galil Software engineers. One of the company's primary goals is gaining more clients beyond Israeli borders. By becoming a global service provider, Galil Software can expand and absorb a larger number of employees.

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<sup>109</sup> Tali Heruti-Sover, Inbal Orpaz, [A Venture Capital Fund's Rough Ride in Boosting Israeli Arab Industry](#), *Haaretz*, May 29, 2015; [Arab Citizen Employment in Israel](#), *Inter-Agency Task Force on Israeli Arab Issues*, July 2013, p. 29

<sup>110</sup> Heruti-Sover, Orpaz, [A Venture Capital Fund's Rough Ride in Boosting Israeli Arab Industry](#).



### Maof HR

#### **Human Resources Firm**

Maof HR is a private human resources company responsible, under the Ministry of Labor tender for the placement of Arab professionals in the high tech industry, for the center and south of Israel. Maof-HR works in various industry sectors across Israel. Since receiving the tender, MAOF has established the "*ForceTech*" initiative for the placement of Arabs in high-tech. Maof has enlisted the Taldor IT company for conducting IT courses for candidates, and has partnered with Applesseeds for recruitment and activities in universities. As of summer 2018, Maof has established an initial model for placement that will include technical, soft-skills, and language supports for candidates, yet to be implemented.

#### **Nazareth Industrial Park**

The Park was established with the initiative and investment of industrialist Stef Wertheimer in 2012. Currently hosting seven companies and two startups, the park has become a symbol of Nazareth's emergence as a tech and business hub. The park is home to branches of global companies such as Amdocs, Broadcom, and Intel, as well as Alpha Omega. It is designed to contain a maximum of 25 companies and 1,000 employees. Today it hosts nearly 400 workers, 30% of whom are Jewish professionals and the rest Arab. The park is similar to other initiatives by Wertheimer in Tefen, Omer, and Tel-Hai, where educational activities are held on an ongoing basis—an eventual goal for the Nazareth Park as well. The Park already hosts several annual community events and conferences, and the companies within it conduct educational tours and activities of their own volition.

### NGT3

#### **Biotech INcubator**

NGT3 was initially established in 2002 as "NGT" in Nazareth, with the goal of opening a biotech incubator in an Arab town. Its initial investors were Arab and Jewish high-tech and business professionals, marking the first time Arab investors funded technological companies. In 2013, NGT3 was established as the next generation of NGT with a "triple bottom line:" a high return for investors, social agenda, and adding value to innovation in biotech. The incubator offers managerial support, networking and massive business development support, which includes bringing large multinational companies and regulatory experts to work with its startups. To date, the incubator has helped roughly 40 startups, 17 of which were founded by Arab entrepreneurs and four co-led (Arab-Jewish). This includes three Arab women entrepreneurs. Each startup receives approximately NIS 3 million for the first two years of its operation within the incubator—15% of which is funded by NGT3 investors and the rest from the Innovation Authority. Overall, NGT3 currently has access to \$20 million funding from the government and approximately \$12 million from private investors. Startups can continue to operate under the incubator beyond the first two years with largely private funds, and most are eligible for additional government supports. One of the primary barriers faced by the biotech incubator is

finding and recruiting Arab entrepreneurs. The majority of Arab graduates from life sciences are more likely to turn to the medical professions and are reluctant to engage in the more risky entrepreneurial career path.

### SadelTech

Web, Mobile and QA Services Company

The web development, mobile application, and QA services company was established in 2012 by Negev-born Ibrahim Sana along with Udi Keshet and Jacob Baharav, with a mission to employ Negev Bedouin in high-tech. Since establishment, the company has provided services to a range of private companies and startups as well as public schools, local councils, and NGOs. Today, 80 Negev schools are using a digital platform for teachers and pupils implemented by Sadel with the support of the Innovation Authority, which has also approved a new round of support for Sadel in 2018 for the development of a more advanced platform. SadelTech has 15 employees, 10 of which are Negev Bedouin. The company also helps budding Bedouin entrepreneurs with startup ideas by investing in-kind business and development consultation in exchange for equity. For instance, it is currently invested in the Bedouin-founded Takalot startup for 'smart' delivery services in the Negev. Sadel employees are encouraged to develop and pitch startup ideas on an ongoing basis at the company. The company is currently based in the Negev city of Hura.

### Siraj ('light-source') Technologies Ltd.

Software Company

Founded in 2017 by Bedouin and Jewish entrepreneurs and academics, Siraj is a Be'er Sheva-based software company that seeks to generate "high-level job opportunities for Bedouin society in the fields of technology and high-tech." It does so both as a social enterprise that hires Bedouin engineers and reinvests its profits into technological training within Bedouin society. Parallel to Siraj Technologies, the NGO "Siraj: Advancing high-tech in the Bedouin Community" was established as its partial owner. The Siraj NGO ensures that company profits are reinvested in the Bedouin community and develops philanthropic support for educational activities that do not generate profit. In its pilot year, Siraj established a core team of six Bedouin engineers, developed an expertise in IIoT (Industrial Internet of Things) platforms, successfully completed a development project for GE Digital, and has begun working with three additional companies. It also conducted several tech-related events for the Negev Bedouin community, including an introduction to IIoT and a well-attended meetup with the first employee of Waze, Fej Shmuelevitz. The Siraj NGO has also developed several models for vocational opportunities through Siraj Technologies, including a 6-month "on the job training" program, after which 70% of participants would be able to integrate into the Siraj R&D team. Siraj Ltd. received the WeWork Creator Award in October 2017, and was awarded the "Minorities Track Startup Companies" research and development grant from the Innovation Authority in 2018.

**Takwin Labs**  
Venture Capital

Takwin (Arabic for "genesis") Labs is a venture capital fund established in 2014 with the goal of investing in and supporting Arab entrepreneurs in building viable companies. The VC was established as a partnership between Babcom Centers, Pitango Venture Capital, and Jerusalem Venture Partners (JVP), which raised NIS 12 million in investment funds. Takwin invests in companies that include at least one Arab founder, and currently has eight startups in its portfolio. The fund provides technological and managerial support, accompanying startups from their earliest stage of development, and offers space in its headquarters in Haifa, currently used by two of its startups. Takwin is focused on building the potential of Arab entrepreneurs and their ideas by offering intensive consultation and assistance with all aspects of company development, from research, to pitching, to establishing a team, to formulating a business strategy.

**Pre-academic Educational Initiatives**

This briefing paper focuses on Arab employment and entrepreneurship in high-tech and therefore does not map the various educational initiatives working in Israel's public schools and informal education frameworks for Arab citizens 18 years old and under. Such programs are part of efforts to expand informal education in Arab society and close Arab educational achievement gaps.<sup>111</sup> They work to provide early exposure to high-tech, vocational training and certifications, 'hackathons,' workshops, lectures, tours, and more. Several organizations listed above conduct such educational activities as part of their operations, (i.e. Tsofen, Presentense, AWSC, Hasoub, Unistream, and the Galilee Society). Other organizations not included in the current report provide such services as well, such as the NET@ youth program by [Appleseeds](#), [Alrowad](#), [MOONA-Space for Change](#), the [Tamar Center in the Negev](#).

Several high-tech integration programs, detailed below, aim to provide an entry ramp to high-tech degrees for Arab high school students and graduates. Mostly following a gap year model, some begin in parallel with high school studies:

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<sup>111</sup> For more on the informal education activities run by these organizations, see the briefing paper, [Informal Education in Israel's Arab Society](#), *Inter-Agency Task Force on Israeli Arab Issues*, July 2017, Appendix.

### Hesegim (achievements) in Hi-Tech

Established in 2014 with support from the Council for Higher Education, this program helps 18-35 year-olds from the socio-geographic periphery to enroll in higher education engineering (75%) and computer/exact science tracks (25%), and to complete their first degree in these subjects. Its purpose is two-fold: to increase the pipeline of engineers entering into the industry, and to make high-tech more accessible to communities in the Israeli periphery, including Arab citizens who comprise roughly 20% of the program's participants. Hesegim helps candidates with two central barriers: lack of enrollment qualification and financial hardship. Its selective recruitment process, evaluations, and supports are designed to prevent dropouts among participants who do make it into degree programs.

Selected candidates begin the program upon graduating high school, with a 9-13 month pre-academic preparatory program that includes courses in math, physics, English, scientific writing, learning skills, and psychometrics. In this stage of the program, participants receive a monthly living-expenses grant and comprehensive academic and career counseling. Upon completing the preparation course, candidates must pass entrance exams and meet higher-education qualifications before receiving continued support. Those who pass are accompanied by the program throughout their first-degree studies, with supports such as living and tuition scholarships (NIS 100,000 per capita), academic, personal, and career counseling, housing aid, laptop computers, and others. To date, approximately 200 students have reached year two of their degree track through the program, and roughly 300 are enrolled in its pre-academic course. Achievements in Hi-Tech works in cooperation with Ben-Gurion and Bar-Ilan Universities and the Technion.

### AJEEC-NISPED—Bridge-Tech

Due to the low representation of Negev Bedouin entering high-tech relevant degree programs, AJEEC-NISPED launched Bridge-Tech in 2016 as a "collective impact" model.<sup>112</sup> It begins as a gap-year program and supports its candidates through university and into employment. The gap-year phase of the program is a 13-month intensive that engages candidates 5-days a week in three central ways:

- (i) Academic—candidates study math and academic/spoken English and Hebrew at the five-unit matriculation level, in addition to prep courses for the psychometrics exam and the YAEL test for Hebrew language aptitude. Candidates also take a website development course and an industry-oriented course, both of which entail a final project.
- (ii) Personal & life skills—focused on teamwork, self-confidence, and leadership. Candidates volunteer at the Carasso Science Park in Be'er Sheva, run weekly

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<sup>112</sup> In reference to the collective impact model for sustainable social change, not to be confused with the Collective Impact organization in Israel. For more on this model, see [here](#).

educational activities in their respective towns, and conduct a science festival for the Bedouin community at the end of the year.

- (iii) Orientation—candidates are exposed to higher education programs through tours at Israel's leading universities, and to the industry via day tours to high-tech companies. Candidates meet with role models from the industry and learn about its needs and standards. Participants in the gap-year program receive a monthly scholarship for travel and living expenses, and pay only a low participation fee and the cost of standardized tests.

Following the gap-year program, Bridge-Tech professionals help candidates apply to university and for scholarships, and select their courses once accepted. Monthly meetings are held with all candidates throughout their university studies. Bridge-Tech also awards its candidates a scholarship covering first-year tuition and living expenses. The program is structured to accompany participants through graduation and to the employment phase.

The first cycle of Bridge-Tech gap-year candidates completed the gap-year program in 2016 and are therefore still at the university phase. Of 20 initial candidates, 17 completed the program, 13 enrolled in university programs, and 8 enrolled in high-tech relevant tracks. The second Bridge-Tech cycle began in 2017 with 30 candidates, with support from the Ministry of Education under the definition of a 'leadership institute.'

#### **Givat Haviva—Bara'em Hi-Tech**

Established in 2015, the Bara'em program enables Arab high school students from the Wadi Ara region to begin attaining a computer science degree (B.Sc.) while in high school from the Netanya Academic College. Selected pupils take weekly courses starting in 9<sup>th</sup> grade, earning 60% of credits toward their B.Sc. by the end of high school. They complete the remaining courses upon graduation with an additional fifth year. Participants do not have to complete a psychometrics exam but must have a full matriculation certificate in order to attain their degree. Courses are conducted at the Givat Haviva campus in the first two years and at the Netanya Academic College for the latter three. They are taught by Netanya College instructors, with additional weekly support workshops taught by excelling students from the College. While in the program, participants meet with and tour high-tech companies as well as civil society placement organizations such as Tsofen. As of 2018, 70 pupils are enrolled in year one of the program, 24 in the second, and 22 in third. Dropouts are due to academic and language difficulties as well as cost—participants must pay NIS 8,000 tuition to participate along with transportation and other costs. Each cycle of the program is currently comprised of 50-70% girls. The program's goal is to reach 80 participants, and will be continuing in partnership with Netanya Academic College in the next academic year, 2018-2019.