



STUDY

Israel's automotive and smart mobility industry

Electrified, autonomous and intelligent

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Table of contents

1. Management summary.....	5
2. Introduction and methodological approach	7
3. Disruptive trends in the automotive industry: Changes in the technological ecosystem	8
3.1 E-mobility: Regulatory pressure on a developing market	9
3.2 Autonomous mobility: A race between traditional automotive companies and new players	12
3.3 Smart mobility: Creating robust strategies in times of radical change	15
3.4 Perspective for 2030: Control points within the technological ecosystem	18
4. Israel's automotive and smart mobility industry	20
4.1 Development of Israeli industry.....	20
4.2 Technology competencies of selected Israeli startups	26
4.2.1 E-mobility.....	26
4.2.2 Autonomous mobility	27
4.2.3 Smart mobility.....	28
4.2.4 Conventional vehicle technology and other fields	29
4.3 Israel's entrepreneurial ecosystem	30
4.3.1 Finance.....	31
4.3.2 Human capital.....	32
4.3.3 Market.....	34
4.3.4 Policy	35
4.3.5 Support	37
4.3.6 Culture	39
4.4 Strengths and technology potential of Israeli industry	40
5. Growth opportunities	43
5.1 International growth opportunities for Israeli companies	43
5.1.1 E-mobility.....	43
5.1.2 Autonomous mobility	44
5.1.3 Smart mobility.....	44
5.1.4 Conventional vehicle technology and other fields	44
5.2 Opportunities for international companies to invest in Israel	45
5.2.1 Establish an R&D operation in Israel.....	45
5.2.2 Buy technology and talent through M&As and strategic ventures	46
5.2.3 Set up new platforms such as innovation labs and accelerators	46

5.2.4	Use Israel as a base for managing your innovation activities	47
5.2.5	Engage Israel's high-tech diaspora	47

Table of figures

Figure 1: Key drivers of disruption in the mobility landscape	8
Figure 2: Key influencing factors and trends impacting the automotive industry	9
Figure 3: Drivers of global electrification scenarios.....	10
Figure 4: Share of propulsion types, 2020 and 2025 (high electrification scenario)	11
Figure 5: Summary of push factors for ADAS from governments and consumer protection bodies	13
Figure 6: SAE definitions of levels of autonomous mobility	14
Figure 7: Launch horizon for automated driving functions	14
Figure 8: Overview of global mobility scenarios: possible futures in 2030.....	16
Figure 9: Autonomous scenario: Estimated revenues and profits [EUR bn]	17
Figure 10: Critical control points for the 2030 technology ecosystem.....	19
Figure 11: Structure of the Israeli automotive and smart mobility industry	21
Figure 12: Overview of selected OEM/OES activities in Israel	22
Figure 13: Overview of recent activities in Israel.....	23
Figure 14: Evolution of Israeli automotive and mobility startups and their financing	25
Figure 15: Startups by development phase and capital-raising model	26
Figure 16: E-mobility: Examples of Israeli startups	27
Figure 17: Autonomous mobility: Examples of Israeli startups	28
Figure 18: Smart mobility: Examples of Israeli startups	29
Figure 19: Vehicle technology: Examples of Israeli startups.....	30
Figure 20: Israel's entrepreneurial ecosystem	30
Figure 21: Israel is a reliable investment region for financial partners	31
Figure 22: Israel's human capital.....	33
Figure 23: Technology-based market view	34
Figure 24: Overview of national R&D programs from the Office of the Chief Scientist.....	36
Figure 25: Overview of top-level state support.....	37
Figure 26: Overview of support	39
Figure 27: Key characteristics of Israeli entrepreneurs	40
Figure 28: Characteristics and success factors of the Israeli entrepreneurial ecosystem	41
Figure 29: Israel's activity radar for critical control points, by company maturity	42
Figure 30: Mastering critical control points guarantees future growth opportunities	43
Figure 31: Four ways to benefit from Israel's expertise.....	45

1. Management summary

The automotive industry is currently getting excited about possible disruptions arising from technological and societal trends such as electric, autonomous and smart mobility. These trends attack the very foundations of the business models employed by established players and existing supplier structures. In particular, a new cultural behavior in which people "consume mobility" rather than buy cars could have a major impact on current players.

Israel has recently become active in the automotive and smart mobility industry. Technology companies like Mobileye and Valens and mobility service providers such as Waze and Gett have their roots in Israel and are driving growth in this sector in the region. Historically, Israeli companies supplied conventional mechanical parts to the automotive world. But more recently, the digitization of mobility has demanded new competencies – such as object recognition and tracking for advanced driver assistant systems, as well as mobility behavior projections for shared ride services. These are precisely the fields where Israel has developed specific skills in the past, often targeting military defense applications or big data applications for intelligence services. These capabilities, which are very important for the future, are accessible to a large share of Israel's highly skilled workforce. A growing awareness for the availability of these competencies is reflected by the increasing investments and activities of automotive players of the caliber of GM, VW, Daimler, Ford, Renault-Nissan, Bosch, Samsung (Harman) and many others.

One noticeable feature of the Israeli business landscape is the large number of entrepreneurs and small businesses that have focused on the above-mentioned technological trends in recent years. The cultural aspects that foster this development and motivate people to start a new business can be summed up in a simple statement: "It is the Israeli dream to launch a startup." The business culture is direct and somewhat confrontational: People are trained in out-of-the-box thinking during their military service and develop a robust attitude toward failure and risk-taking. This combination of characteristics results in a fast speed of business. Global venture capitalists have become aware of the potential of Israel's technology and IT startup scene and are increasingly investing in the region. The country's tightly meshed business network culture allows easy access to investors, speeding up company development.

Further growth in local businesses can be achieved by targeting the relevant technologies and interfaces – or "critical control points" – in each technology sector. These interfaces are directly linked to sharing in revenues in future business models that rely on the use of mobility. Israel's local industry may indeed start growing faster, as many multinationals are excited by the innovations coming from the region and are keen to participate or collaborate. Companies are investing in the region through bilateral R&D partnerships, mergers and acquisitions, strategic ventures, setting up innovation labs, or simply by connecting to the local scene to manage innovation areas.

Overall, the Israeli automotive and smart mobility industry is becoming an innovation lab and pulse generator for the movements connected with electric, autonomous and smart mobility.



Voices from the automotive industry on Israel



*“Israel is now a world leader in the autonomous vehicle market place. **If anyone had any doubt, all you have to do is look at the Mobileye transaction. Not just because of its unbelievable size but because of the fact that Intel has now moved their world activity in mobility to Israeli headquarters.** In addition to the Intel leadership, there are now approximately 500 different mobility startups and leading mobility funds in Israel.”*

Jonathan Medved (OurCrowd)

August 02, 2018 | NoCamels



*“**[in auto tech startups] a lot of the entrepreneurs are coming out of the Israel Defence Forces and they tend to be older than the traditional Silicon Valley (entrepreneurs). They have a lot of judgment and wisdom.** Particularly in areas like cybersecurity, there’s tremendous activity coming out of Israel.”*

Bill Ford (Ford)

May 23, 2018 | Technology News



*We were not known as a country that provides technology to the automotive industry and **suddenly you have more than 500 different startups dealing with ... the automotive industry**”*

Ziv Aviram (Mobileye)

May 23, 2018 | Technology News



*It’s just the right environment for ground-breaking innovations, and thus for Bosch as well. **The country has a lot of scientific and technological potential in many areas that are important for our company’s future, and we want to take advantage of that. Relative to its population, no other country is as innovative.**”*

Volkmar Denner (Robert Bosch)

June 22, 2016 | Automotive World



*Daimler board member Professor Thomas Weber, who also heads the conglomerate’s research and development ventures for cars, said the new technology center **“seeks to boost the global R&D outline with the help of Israel, the high-tech nation...so that we will continue to be the automotive industry’s technological leader in terms of efficient, technologically advanced, safe cars.”***

Thomas Weber (Daimler)

November 7, 2016 | Globes - Israel Business News



“There are a lot of areas in Israel that are going to play a vital role in the automotive industry ; there are likely to be more areas to which Israeli entrepreneurs will bring the latest innovations.”

Uri Pachter (Faurecia)

August 02, 2018 | NoCamels



*“That’s why we don’t think or act like a normal VC fund. Our goal is not pure economic profit. A VC fund can do a lot to help young companies, but it can never be their client. **We can, and after we invest in a company, we start working together to integrate its technologies into GM vehicles.**”*
Lauckner, unsurprisingly, has a flattering view of the Israeli tech scene, claiming **“there are many capabilities here that suit our needs.”**

Jon Lauckner (GM)

April 19, 2016 | Globes - Israel Business News



*“This opening is part of the Alliance policy on global presence upstream, in research and innovation alike. **The dynamic environment in Israel is an opportunity that will serve both to promote the electric vehicle and foster creativity on mobility.**”*

Serge Passolunghi (Renault)

June 14, 2016 | auto.economicstimes

2. Introduction and methodological approach

Over the last two decades, there has been a significant increase in the number of Israeli startups and companies operating in areas such as the shared mobility economy, fleet management, big data for transportation, connected vehicles, autonomous driving and e mobility. About 550 startups are currently operating in these fields, while industry interest has been growing and investments in the Israeli smart mobility sector reached USD 22 billion over the last five years. To take just one example: quick-charging battery startup StorDot alone received over USD 80 million in funding during 2017-2018¹.

The objective of this report is to provide global stakeholders with an up to date professional analysis of the potential and opportunities created by the Israeli smart mobility industry.

To gain a solid understanding of the industry, we conducted a first-hand analysis of the Israeli smart mobility industry, including looking at input from the Israel Export Institute as well as from the Fuel Choices and Smart Mobility Initiative. We also held on-site meetings with companies, accelerators, venture capitalists and other industry leaders.

The report is structured as follows:

1. Key technological and commercial trends in the automotive and mobility sectors

This section summarizes the current status and main trends in the industry, with a special focus on the following subsectors:

- > E-mobility
- > Autonomous mobility
- > Smart mobility

We also identify critical control points within the technological ecosystem formed by these subsectors. The topic of smart mobility thus covers activities such as a) connected cars, b) urban mobility, transportation and city logistics, c) shared mobility and d) big data applications. Our findings are based on a combination of extensive project work around the globe and Roland Berger's ongoing research activities.

2. Israel's smart mobility technological landscape

This section is based on a first-hand survey of Israel's smart mobility industry and overall entrepreneurial ecosystem. As well as carrying out desk research, Roland Berger spoke to more than 25 people from startups, incubators and accelerators, ventures capitalists and policymakers about the entrepreneurial ecosystem as a whole. Based on this overview, we then analyzed the competencies that exist within the region and the strengths of the Israeli smart mobility industry compared to the global industry.

3. Growth opportunities

Based on our analysis of technology trends and the Israeli smart mobility landscape, we see a number of opportunities for Israeli startups within the global trends. We also see opportunities for multinationals to invest in Israel's smart mobility industry.

¹ Source: Crunchbase

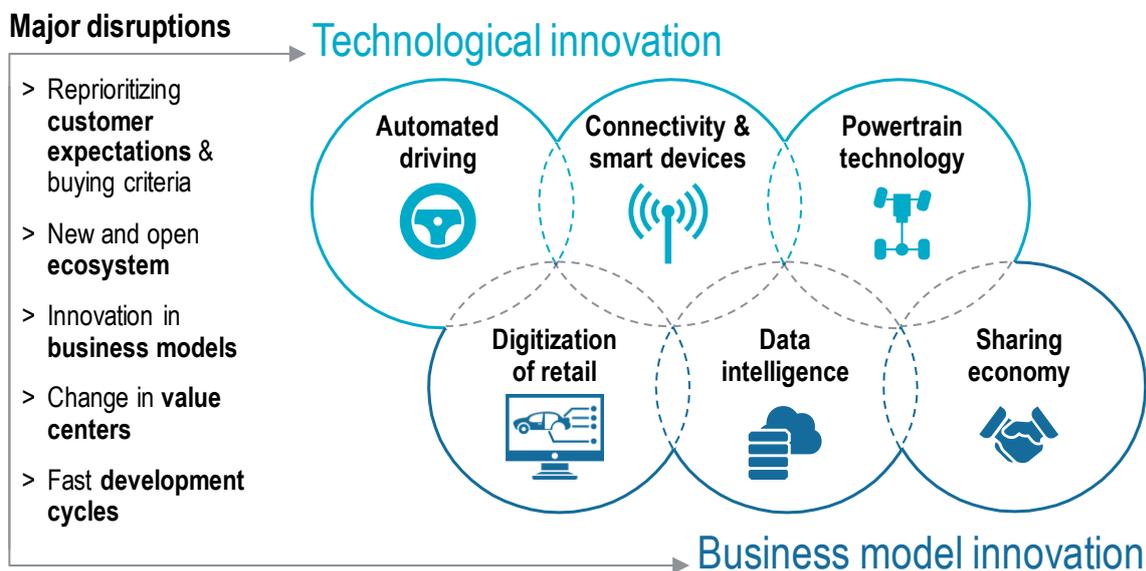
3. Disruptive trends in the automotive industry: Changes in the technological ecosystem

The automotive and mobility ecosystem as we know it is set to change in the next decade. Driven by disruptions such as the reprioritization of customer expectations and new, open ecosystems (for example on the mobility level), new technological innovations are appearing – and with them business model innovations.

New industry entrants and established OEMs are fast developing advanced driver assistance systems into holistic solutions that enable automated driving. Connectivity between systems, vehicles and infrastructure enables new functionality and smart traffic management. We are also seeing continuous development in powertrains: from more efficient conventional drives and the use of alternative fuels to powertrain electrification and long-distance electric driving using fuel cells.

On the business model side, digital marketing is introducing consumers to a completely new ownership experience and lifecycle, replacing the former "retail + sales + aftersales" concept. The availability of information and the possibilities for sharing information, generated by smartphones and high-speed communications, open up new business models for smart advertising and sharing mobility. For example, customers will see advertisement depending on their mobility behavior and can be linked to others to reduce their joint costs of mobility.

Figure 1: Key drivers of disruption in the mobility landscape

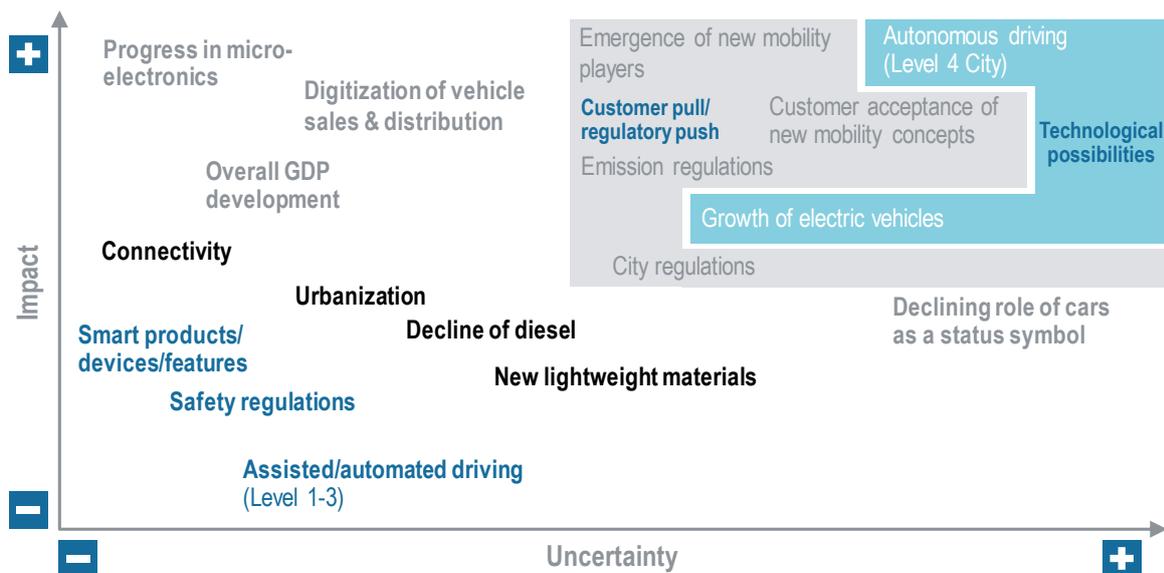


Source: Roland Berger

We therefore need to evaluate the various factors driving the development of the automotive industry in terms of both their level of impact and their certainty. Future strategies must take into account all possible developments within the industry. For example, events such as the recent "dieselgate" had a significant impact on the industry, yet were considered very unlikely only a couple of years ago.

In the following sections, we first focus on developments driven by customer demand, regulatory pressure and technological advances. E-mobility and autonomous mobility represent decisive changes in the way vehicles are designed, built and used.

Figure 2: Key influencing factors and trends impacting the automotive industry



Source: Roland Berger

Looking at these developments, we see further disruption potential on a higher level as people change their day-to-day mobility behavior. Novel service solutions will emerge, driven by digitization, increasing connectivity and new shared behaviors. This will have a fundamental influence on the scenarios. The key challenge will be to occupy the critical points for future business models.

3.1 E-mobility: Regulatory pressure on a developing market

Environmental awareness is driven by events such as extreme weather phenomena and high fuel prices, which lead to high expenditure on mobility. Governments have recognized these wider developments and are now focusing on shaping a sustainable individual mobility strategy that encompasses resource conservation, environmental compatibility and safety. In response, OEMs have begun to build cleaner, safer and more diverse vehicles, including a variety of zero-emission vehicles.

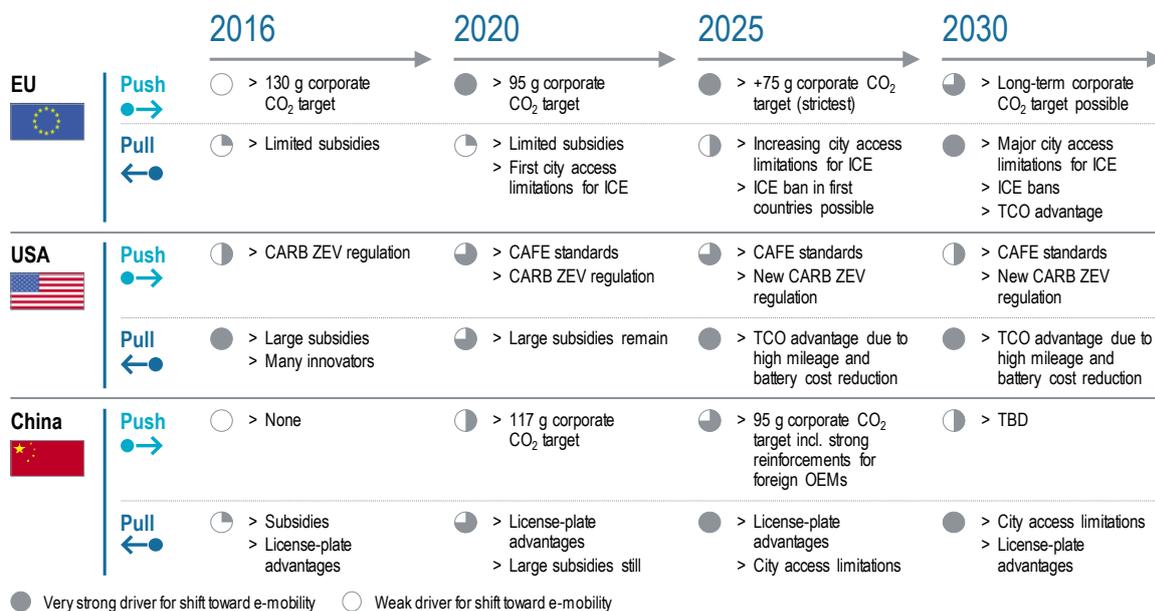
The Kyoto Protocol and, more recently, the Paris Agreement, signed in 2016, represent major achievements in the joint understanding of environmental protection. Both aim to reduce CO₂ emissions significantly in the future. For developed countries, the Kyoto Protocol sets out the objective of reducing emissions by 25-40 percent by 2020 (compared to 1990 levels) and by 80-95 percent by 2050.² The transportation sector is one of the main producers of CO₂ worldwide,

² King, D.; et al. (July 2011), "Copenhagen and Cancun"

responsible for 23 percent of all CO₂ emissions in 2013 and second only to the energy industry (42 percent).³

As a result, governments are pushing the automotive industry for cleaner vehicles. Fuel efficiency and emission targets have been introduced to decrease CO₂ and other emissions by both passenger and commercial vehicles, as shown in Figure 3.

Figure 3: Drivers of global electrification scenarios



Source: Roland Berger

In Europe, the current CO₂ regime obliges the automotive industry to significantly reduce CO₂ fleet emissions. In 2020, 95 percent of all vehicles will be allowed to emit just 95 g/km, compared to 130 g/km in 2015. This corresponds to average fuel consumption of 3.5 l/100 km and is only achieved by a few vehicles today. As of 2020, the targets will need to be met by the entire European fleet of newly registered vehicles each year. The European target for 2020 is more challenging than in other markets, such as the USA and China. At the same time, the European Commission is already discussing plans to further increase efficiency in the area of transportation, with the possible introduction of a new set of targets for 2025 or 2030.

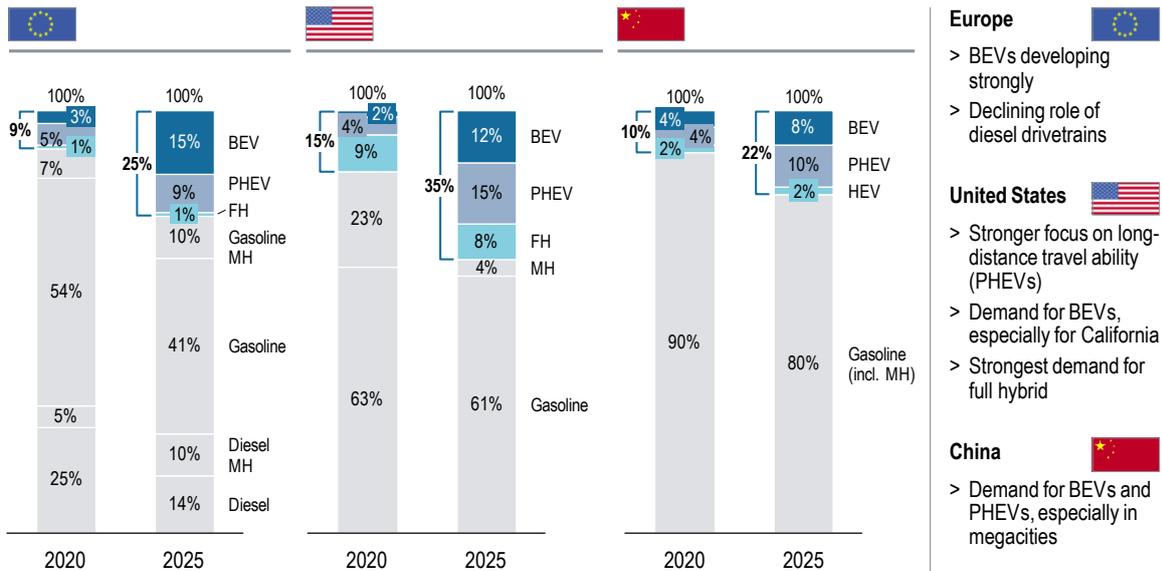
In addition, many cities have restricted the use of vehicles to decrease emission levels in their downtown areas. London, for example, has imposed a congestion charge since 2003. In Germany, all vehicles are classified by emission level (green, yellow or red) and cities can prevent certain vehicle segments from accessing downtown areas (or restrict their access) if necessary. European cities such as Amsterdam, Paris and Oslo are pursuing similar ways of introducing inner-city tolls or even discussing banning certain types of vehicle.

In response to these political regulations, OEMs have improved their vehicles – especially their powertrains, which, besides vehicle mass, aerodynamics and overall power consumption, are one

³ Statista, 2013

of the main levers for cutting CO₂ emissions. Alongside downsizing engines, powertrain electrification is becoming more and more attractive as a way to meet future emissions goals and the local requirements of cities.

Figure 4: Share of propulsion types in 2020 and 2025 (high electrification scenario)



BEV: Battery Electric Vehicle; PHEV: Plug-in Hybrid Electric Vehicle; FH: Full Hybrid; MH Mild Hybrid

Source: Roland Berger

In the long term, most vehicles will have an electrified drivetrain. Plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs) will represent the majority of new car registrations globally by 2030. While BEVs will replace conventional ICE-powered vehicles in megacities in particular, fuel cell electric vehicles (FCEVs) will also start to penetrate the market and, together with PHEVs, have a significant impact on long-distance electric driving. These technologies will become self-sustaining as an attractively priced alternative for many end-customers. They will also benefit from the trend toward shared mobility. This technology shift will be accelerated by strong regulatory action in the medium term, especially in Europe and China.

In the meantime, new PHEV architectures for larger production volumes will enable initial economies of scale to be generated for electric traction. Manufacturers will develop and introduce special modular PHEV architectures before 2025 as a cost-effective solution. This move will be prompted by increasing customer pull from Japan and some parts of North America, as well as by the need to comply with future European and Chinese CO₂ fleet emission regulations. Both factors will encourage the use of PHEVs. These architectures will leverage the full potential of strong electric traction motors while bypassing the cost-driving functions in combustion engines, such as variable valve lift, to improve partial loads. Future PHEVs will drive in purely electric mode at low loads. They will also significantly simplify transmission, as they only require a few gear ratios. Also, BEVs and FCEVs will be integrated in these modular architectures and will benefit from growing economies of scale.

The electrification of individual mobility is a key topic for sustainable transportation. One key success factor is, therefore, mastering R&D in various areas:

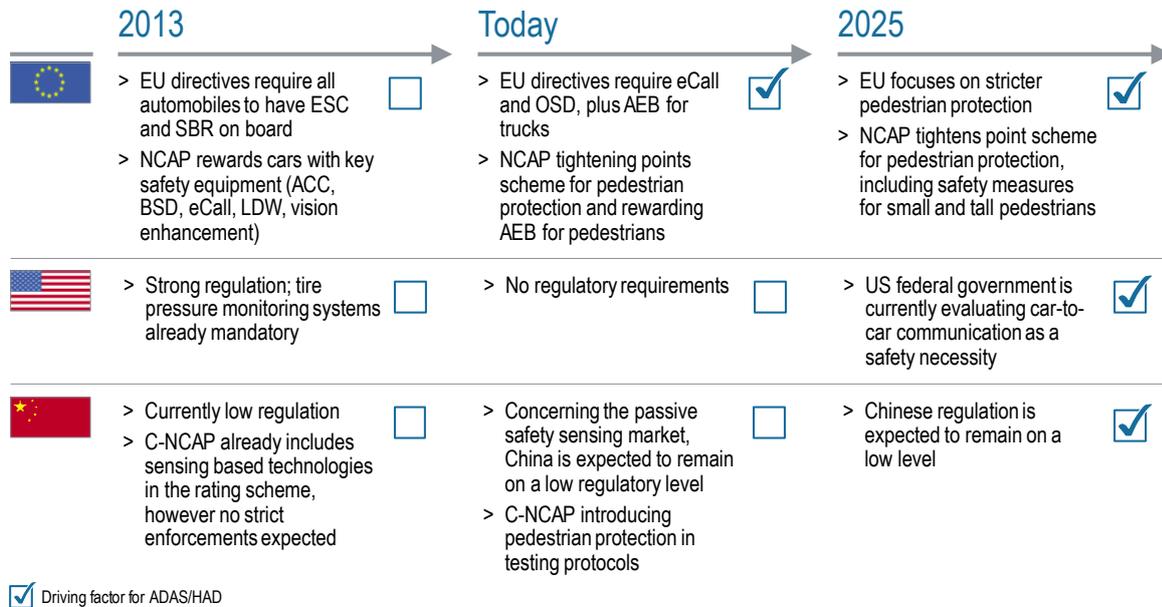
- > **Electric powertrain:** The electric powertrain consists of a modest number of components, namely the electric motor and the corresponding power electronics. The current short-term focus lies on permanent magnet synchronous motors (PMSM), despite their higher cost due to high energy density and efficiency requirements. As battery costs come down, a stronger focus will develop on cost, leading to the gradual adoption of externally excited synchronous motors (EESM) and asynchronous motors (AM). In the long run, reluctance motors (RM) will advance from the R&D stage to the market.
- > **Power electronics:** The architecture of power electronics is evolving, as is the choice of semiconductor modules. A gradual evolution at the module level in terms of functional integration is expected through 2023, accompanied by a reduction in part complexity. The next generation will introduce dedicated insulated-gate bipolar transistors (IGBTs) and metal-oxide semiconductor field-effect transistors (MOSFETS) for automotive applications. In semiconductors, we will see the gradual introduction of silicon carbide over a relatively long overlap period in which Si and SiC coexist. However, SiC-based power electronics require substantial investments. Power electronics based on gallium nitride (GaN) are currently not considered suitable for automotive applications.
- > **Batteries:** Energy storage and management are crucial technological components for all kinds of electrified vehicles. The costs of Li-ion battery cells and the periphery are key for future developments in mass production. In addition, alternative concepts (including new material combinations such as lithium-air) may lead to breakthroughs in terms of the power and energy density of next-generation cells.

3.2 Autonomous mobility: A race between traditional automotive companies and new players

Alongside the automotive industry's activities to reduce CO₂ emissions, governments and consumer protection associations such as the NCAP are also pushing for safer transportation. In recent years, new requirements have been defined to increase passive and active safety, such as the small overlap crash test and protection for pedestrians). Figure 5 summarizes the push factors for advanced driver assistance systems (ADAS) coming from government and consumer protection associations.

In this context, "passive safety" refers to features that help reduce the effects of an accident, such as seatbelts, airbags and strong body structures. The term "active safety" is increasingly used to describe systems that leverage an understanding of the state of the vehicle to both avoid and minimize the effects of a crash. This includes braking systems, such as brake assist, traction control and electronic stability control systems, all of which interpret signals from various sensors to help the driver control the vehicle (e.g. lane departure warning or LDW). Forward-looking, sensor-based systems such as advanced driver assistance systems (ADAS), including adaptive cruise control (ACC). Collision warning/avoidance/mitigation systems are also considered active safety systems under this definition.

Figure 5: Summary of push factors for ADAS from governments and consumer protection bodies



Source: EC, ETSC, expert interviews, Roland Berger

There is no question that highly autonomous driving will emerge, and we expect to see it arrive gradually over the next 15 years (Figure 6, Figure 7). Today, many vehicles on the road are equipped to Level 1, with function-specific automation, including features such as cruise control and automatic braking. Advanced driver assistance features, such as adaptive cruise control combined with lane keeping assistance, are referred to as Level 2. Combined function automation is already offered by many established manufacturers.

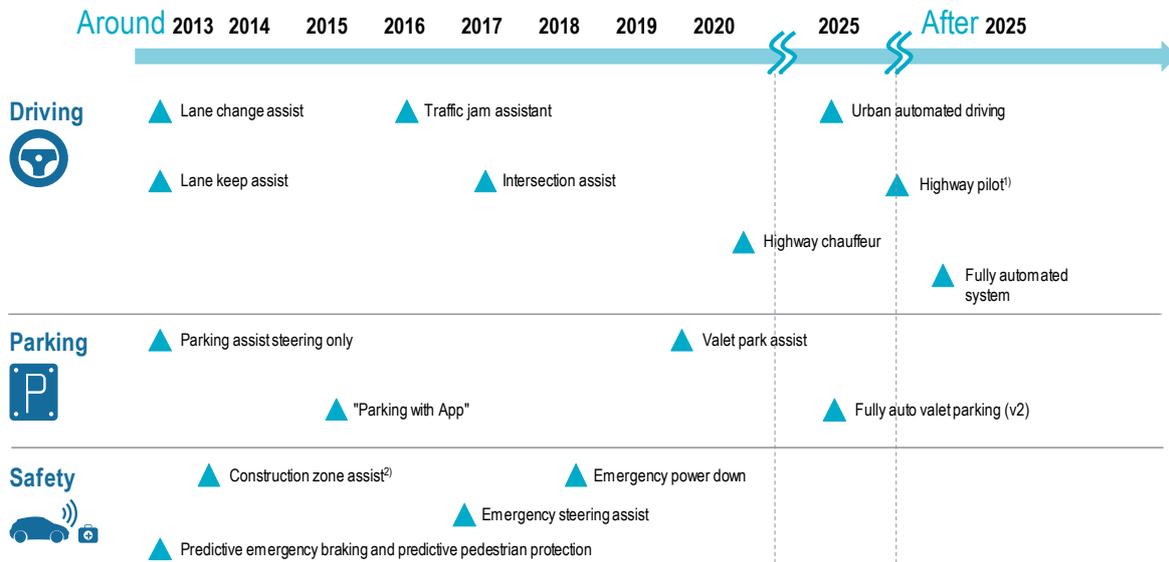
Audi was one of the first auto makers to offer Level 3 automation in 2018. Looking forward, the technology is expected to be widely adopted only in 2019-2020, with features such as the highway chauffeur (automated driving on highways). We expect Level 4 or "high automation" to be made available first for low-speed situations, such as on parking lots or in low-speed areas, by 2020-25, and eventually for more complex situations, such as city driving, by 2025-30. Even with the introduction of the relevant technology, we do not expect the worldwide adoption of fully self-driving automation with "door-to-door" capabilities across all vehicle segments before 2030.

Figure 6: SAE definitions of levels of autonomous mobility

SAE level	0	1	2	3	4	5
Name	No automation	Driver assistance	Partial automation	Conditional automation	High automation	Full automation
Definition	The full-time performance by the human driver of all aspects of the dynamic driving task, even when enhanced by warning or intervention systems	The driving mode-specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the human driver will perform all remaining aspects of the dynamic driving tasks	The driving mode-specific execution by one or more driver assistance systems of both steering and acceleration/deceleration using information about the driving environment and with the expectation that the human driver will perform all remaining aspects of the dynamic driving task	The driving mode-specific performance by an automated driving system of all aspects of the dynamic driving task with the expectation that the human driver will respond appropriately to a request to intervene	The driving mode-specific performance by an automated driving system of all aspects of the dynamic driving task, even if a human driver does not respond appropriately to a request to intervene	The full-time performance by an automated driving system of all aspects of the dynamic driving task under all roadway and environmental conditions that can be managed by a human driver
Execution of steering and acceleration/deceleration	Human driver	Human driver and system	System	System	System	System
Monitoring of driving environment	Human driver	Human driver	Human driver	System	System	System
Fallback performance of dynamic driving task	Human driver	Human driver	Human driver	Human driver	System	System
System capacity (driving modes)	n/a	Some driving modes	Some driving modes	Some driving modes	Some driving modes	All driving modes

Source: SAE International, J3016, fka, Roland Berger

Figure 7: Launch horizon for automated driving functions



1) Highway pilot= highway chauffeur + higher degree of automation 2) Tested – date of series production not available

Source: Press research, conference papers, fka, Roland Berger

Removing the human element from driving as in Level 4 requires critical sensory functions provided by various technologies. Many of these technologies already exist today. However, even enabling Level 3 in complex traffic and driving conditions requires a full mastery of several areas:

- > **Vehicle location and environment:** As there is no longer any active human input for vehicle functions, highly precise, real-time information about the vehicle's location and its surrounding environment is required, including road signs, pedestrian traffic, curbs, obstacles, traffic rules and so on.
- > **Prediction and decision-making algorithms:** Advanced concepts based on artificial neural networks (unsupervised deep learning, machine learning) are needed to create systems that can detect, predict and react to the behavior of other road users, including other vehicles, pedestrians, animals and so on.
- > **Real-time learning, highly accurate mapping:** Detailed maps of entire paths must be available to provide additional and redundant information for the environmental model that vehicles use for path and trajectory planning.
- > **Vehicle-driver interface:** A self-adapting interface with a smooth transition of control to and from the driver, mechanisms to keep the driver alert and a flawless ride experience will be key to winning consumer confidence.

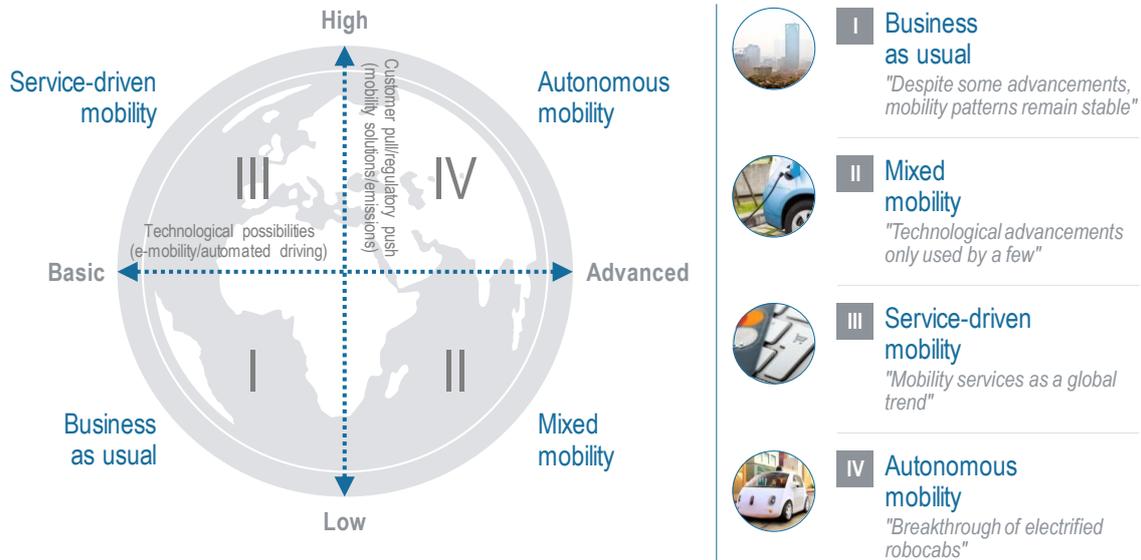
3.3 Smart mobility: Creating robust strategies in times of radical change

Industry players all agree that they face a fundamental shift in consumer attitudes towards automobiles. At the moment, however, there are more questions than answers. For example, who will earn money selling products or services – and what products and services will they be exactly?

The three overarching trends driving the industry are well known: alternative propulsion systems, driverless and connected cars, and the shared economy. These three trends are expected to give rise to new business models, complete with their own sources of revenue and profits. But how should companies deal with the possibilities? The future is not certain: Depending on how and when various trends manifest themselves, an infinite number of different futures are possible.

To make sense out of this confusion, we have defined scenarios along the axes of "technical possibilities" and "customer/regulatory pull". These axes mark the boundaries of possible developments in the timeframe to 2030 (see Figure 8). To quantify the impact of the different scenarios on players in the future mobility ecosystem, we use the Roland Berger Global Revenue Stream and Profit Pool Model, a dynamic model of the revenue streams and profit pools in the automotive ecosystem. Starting with a forecast of future demand for mobility, it covers the entire mobility value chain, including 15 data-driven business models for mobility and connectivity, all global regions, nine different modes of transportation, different vehicle value segments (budget, volume, premium), propulsion technologies (ICE, PHEV, BEV) and automation levels (information, assistance, fully automation), plus six retail channels, spare parts, after-sales and financial services.

Figure 8: Overview of global mobility scenarios: Possible futures in 2030

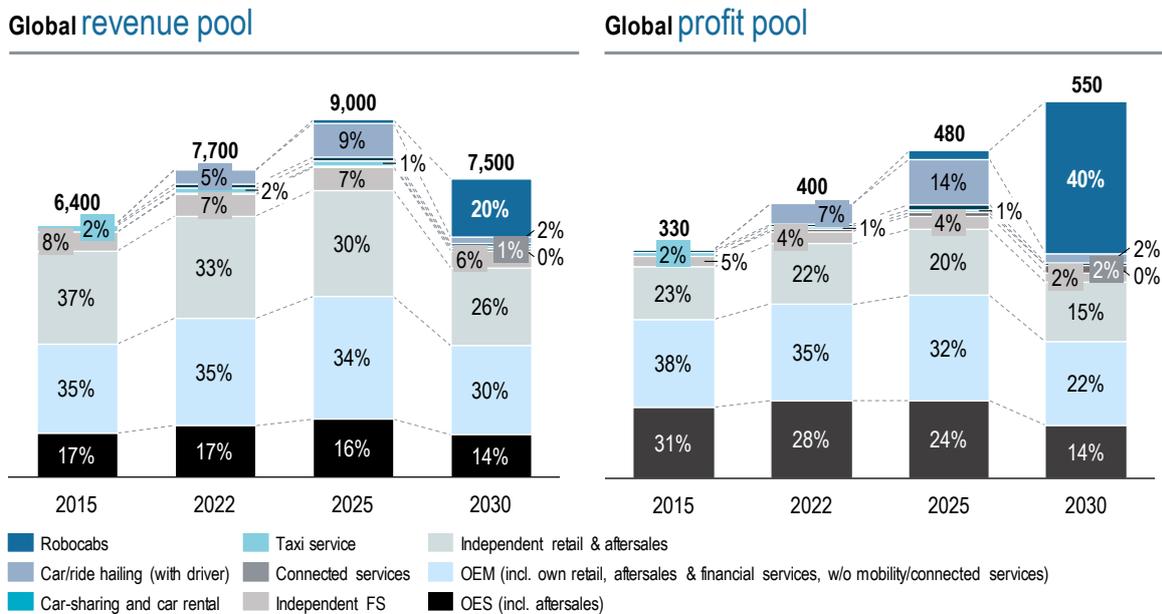


Source: Roland Berger

In the most extreme development – the "autonomous mobility" scenario – electric robocabs lead to a shift in supplier revenues and profits, and also result in reduced revenues for aftersales, repair services and financial services. These robocabs would be sold directly in large quantities, with significantly lower margins for manufacturers and dealers. They would also quickly replace the already fast-growing new mobility services of car-sharing, ride-sharing and ride-hailing.

Figure 9 shows the result of this scenario, based on the aggressive assumption of the first robocab test fleets appearing on the road in 2022 and commercialization taking place from 2025. At the core of the scenario, we see gradual expansion toward a share of overall road-based mobility in 2030 of around 25 percent for developed countries, 50 percent for China and a small percentage for megacities in other countries.

Figure 9: Autonomous scenario: Estimated revenues and profits [EUR bn]



Source: Roland Berger

A quantitative scenario analysis helps us identify the major shifts in profit and revenue pools that are common to all scenarios. It also allows us to identify any "unique" business opportunities and threats in each of the scenarios, and to spot the early signs of how scenarios are developing.

The drop in industry revenues from 2025 onward reflects an increase in the utilization of shared vehicle assets, especially through "mobility as a service" and/or robocabs. The new mobility services enjoy a share of roughly 40 percent of the overall global profit pool. To secure a large share of this profit pool, companies need to control the following technologies, services and platforms:

- > **Robocabs/taxi services:** The scenario is based on the existence of a large robocab fleet. These vehicles will be in use 24/7, with recharging and servicing taking place at off-peak demand times during the night. Vehicles need to be designed for intensive use and considerable durability. The vehicle fleet must cover a range of sizes, offering efficient transportation for both small and large groups. The manufacturer's brand will become less and less important and will not generate any surcharge possibilities. Instead, people will look at what the mobility providers offer during the ride, such as free wireless Internet or personalized streaming services.
- > **Mobility planning platforms:** Robocabs will require an intelligent mobility planning system for service providers and transparent, easy and quick access for end customers. Predicting mobility behavior will make it possible to optimize the service. The problems typically found in today's free-floating car-sharing fleets – such as the race for the next available car during rush hours – will disappear. Mobility planners will be able to return vehicles from low-demand locations to the hotspots in cities where they expect the highest demand in the coming minutes.

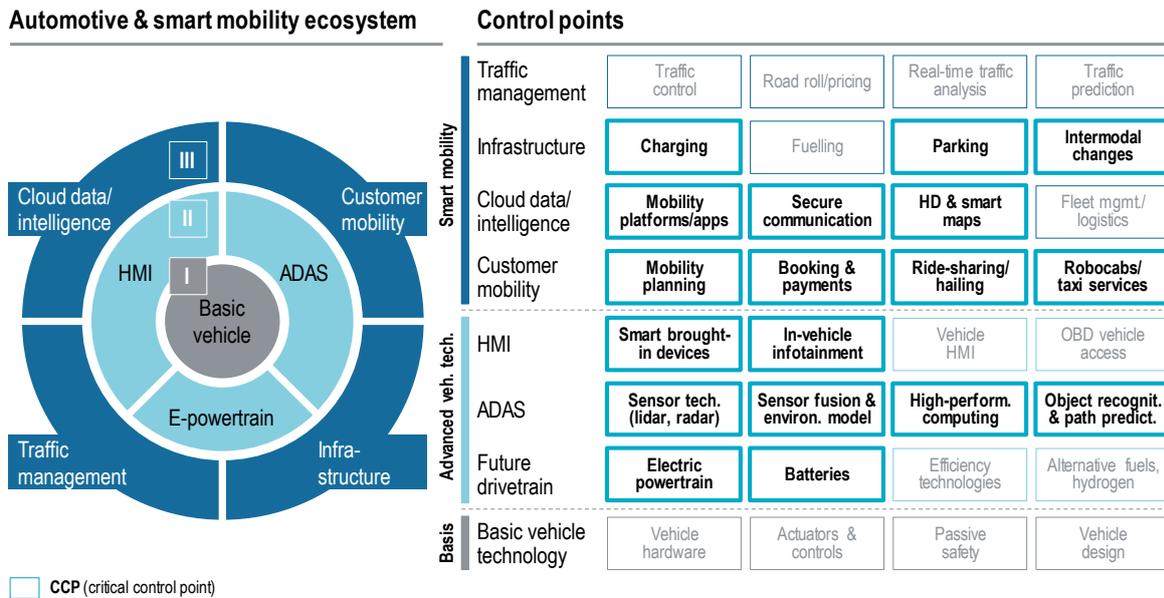
- > **Ride-sharing/ride-hailing:** Individual mobility customers are increasingly motivated by time and cost efficiency rather than status symbols. The younger generation in particular is challenging established business models by demanding the opportunity to share rides. This highly dynamic market is evolving particularly in regions with a limited number of vehicles. Ride-sharing and ride-hailing is especially important during peak demand times, where a regular service is either hard to get or expensive. For example, taxis are nearly impossible to find when it's raining in China, and expensive for making longer journeys to airports in Europe.
- > **Booking/payment:** These new services require standardized booking and payment processes that customers find transparent, easy to register for and simple to use. Recent examples highlight the possibilities created by new blockchain business concepts. When people share their private vehicle or robocab with others for a limited time, the booking and payment processes inevitably become more complex.

3.4 Perspective for 2030: Control points within the technological ecosystem

To prepare for these diverse future scenarios, companies should focus on conquering and occupying the critical "control points" that will allow them to capture a major part of future profit pools. These control points could include access to critical technologies, resources and skills or to specific customer groups. Occupying critical control points early on builds a foundation for fully executing your strategy once early signals emerge.

For example, the "booking and payments" control point is an essential part of nearly all automotive and smart mobility ecosystems. Ownership of this element ensures participation in all revenue streams and most business models. High definition (HD) and smart maps are a further critical control point for smart mobility, since a plentitude of applications are built around this technology. They are currently only available from a limited number of providers.

Figure 10: Critical control points for the 2030 technology ecosystem



Source: Roland Berger

Even the most disruptive innovations do not materialize overnight: Change is a process of evolution. That said, alternative propulsion systems, connected vehicles and driverless cars still call for incumbent automotive manufacturers, suppliers and service providers to make changes now. In particular, players must:

- > Define their intended role in the new mobility ecosystem
- > Radically rethink their current value-added and investment focus and dramatically improve their efficiency to be able to make the necessary investments in the coming years
- > Explore new ways of gaining access to innovations in technology, business models and so on
- > Occupy critical control points so they can implement new business models as soon as the opportunity arises

Evolution invariably results in the extinction of species that are incapable of adapting. The next generation of players has the potential to take slow-moving established players by surprise.

4. Israel's automotive and smart mobility industry

The majority of Israeli startups are based on disruptive technological innovation. Israel's innovation sector is a strong magnet for many of the world's largest companies: In 2017, Intel acquired Mobileye, a Jerusalem-based manufacturer of automotive chips and car sensor systems, for USD 15.3 billion. Continental bought smart car technology startup Argus Cyber Security. Meanwhile, Samsung, Delphi Automotive and Magna International collectively invested USD 82 million in Israeli lidar startup Innoviz Technologies, while other players open centers, Lab or campus on the territory to benefit from the innovation resources: so did VW, Skoda, Seat, Konnect, etc. in 2017 and 2018

Yet it's not just global multinationals that are converging on "Silicon Wadi", as Israel's tech hub in and around Tel Aviv is known. Mid-sized companies, venture capitalists and entrepreneurs from around the world are all homing in on the country's booming tech scene to invest, find partners and discover new business models and technologies for their digital transformation. They come from all sectors – not only IT, but cars and finance, agriculture and healthcare, too. The numbers alone are astonishing.

This section provides an overview of the general development of Israel's automotive and smart mobility industry. A deep dive into electric, autonomous and smart mobility then reveals the technology competencies of selected startups and the diversity of topics currently being covered. This is followed by a description of the Israeli startup ecosystem, broken down into the categories finance, human capital, market, policy, support and culture. The description is based on a series of on-site interviews with more than 25 startups, incubators, accelerators, venture capitalists and policymakers. Finally, we use the results of the deep dive to identify the strengths of the Israeli entrepreneurial ecosystem.

4.1 Development of Israeli industry

With a population of just eight million, Israel is home to more than 6,000 startups. Over 600 venture capital-backed deals are struck here annually. The country recently created 1,370 new technology startups in just one year (2017)⁴, making **Israel the world leader in terms of startups per capita**. Silicon Wadi also has the second-largest concentration of technology-related startups in the world, right after California. There are now more technology companies from Israel listed on the NASDAQ stock exchange than from any other country except the United States and China. The tiny Mediterranean nation attracts more venture capital relative to the size of its economy than any other country in the world.

In 2017, Israeli startups raised USD 5.2 billion in venture capital, compared to USD 4.9 billion raised in Germany (which has ten times the population) and just USD 3.1 billion in France. In addition, foreign and local companies spent USD 23 billion to acquire 112 Israeli tech companies in 2017.⁵ Nor does this phenomenal pace of growth show any signs of slowing down. No wonder Israelis boast of their country being the "Startup Nation".

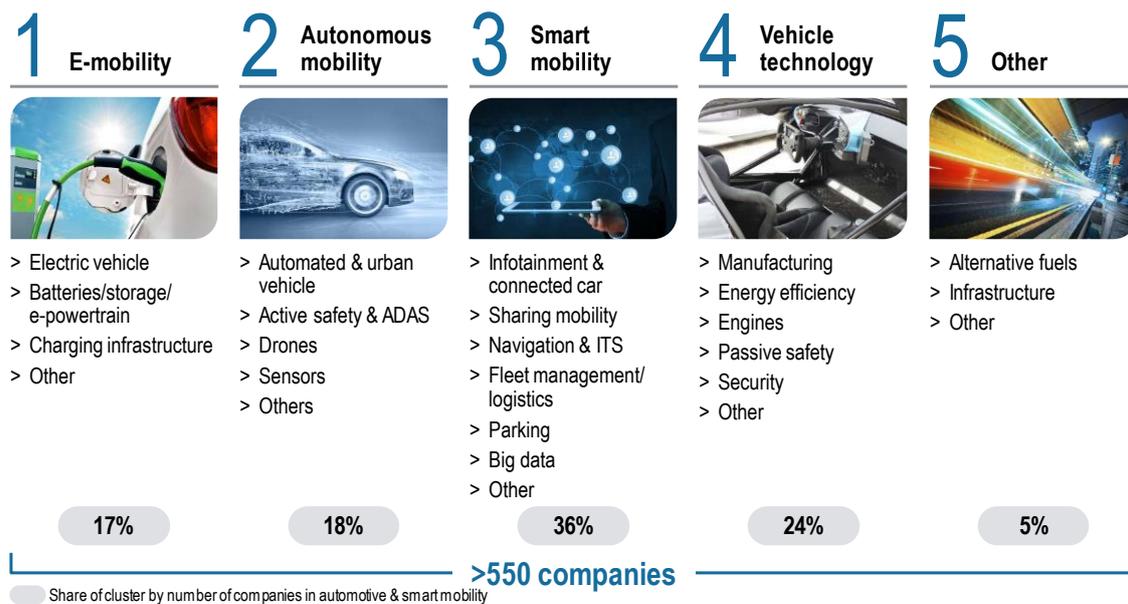
The Israeli automotive and smart industry is home to more than 550 companies, from well-established businesses to young startups still in their founding phase. This variety can be structured into five major content clusters: e-mobility, autonomous mobility, smart mobility, conventional vehicle technology and other topics.

⁴ Geektime: Startups and venture capital in Israel | Annual Report 2017

⁵ IVC-Meitar High-Tech Exits 2017 report

The e-mobility cluster comprises about 17 percent of all industry sector businesses, whose activities range from the production of smaller full electric vehicles and electric powertrain components to charging infrastructure solutions. In the autonomous mobility cluster, which also accounts for about 17 percent, companies develop products such as fully autonomous vehicles for urban use, drones, and advanced driver assistance systems (ADAS) based on sensor technologies, often derived from defense applications. The smart mobility business sector (about 36 percent) is highly fragmented and spans a wide variety of unique service offerings ranging from infotainment and connectivity solutions, shared mobility applications and smart navigation and transportation systems to parking and big data solutions. The conventional vehicle technology cluster (about 24 percent) covers areas such as engine development, while the final cluster includes other fields such as alternative fuels. Spillover effects from successful companies such as Waze or Mobileye are fostering the growth of further startups in the same region.

Figure 11: Structure of the Israeli automotive and smart mobility industry



Source: Roland Berger

At the same time, new business sectors spring up and grow quickly in Israel, creating new opportunities for both traditional players and startups in the automotive industry. Developing innovative software within the rigid, traditional ecosystem of an automotive company appears challenging for startups that do not have a strong partnership network. For traditional automotive players, establishing strategic cooperation is an important way to acquire both the knowledge and the characteristically effective functioning of a startup culture. Simultaneously, young entrepreneurs become increasingly motivated to be part of a big success story when companies like Google, Apple and BMW invest in their ideas. An overview of recent activities by selected automotive OEM and OES players is given in Figure 12. After the first billion-dollar exit of an Israeli consumer app, one of the founders said that the whole 'Startup Nation' had decided to quit aiming for fast exits and

build billion-dollar companies instead.⁶ A new benchmark and a new cultural mindset was thus birthed, setting new targets on the future horizon.

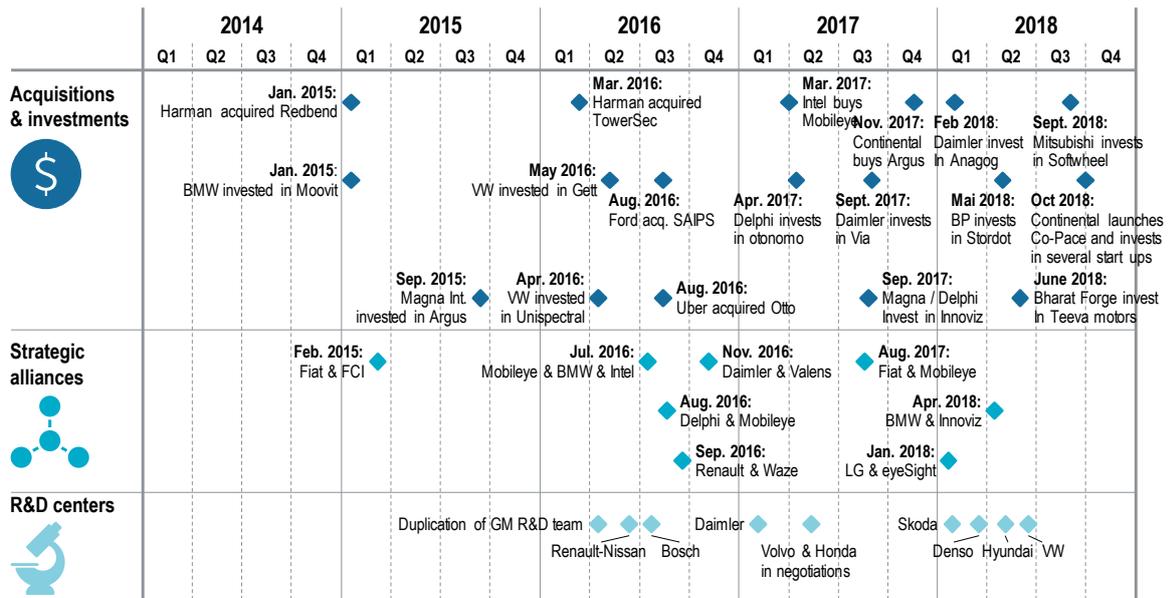
Figure 12: Overview of selected OEM/OES activities in Israel

		Technology scouting	Local investment	Local R&D center	Comments
OEM	BMW	■	■	□	Several investments, e.g. Moovit
	Daimler	■	■	■	R&D center opened in Q4/2017, startup investments
	Fiat	■	■	■	Several collaborations with startups & regional dev.
	Ford	■	■	□	Invested in SAIPS, tech. scouting activities
	GM	■	■	■	R&D center, founded 2008, today > 250 employees
	Hyundai	■	■	□	Plans R&D center, invested in Autotalks, Technion
	Renault	■	■	■	Launched USD 1 billion VC fund & Innovation Lab
	Seat	■	□	■	Tech scouting operations via Seat Xplora project
	Skoda	■	□	■	Invested in DRIVE, several other investments
	Volvo	■	■	□	Invested in DRIVE, several other investments
VW Group	■	■	■	Invested in cyber security, Gett, Tel Aviv campus	
OES	Bosch	■	■	■	Opened R&D center in 2016, invested in AnyVision
	Denso	■	□	■	R&D center focusing on AI and autonomous driving
	LG	■	■	■	R&D for IoT, wellness devices, entertainment.
	Plastic Omnium	■	■	□	Investment in Elbit Energy, POCeITech
	Samsung / Harman	■	■	■	R&D centers, some acquisitions by Harman

Source: Israel Export Institute, Fuel Choices and Smart Mobility Initiative, Roland Berger

⁶ Business Insider | Waze cofounder tells us how his company's \$1 billion sale to Google really went down

Figure 13: Overview of recent activities in Israel



Source: Israel Export Institute, Fuel Choices and Smart Mobility Initiative, Roland Berger

All in all, Silicon Wadi has become a mutually beneficial environment for established companies and young entrepreneurs in the automotive industry. Driven by investments and inspired by other business ideas, new startups spring up that offer still more investment opportunities. To illustrate this point and highlight the tremendous opportunities that exist, of the section below briefly outlines some of the biggest recent Israeli startup success stories.

Mobileye, founded in 1999 in Israel, is a market leader for ADAS camera systems and a pioneer in autonomous driving. Based on visual information, its sophisticated software determines the distance from the vehicle ahead or calibrates how much time the car needs for emergency braking to avoid an accident. Mobileye provides customized technology platforms to 90 percent of the global OEMs and was valued at USD 7.5 billion during the IPO in 2014. True to its fundamental objective of making traffic safer, Mobileye ended its cooperation with Tesla this year due to two fatal accidents in autopiloted Tesla vehicles: Its camera system is designed to support but not yet replace the human driver.

Almost as famous as Mobileye is Waze, which provides real-time traffic information for navigation apps and was founded in 2007. Waze became the first billion-dollar exit in the Israeli startup community when it was purchased by Google for USD 1.15 billion. Google maintained the company's office in Israel to further benefit from the unique Israeli market. It also continues to adhere to the founding principle of saving every user a few minutes a day. Nowadays, about 70 percent of traffic data in Google maps is provided by Waze.

Like Waze, Moovit and Gett are two additional examples of smart mobility solutions that likewise focus on crowdsourced data. Moovit, established in 2011, gives commuters a real-time estimate of how long it would take to get from A to B by public transport and cabs. More than 15 million users in over 1 500 cities in 60 countries use Moovit, which also partners with Uber, Lyft and Gett. BMW, the

Bernard Arnault Group and Keolis, the biggest French transportation company, have all invested in Moovit, for example. Gett, one of the major Uber rivals founded in 2010, recently received a USD 300 million investment from Volkswagen, the world's second-largest car manufacturer. Gett connects taxi drivers to customers to facilitate a quick and easy ordering process.

Founded in 2006, Valens is an interesting example of how new technologies from other sectors become interesting for automotive purposes. Providing semiconductor products for the distribution of uncompressed HD multimedia content, Valens generally cooperated with companies like Sony, LG and Samsung. However, it then developed a cable for high data throughput that could reduce the number of built-in cables in a car, reducing total car weight by up to 150 kg.

As shown by the examples above, most business ideas revolve around artificial intelligence, big data/analytics and communications. At the same time, all the opportunities arising from connectivity also generate threats in the form of the risk of hacking. In response, specialized IT companies such as TowerSec, founded in 2012, develop on-board security solutions for carmakers. These players can leverage the wealth of experience in digital security systems that is available in Israel.

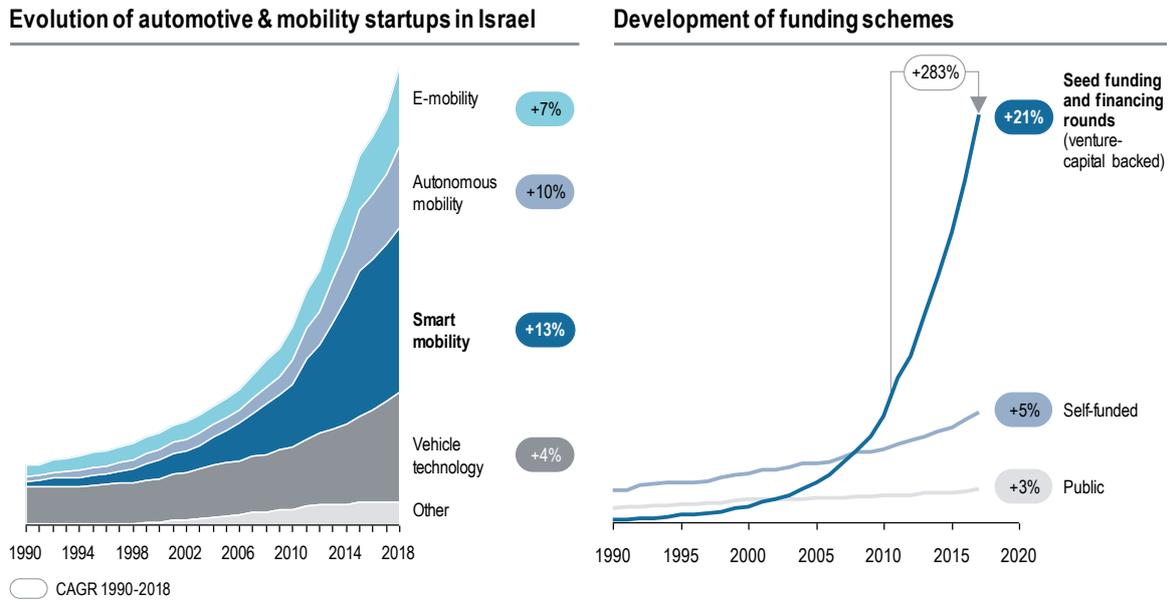
In 2016, Harman purchased TowerSec for USD 75 million to develop a car security framework for connected car and infotainment systems.

Silicon Wadi, a breeding ground for innovative ideas, has produced impressive entrepreneurial success stories and fascinating partnerships between startups and incumbent firms. Existing companies stimulate each other and motivate further people and firms to join this community. The Israeli automotive sector is thus becoming a powerhouse in certain areas, benefiting from the knowledge that has been accumulated since the 1990s, when Israel held a leading position in telecommunication and radar systems.

It is a fact that the development of the automotive business in Israel has a long tradition (Figure 14). The first automotive supplier companies were founded as far back as 1932, and the industry has developed steadily since then, with occasional ups and downs. Around 60 companies existed in 1990, focusing mainly on conventional mechanical automotive technologies such as transmission parts or air filters. The last decade of the last millennium saw rapid growth in the number of firms, with new companies focusing their technological expertise more on e-mobility and autonomous mobility. The vast majority of new businesses founded in recent years have focused on smart mobility. As a result, there are three times as many smart mobility companies today as there are e-mobility or autonomous mobility companies.

The development of smart mobility businesses also correlates to the availability of venture capital as a means of financing. Before 2000, only a negligible amount of companies relied on seed funding. Driven by the Internet bubble around the turn of the millennium, more and more business founders began searching for seed funding, and many still rely on it today. The Israeli government fostered this process by enacting the Angel's Law in 2011, updated in 2016 to reduce bureaucracy. In essence, this law provides tax benefits to investors who invest in companies still in their early R&D stage. Foreign investors can even enjoy a tax write-off option and exemption from Israeli capital gains tax.

Figure 14: Evolution of Israeli automotive and mobility startups and their financing



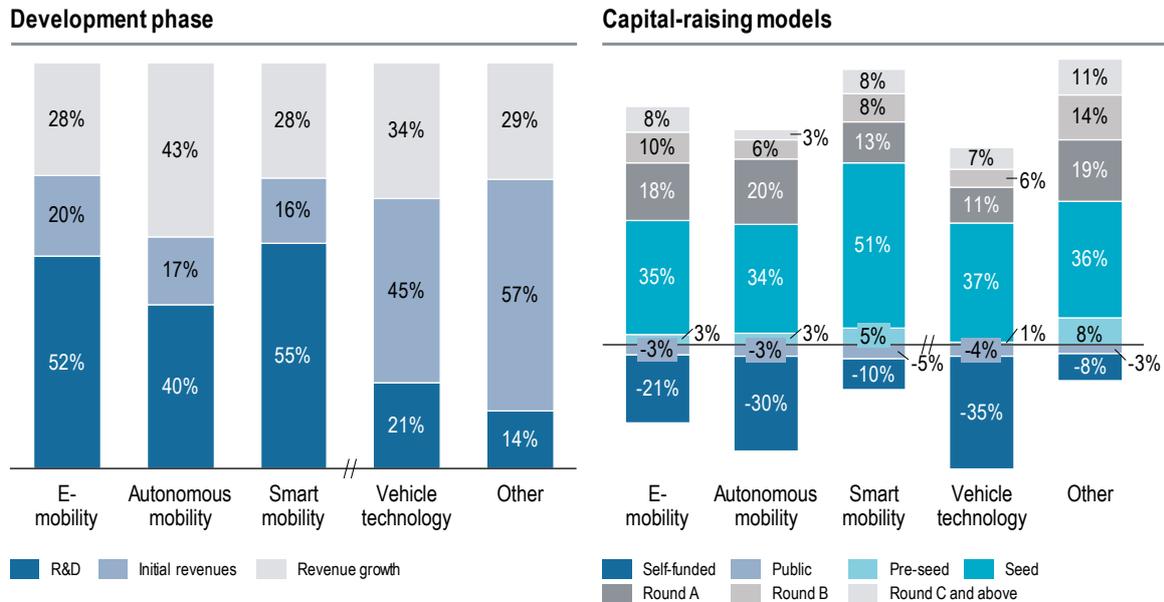
Source: Israel Export Institute, Fuel Choices and Smart Mobility Initiative, Roland Berger

Comparing new businesses by industry sector highlights the different types of financing in each sector. Companies in the e-mobility sector were already up and running in the 1990s, well before the hype over e-mobility that emerged around 2010. About 40 percent of the companies in this sector are still developing their products and are not yet generating initial revenues. The financing model in this sector is comparable to that for conventional vehicle technologies, which typically include a lot of hardware development. This requires a great deal of time-consuming and cost-intensive work – to build mechanical prototypes, for example.

The autonomous mobility sector, which is also still fairly young but is developing more quickly than the e-mobility sector, has the largest share of businesses already generating substantial revenues. Interestingly, this sector relies mostly on self-funding and appears to make the least use of seed funding. Depending on the business focus, initial funding is often used for electronics and software development, besides labor.

By contrast, the smart mobility sector – the youngest and fastest-developing sector – relies most heavily on seed funding. Just seven percent of businesses here are self-funded and nine percent use public money, levels far below the averages for the automotive industry. This can be explained by the relatively small amount of money needed to found a business focusing on software development: Cash is used for labor, software and digital hardware, which may even be rented. The sector does not require costly investments in prototypes with mechanical hardware, and working alpha versions can be built quickly. At the same time, the smart mobility sector has the smallest share of businesses in the revenue growth phases.

Figure 15: Startups by development phase and capital-raising model



Source: Fuel Choices and Smart Mobility Initiative, Roland Berger

4.2 Technology competencies of selected Israeli startups

Although Israel does not have a native auto manufacturing industry, more than 200 research groups and over 2,000 entrepreneurs nevertheless participate in the automotive and smart mobility ecosystem. This access to talents and ideas motivated General Motors to establish an Advanced Technical Center in Israel as an R&D organization and point of access to the local market. Other auto makers are also currently investigating options for establishing a local presence. In addition, leading automotive companies such as Daimler, BMW, FCA and Toyota source key auto parts from the region and regularly search locally for innovation. A holistic and up-to-date overview of automotive and smart mobility startups in Israel can be obtained from www.fuelchoicesinitiative.com or www.export.gov.il/en.

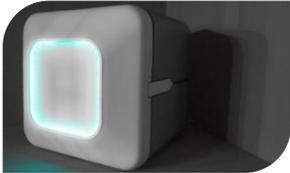
4.2.1 E-mobility

The e-mobility sector comprises around 85 businesses founded in the past 20 years. Since Israel has no access to major natural resources, the country has always sought to use energy efficiently. Following the early development and intensive adoption of solar power, Israel has also been experimenting with the use of electricity for mobility. This gave local e-mobility businesses a head start even before e-mobility came more into the public eye around the year 2010.

Local companies focus on components for electric drivetrains – from electric machines, power electronics and batteries to full vehicles. E-mobility is seen as an opportunity for emission-free last-mile mobility, and many electric urban scooter concepts are found in the region.

Figure 16 shows three examples of the creativity typical of this sector.

Figure 16: E-mobility: Examples of Israeli startups

<p>1 Startup idea: City Transformer</p>  <ul style="list-style-type: none"> > The first "foldable" car that can shrink its wheel-width, a two-seater light electric car > Has the ability to fold into the parking space of a motorcycle based on a unique patented folding mechanism built into the platform > Speed up to 90km/h in drive mode and 40km/h in park mode > Four vehicles able to park in one car-parking space > citytransformer.com 	<p>2 Startup idea: Chakratec</p>  <ul style="list-style-type: none"> > Chakratec produces kinetic storage that matches the needs of EV charging stations (EVCS) to provide high quality and reliable service > This storage system has strong economic benefits, especially in small to medium-sized applications from 3 kWh to 3 MWh > The kinetic battery combines technical advantages with financial savings and is also clean and green > chakratec.com 	<p>3 Startup idea: StoreDot</p>  <ul style="list-style-type: none"> > New-generation electric vehicle battery that charges fully in 5 minutes, providing a range of 300 miles > Technology: <ul style="list-style-type: none"> – Chemically synthesized organic molecules – Uses a unique multifunction electrode > Benefits: <ul style="list-style-type: none"> – Increased capacity – Fast-charging capability – Prolonged battery life > store-dot.com
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Source: City Transformer, Chakratec, StoreDot, Roland Berger

4.2.2 Autonomous mobility

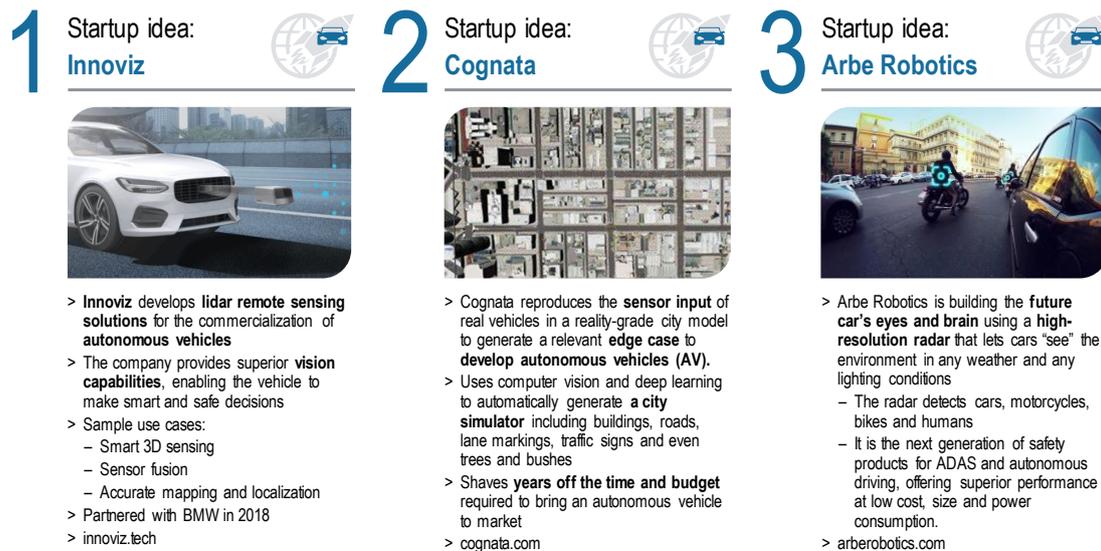
The autonomous mobility sector is home to the same number of companies as the e-mobility sector (see Figure 15). The software and hardware engineering capabilities needed to develop solutions for ADAS and highly autonomous vehicles are closely linked to the development of defense solutions. The state of Israel invests strongly in security solutions, which includes both weapons development and cyber-security.

As a result of this investment strategy and the experience built up in this field, Israel ranked first for cyber-security in 2013 (IMD 2013), with annual exports of more than USD 3 billion. The cyber-security industry is estimated to represent 10 percent of global sales and 20 percent of global investments. Israel is home to R&D centers for 20 multinational corporations, including IBM, Cisco and GE. Israeli antivirus software protects one in six computers worldwide.

Some companies outshine other local and even global businesses in this sector. Mobileye, for example, founded in 1999, is a well-known supplier of the ADAS hardware and software solutions that lay the basis for highly autonomous vehicles. The company recently announced plans to team up with Intel and BMW to put a fully autonomous car on the road by 2021. This partnership will set a standard for autonomous vehicles and intends to create an open platform that other contributors can join in the future.

RedBend, also founded in 1999, is a software management company for connected cars. The company's technology enables vehicle software to be securely managed and even updated remotely. More than four million vehicles are already part of its secure network. In times of increasingly complex software and value shifts towards software solutions, especially in the context of autonomous vehicles, this functionality is more and more important. The company was acquired by Harman International for USD 170 million in 2015.

Figure 17: Autonomous mobility: Examples of Israeli startups



Source: Innoviz, Cognata, Arbe Robotics, Roland Berger

4.2.3 Smart mobility

The Israeli startup scene is considered one of the world's most innovative digital environments. Multinational new media companies such as Google, Facebook, AOL, eBay and Yahoo all have R&D facilities in the region, and Israeli new media and Internet companies export advanced services worth several billion US dollars a year.

The smart mobility startup scene is continuously searching for solutions to inefficiencies in the daily lives of millions of people, aiming to make those lives more enjoyable. Businesses often utilize a big data or community-based approach to gather information and build new services. Companies focus on infotainment, navigation, shared mobility offerings, smart navigation (including parking management) and complete fleet management with logistics optimization. Developments are tested on the Israeli market, whose size is manageable, then later exported to selected larger markets, depending on the service and the framework conditions.

Figure 18 outlines three ideas from Israeli smart mobility startups.

Figure 18: Smart mobility: Examples of Israeli startups

<p>1 Startup idea: Guardian OpTech</p>  <ul style="list-style-type: none"> > Guardian Optical technologies has sensor technology encompassing 2D, 3D and motion analysis. It enables OEMs to produce safer, more convenient cars at a lower cost > Main use cases: <ul style="list-style-type: none"> – Intruder alert – Airbag sensor – Seatbelt reminder – Occupant monitoring (driver, infants) > guardian-optech.com 	<p>2 Startup idea: Fleetonomy</p>  <ul style="list-style-type: none"> > Fleetonomy provides AI-based solutions to maximize fleets by enhancing efficiency, generating insights from passenger car fleet data, and creating new revenue streams > Main use cases <ul style="list-style-type: none"> – End-to-end, multi-service mobility – Fleet Intelligence – Simulation and planning – Autonomous-ready solutions > fleetonomy.io 	<p>3 Startup idea: Aurora Labs</p>  <ul style="list-style-type: none"> > The company is focused on detecting and fixing software bugs. It offers a self-healing platform for connected vehicles. Predictive algorithms address all stages of vehicle maintenance: <ul style="list-style-type: none"> – Detecting faults in software behavior and predicting downtime events – Fixing errors in the electronic control unit (ECU) software on the go – Over-the-air ECU updates with zero downtime, not requiring dual memory > auroralabs.com
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Source: Guardian | OpTech, Fleetonomy, Aurora Labs, Roland Berger

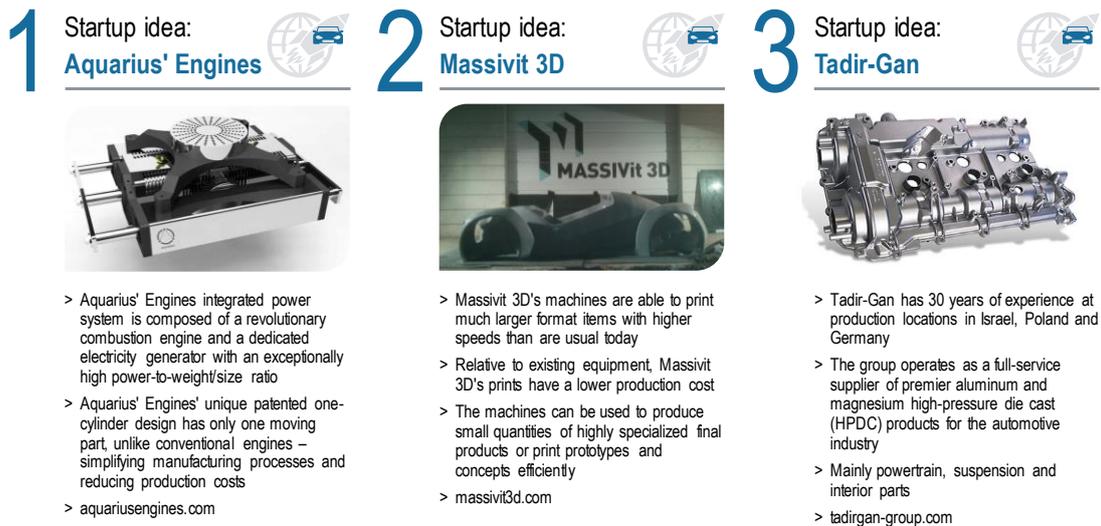
4.2.4 Conventional vehicle technology and other fields

The vehicle technology sector in Israel has the longest history of all the three sectors in scope. It focuses on an array of technology topics that can, for the most part, be applied to any vehicle, irrespective of the type of drivetrain or level of connectivity. The sector includes technologies for engines, energy efficiency, passive safety, security and production.

The technology topics for engines and energy efficiency are closely interlinked. Multiple concepts for highly efficient engines can be found within this sector, each with their own advantages for use directly in drivetrains or as range extenders for electric vehicles. Also important in this sector are manufacturing technologies, for example the production of lightweight components from aluminum or magnesium and new production methods such as 3D printing. Production of components from aluminum or magnesium was established in the past decades and demand is constantly growing due to pressure in the industry to pursue lightweight design. By contrast, 3D printing is a new technology that makes it possible to produce complex structures that cannot be produced efficiently using other techniques. Since 3D printers do not require any complex manufacturing tools, they are often used to quickly generate prototypes and small quantities of products.

Figure 19 presents three examples of businesses from the region.

Figure 19: Vehicle technology: Examples of Israeli startups

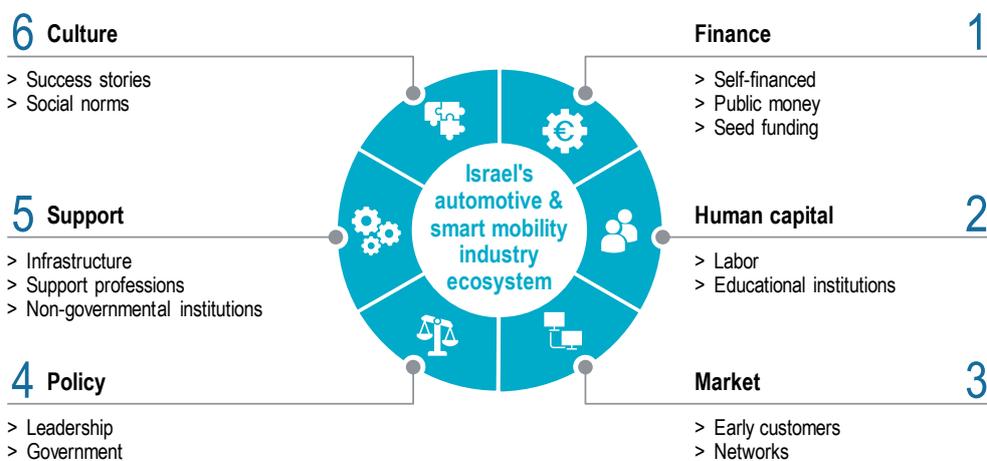


Source: Aquarius Engines, Massivit 3D, Tadir-Gan, Roland Berger

4.3 Israel's entrepreneurial ecosystem

This section describes Israel's entrepreneurial ecosystems from six perspectives (Figure 20). Our insights are based on extensive interviews with more than 25 startups, incubators, accelerators, venture capitalists and policymakers.

Figure 20: Israel's entrepreneurial ecosystem



1) Domains in reference to D. Isenberg 2011

Source: Daniel Isenberg 2011, Roland Berger

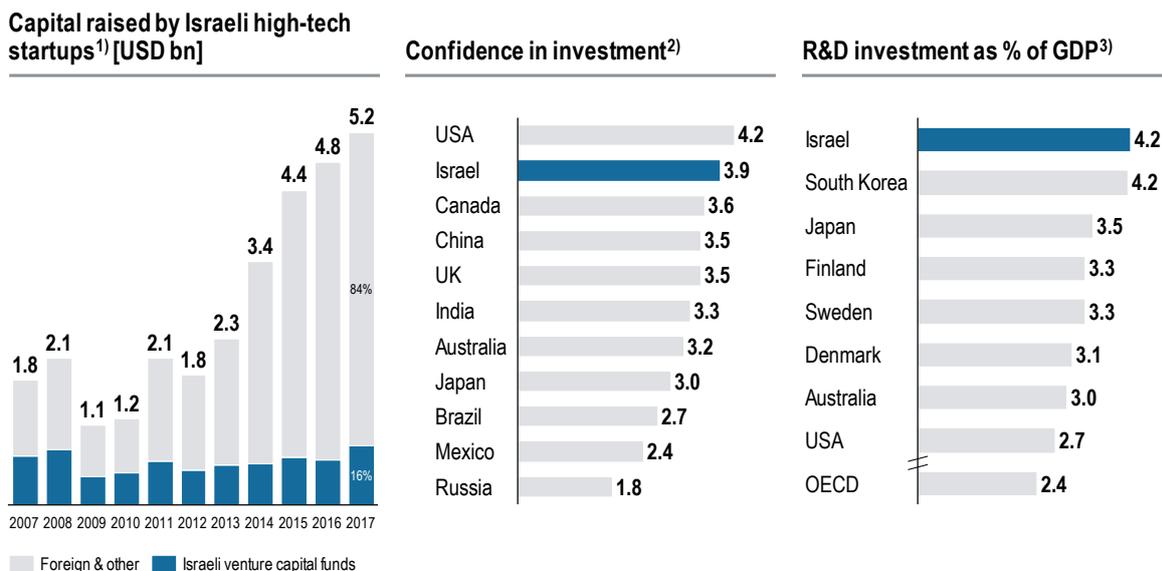
4.3.1 Finance

Israel's vibrant high-tech startup scene raised USD 5.2 billion in venture capital in 2017 and realized exits worth USD 23 billion through M&As and IPOs (see Figure 21). Investment by Israeli venture capital funds rose from about USD 620 million in 2016 to USD 814 million in 2017.⁷ The smart mobility sector alone has raised USD 17.2 billion over the last four years.

However, capital from foreign investors has grown even faster in recent years, with the result that local investment now reflects only 15 percent of the total. This trend could continue: A recent venture capital survey shows that investors appear to have great confidence in business investment in the region (see Figure 21).

Overall, Israeli R&D investments as a share of GDP are the highest worldwide. This creates a basis for knowledge growth, which in turn can lead to new business developments.

Figure 21: Israel as a reliable investment region for financial partners



1) IVC Research Center Capital Raising Survey Q4 2017

2) Deloitte US/2015 VC Survey

3) World Bank

Source: Organizations listed above, Roland Berger

Startups from the region take varying approaches to financing, reflecting the experience and networking opportunities of the founding team. Nevertheless, a common development path can be observed. For the very early initial team and idea building stage, startups often rely on self-funding from the "three Fs" – family, friends and fools. Directly afterward, there are multiple options for financing the very early R&D stage: incubators, accelerator programs, the Israel Innovation Authority (IIA), formerly known as the Office of the Chief Scientist (OCS) program, business angels and venture capitalists. In later R&D stages, incubators, accelerators and business angels play a minor role while the impact of venture capitalists increases.

⁷ The Foreign Investments and Industrial Cooperation Authority, 2017;

The IIA program aims at encouraging and stimulating research and development by new businesses, offering support for the first two to two-and-a-half years. Applications to the IIA program pass through a highly structured three-month evaluation process in which the level of innovation and business potential is evaluated. Several startups have used positive feedback from the IIA as a "quality seal" to convince venture capitalists to invest in them. They then do not require support from the IIA program, are able to access more capital on a variety of terms, and can potentially grow faster.

Ease of access to financing depends on the topic and the funds needed for the subsequent R&D stages. The sheer number of startups in Israel, which include a lot of smaller software companies, results in stiff competition for seed funding for young businesses.

Time to market is a crucial aspect when securing financing. Topics related to the traditional automotive industry, such as energy or ADAS based on hardware, have a relatively long time to market and are thus unattractive to some venture capitalists looking for quick returns. Smart mobility offers the chance to connect to the automotive ecosystem with services, software and apps for smartphones, which can enjoy a relatively short time to market and again increases the attractiveness for venture capitalists. On the downside, they then naturally face strong competition from others in this field.

Given the time to market and the past relevance of the automotive industry, local venture capitalists appear to have only limited interest in investments in the automotive world. Accordingly, local startups are increasingly reaching out to foreign investors. Startups can also benefit from the strong network of a venture capitalist in the latter's home market.

A change in venture capitalists' behavior has been visible in recent years, reflecting their experience during the financial crisis. Other changes are the result of the shift, especially in the field of autonomous mobility, away from a "technology push" strategy and toward a pull strategy, where market demand from customers develops quickly and money for investments becomes relatively easy to secure. Some startups have even enjoyed the comfortable situation of having more venture capitalists willing to invest in them than they actually need, so they could pick and choose the best offers or those venture capitalists with the strongest networks.

A typical challenge is that venture capitalists want to see a vision for the next 50 years but are themselves aiming to exit in the next five. It appears that international venture capitalists, thanks to their greater experience, are able to close this expectation gap more easily.

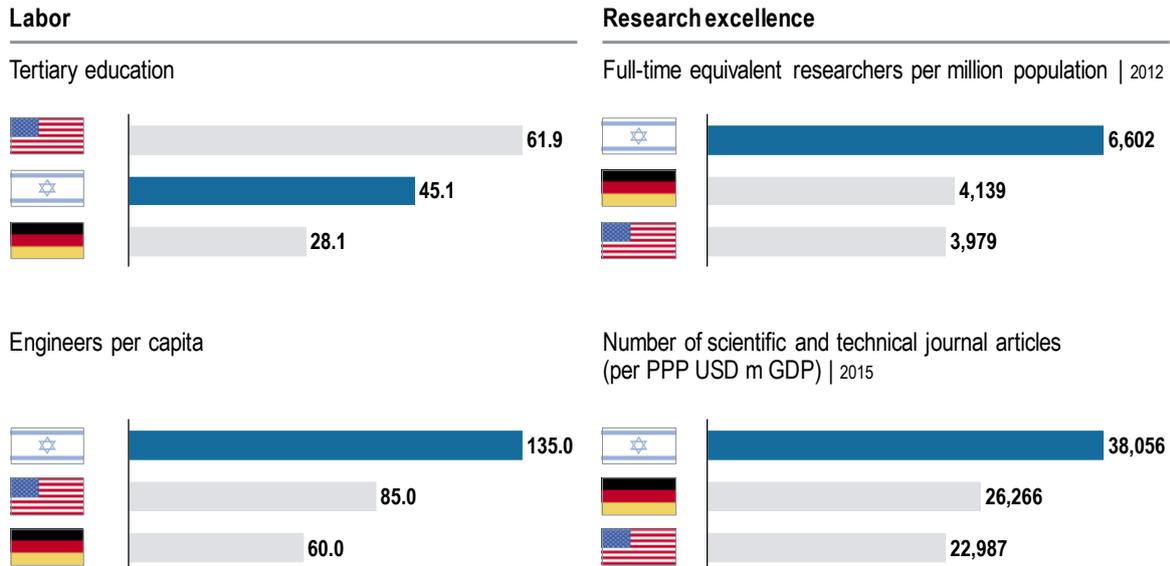
4.3.2 Human capital

Israel lacks any substantial natural resources. The only significant resource the country can leverage is its human capital. As a result, Israel invests highly in education: 47.4 percent of Israel's workforce has tertiary education, compared to an average of 33.3 percent in the OECD countries. The education system in Israel comprises regular schools, universities and also the military, which trains soldiers to become experts in specific fields, depending on their strengths.

The large R&D investments mentioned in the previous section give Israel more full-time equivalent researchers per million population a higher number of scientific and technical journal articles than any leading industrial region. In addition, the country's robust economic performance manifests itself in a low unemployment rate (5.9 percent) and a high labor force participation rate (64.2 percent, compared to 60 percent on average for the OECD as a whole).⁸

⁸ Invest in Israel: Doing Business in Israel, 2016

Figure 22: Israel's human capital



Source: Global Talent Competitiveness Index 2015-16, World Bank 2016, Roland Berger

Most startups that develop relatively fast and are involved in sophisticated technology developments are founded by experienced teams. Nearly all the CEOs and other core team members we interviewed were currently running their third or fourth startup. Looking more closely at their background, it became clear that they all shared one thing in common: their time in the military. Every Israeli has to serve in the Israel Defense Forces (IDF), men for a period of three years and women for two years. When joining the military, each candidate is examined and tested extensively. The best recruits are selected for the "Talpiot program", for example, as part of which they gain a triple degree – in mathematics, physics and computer engineering – alongside their regular military training. About 30-50 recruits out of approximately 15,000 are selected for the program each year, of whom 25-35 graduate. Participants continue to serve in the IDF for a further six years at least.

All young people in the Israeli army quickly learn responsibility, problem-solving skills and team spirit. In some cases, they are swiftly entrusted with cost-intensive projects. They need to solve difficult situations quickly while in command and under real pressure. The result is active, out-of-the-box thinking combined with the desire to make things better and easier.

The networks that people build while in the military and intelligence services are an essential part of the country's business world. It gives them access to contacts for business and serves as a sort of hiring board, with the possibility of evaluation by other people who served in the same unit. This kind of personal network enables Israelis to quickly get into touch with their compatriots: There are usually only two degrees of separation between people, so to speak, compared to a worldwide network average of five "corners".

When recruiting new people to facilitate business development, small startups mainly draw on their personal network. In this way, they ensure that new candidates are experienced and make a real contribution to the firm's development. Interestingly, people often accept significantly lower wages to work for a smaller startup rather than either stay in their current job or accept an offer from a big multinational that is building up a large R&D center in Israel. Instead of a high salary, early team

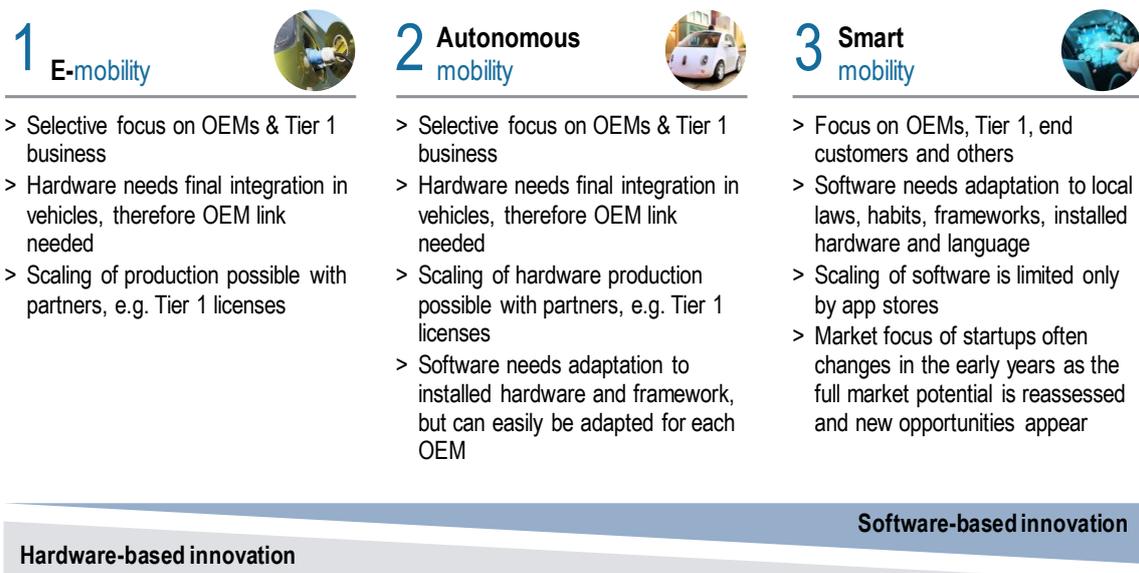
members are compensated with shares or options. People are motivated to work for startups by being given responsibility, gaining a view of the bigger picture and seeing how their job fits into the overall business, and by the opportunity to solve problems themselves.

4.3.3 Market

More than 40 percent of Israel's manufactured exports are high-technology products (OECD average: 16 percent). Israel is also a leading exporter of ICT services, which constitute about 60 percent of its service exports (OECD average: 30 percent).⁹ The markets that new businesses target are, of course, very individual and hence difficult to compare.

The domestic Israeli market of about eight million people is rather small. Local automotive vehicle production does not exist, and local production of components only exists for conventional vehicle technologies. All high-tech products therefore need to focus on exports at some point in their growth strategy. But for some startups – especially those producing software-based solutions for end customers – the small Israeli market is a good training ground, enabling them to create a working product that can then easily be transferred to other markets.

Figure 23: Technology-based market view



Source: Roland Berger

All startups that develop solutions requiring hardware changes or integration in existing automotive systems and components target OEMs and Tier 1 suppliers (see Figure 23). If the OEM accepts the technology, the startups can partner with a Tier 1 supplier for system integration and, ultimately, production. Startups therefore often see themselves as Tier 2 suppliers and do not necessarily need local production facilities: Production can be handled by the Tier 1 supplier acting under license.

⁹ Invest in Israel: Doing Business in Israel, 2016

4.3.4 Policy

The Israeli government operates a broad range of measures that stimulate the founding and growth of new businesses. These include extensive financial R&D support programs, marketing and networking institutions, and tax-reduction programs. In January 2017, the government of Israel approved approximately USD 55 million to be spread over five years as part of the National Plan for the Development of Smart Transportation. Some of the program's aims are to form a test center for autonomous and smart-mobility-compatible vehicles, to create high-definition maps of Israel's roads, and to promote field tests, pilot projects, and demonstrations of technologies in the transportation system. This plan should stimulate the smart mobility industry and support the inflow of financial and human resources to the country. That would boost innovation in the field and create additional touchpoints with other businesses. Foreign companies are encouraged to participate in such activities.¹⁰

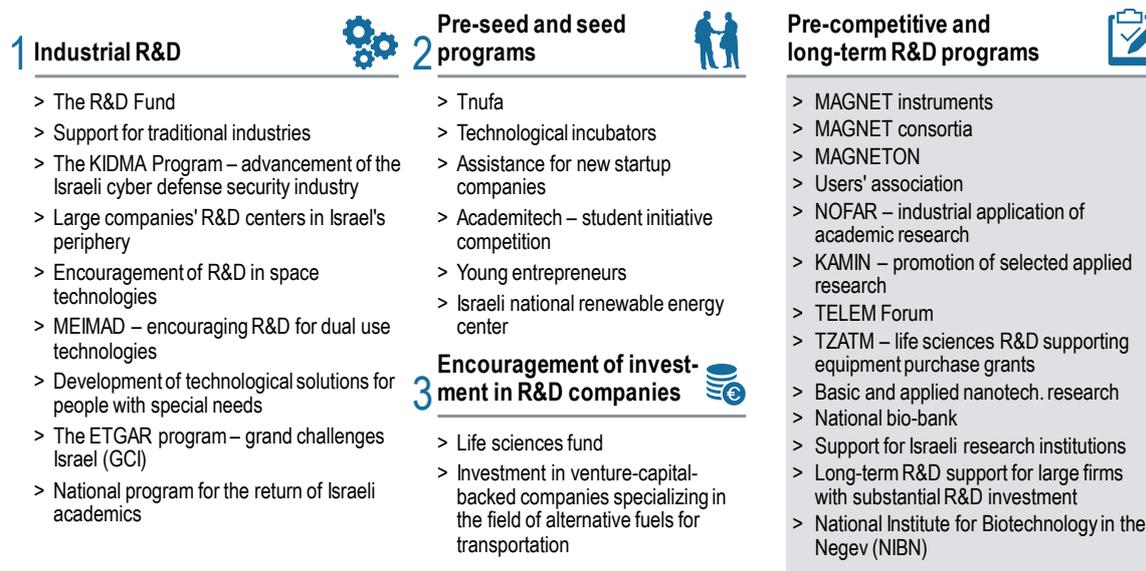
In today's economies, investments in R&D lead to growth, but they are still considered fairly risky in the early stages. As a result, the Israeli government has set up a program to share risk and stimulate such investments. As early as 1984, the Office of the Chief Scientist (OCS) at the Ministry of Economy was empowered under the Law for the Encouragement of Industrial Research & Development. The OCS was recently renamed to Israel Innovation Authority (IIA). The primary goal of the IIA is to promote R&D collaboration between Israel and the international community. The IIA supports hundreds of projects annually, ranging from incipient concepts within a pre-seed framework, incubator and startup companies, to autonomous industrial R&D enterprises. In this way, it operates as a fund with an annual budget of approximately ILS 1.5 billion (roughly USD 400 million).

To receive funding from the IIA, companies need to apply to one of the various programs that exist (Figure 24). Applications are evaluated from a technical perspective (looking at the level of innovation) and from a market perspective (looking at the business potential). Companies can start working immediately and receive feedback from the IIA within a three-month timeframe. The pure R&D fund within the IIA amounts to ILS 1 billion (approximately USD 266 million). Investments need to be matched on a 1:1 basis with private money, and must only be repaid once sales are generated. If the business folds, the loan is cancelled and the founder team is not left with a large amount of debt. The annual turnover of the IIA is about ILS 450 million, which corresponds to a success rate of nearly 50 percent – unusually high for early-stage R&D startup investments.

10

https://www.gov.il/BlobFolder/pmopolicy/2017_des2316/he/secretary_govdecisions_2017_documents_des23165w.docx

Figure 24: Overview of national R&D programs from the Office of the Chief Scientist



Source: Office of the Chief Scientist, Israel Innovation Authority (IIA), Roland Berger

Details of the various R&D funding schemes appear in the report *R&D Incentive Programs*¹¹, published by the Office of the Chief Scientist.

In addition to such generous national and international R&D investments, Israel supports its young businesses with marketing and networking measures, plus tax benefits. The Israel Export Institute, the Industrial Cooperation Authority, Invest in Israel and other institutions foster business development after the R&D phase. They provide access to networks, joint presentation at larger industrial fairs, organized company visits and meetings, and local and international business exchanges. These measures increase the visibility of local startups and stimulate business contacts.

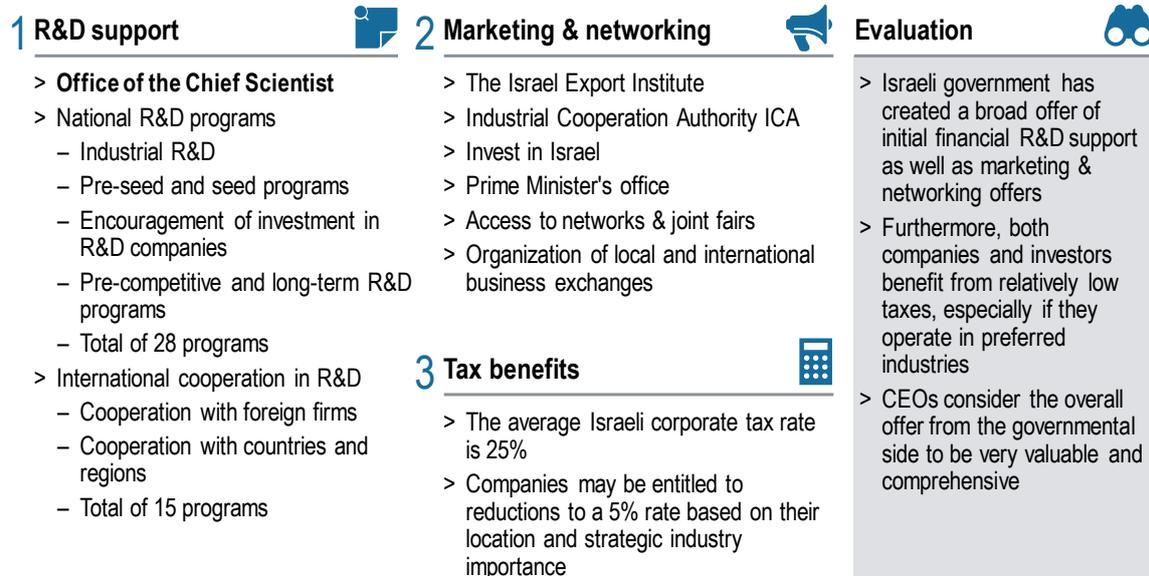
The Israeli government also stimulates business growth in selected areas by means of tax incentives. The average corporate tax rate is 25 percent. However, companies located in specific development areas (socioeconomic areas selected by the Ministry for Industry, Trade and Labor) and covering selected industrial markets that contribute to Israel's GDP can enjoy a five percent tax rate. If they are not located in the development areas, they can still enjoy an eight percent tax rate.¹² One recent example of such sector support is the announcement by the Government, in October 2018, of a plan to replace traditional combustion engines with electric cars and natural gas trucks. This plan relies on levers such as taxation reduction for electric cars to almost zero, making them much more affordable, with the objective to stop diesel or gasoline imports and jump to 1.5 million electric vehicles by 2030.¹³

¹¹ Office of the Chief Scientist, <http://economy.gov.il/RnD/Programs/Pages/default.aspx>

¹² <http://www.jpost.com/Business/Commentary/New-tax-breaks-for-Israeli-industry-you-need-to-understand>

¹³ <https://www.jpost.com/Israel-News/Israel-aiming-to-fully-switch-to-electric-cars-by-2030-569018>

Figure 25: Overview of top-level state support



Source: Office of the Chief Scientist, Invest in Israel, Roland Berger

4.3.5 Support

The Israel Export Institute (IEI) is the premier gateway for doing business with Israeli companies. For sixty years, the organization, which was established and funded by the government and the private sector, has provided expertise in technology and product scouting, joint ventures and strategic alliances with Israeli companies. The IEI is able to help Israeli startups reach international partners through a network of 40+ economic and trade missions spanning the globe. The in-house information and business intelligence unit provides valuable market insights and access to research from leading consulting firms. In addition, the IEI creates business opportunities in the form of B2B meetings arranged domestically (at its Tel Aviv offices) or internationally (at roadshows and exhibitions abroad).

The automotive sector of the IEI continuously monitors current global trends in the field and helps exporters to successfully penetrate markets around the world. By leveraging this knowledge and maintaining strong relationships with key players in the ecosystem (such as VCs, academia, accelerators and the government), the sector has positioned itself as a go-to partner for hundreds of startups and MNCs alike.

In addition, since 2011, one of the growth drivers for the industry has been the Fuel Choices Initiative, Israel's national program for alternative fuels and means of transportation, launched as a joint governmental effort headed by the Prime Minister's Office. Beginning in 2017, the Fuel Choices Initiative was rebranded as the Fuel Choices and Smart Mobility Initiative, refocusing its efforts under the National Plan for Smart Mobility. This official act of the government of Israel was passed "in order to encourage research, development, entrepreneurship, and industry in the field of smart mobility in Israel..."

Aside from the Initiative's previous activities, which included launching the EcoMotion community, supporting pilots and demonstrations, promoting research centers and consortiums in the field of e-mobility, it is now mandated to supervise essential steps to promote smart mobility.

These steps include:

- > Promoting the establishment of a test center for autonomous and smart mobility compatible vehicles;
- > Identifying, creating and making accessible information databases required for R&D that map some or all of Israel's roads in high definition (HD);
- > Advancing cooperation between academics and professionals in the field of smart mobility; promoting field tests, pilot projects, demonstrations of technologies and novel operational approaches in the transportation system that have the potential to reduce congestion, car accidents and the use of crude oil while encouraging broader use of public transportation;
- > Formulating and advancing the regulatory steps involved in enabling testing, operating and providing smart-mobility and shared transport services;
- > Encouraging a business environment that is supportive of the entrepreneurial community and inter-sectoral collaboration in the field;
- > Globally marketing the Israeli industry's activities in the field of smart mobility transportation and strengthening Israel's standing so as to attract international companies in the field;
- > Advancing dialogue and the transfer of knowledge between industry and academia in the field of smart mobility.

The existing tools and programs of the Fuel Choices and Smart Mobility Initiative are still in effect, and different mechanisms of support are offered by governmental partners.¹⁴

All businesses have to deal with certain tasks not directly related to their core business, such as legal matters, accounting and office infrastructure. Several incubators provide startups with full support in these areas, plus access to experts and other services. A comprehensive service would appear to exist for companies focusing on software development. Companies concentrating on hardware have different requirements, such as laboratories and prototyping workshops.

¹⁴ www.fuelchoicesinitiative.com

Figure 26: Overview of support



Source: Interviews, Roland Berger

Our interviews revealed that, after a very short initial phase, the vast majority of startups use their own facilities and pay for any legal and accounting services they use. Attorneys and accountants usually offer tailored pricing concepts for young businesses, reflecting both their limited financial capabilities and the chance to establish a long-term partnership.

4.3.6 Culture

Israel is one of the most innovative countries in the world, ranking tenth in the Bloomberg Innovation Index 2018. It is also a world leader in terms of the rate of investment in R&D (4.2 percent of GDP, against an OECD average of 2.4 percent), which translates into the highest share of researchers per 1,000 employed persons (17.4; OECD average: 7.8).¹⁵ The central region of Israel comprises two areas: the Central District and the Tel Aviv District, which together account for around 40 percent of Israel's total population. This geographical structure facilitates easy networking between business contacts and creates opportunities for dialogue and sharing without long travel times.

To understand the Israeli startup culture, it is necessary to understand the framework within which Israelis live and grow up. The immediate political environment cannot be considered safe, and the Israeli education system – including the military – is unique. The education system, as discussed above, nurtures a very direct and confrontational business culture, out-of-the-box thinking and a specific attitude toward failure and risk-taking. Many of the CEOs we interviewed were frustrated with old technologies and services that did not work as they thought they should, and were looking for ways to change this. In Israel's close-knit community, it appears to be relatively easy to find business partners and team up with them. Starting a business, of course, means taking a risk, but an entrepreneurial spirit and strong work ethics are part of everyday life. Unlike in some other cultures, failing in business is not considered shameful, as failing is part of the learning curve.

Dan Senor and Saul Singer's book *Startup Nation – The Story of Israel's Economic Miracle* gives a fuller description of Israel's cultural world. We summarize some key statements in Figure 27.

¹⁵ Invest in Israel: Doing Business in Israel, 2016

Figure 27: Key characteristics of Israeli entrepreneurs

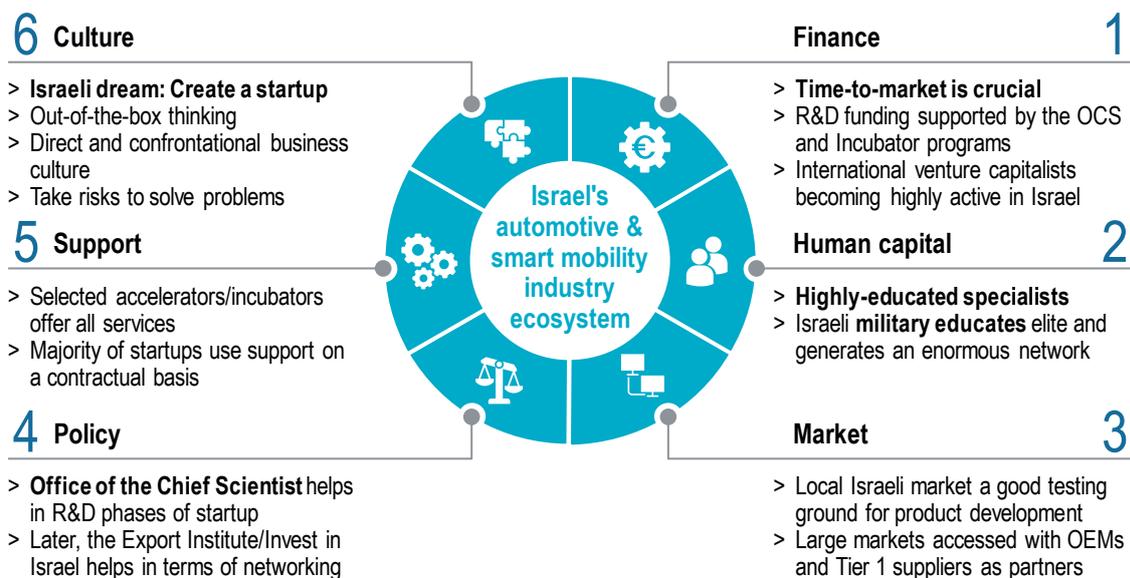


Source: Dan Senor & Saul Singer, "Startup Nation", Yahal Zilka Magma, interviews, Roland Berger

4.4 Strengths and technology potential of Israeli industry

The strengths of the Israeli entrepreneurial ecosystem are a combination of diverse factors (see Figure 28). Financing for R&D and business growth, for example, is relatively easy to find. The country is also home to a large number of highly educated specialists in mathematics, physics and computer sciences, all linked by personal networks created during military service. While the domestic market is relatively small, it can serve as a useful testing ground before targeting larger markets, especially for software products with no scaling challenges. Also, politicians established a framework favoring investment in R&D and business growth more than twenty years ago. Another factor is that the Israeli dream is to "create a startup": The entrepreneurial spirit combines a passion for solving problems with out-of-the-box thinking and a straightforward attitude to taking risks.

Figure 28: Characteristics and success factors of the Israeli entrepreneurial ecosystem

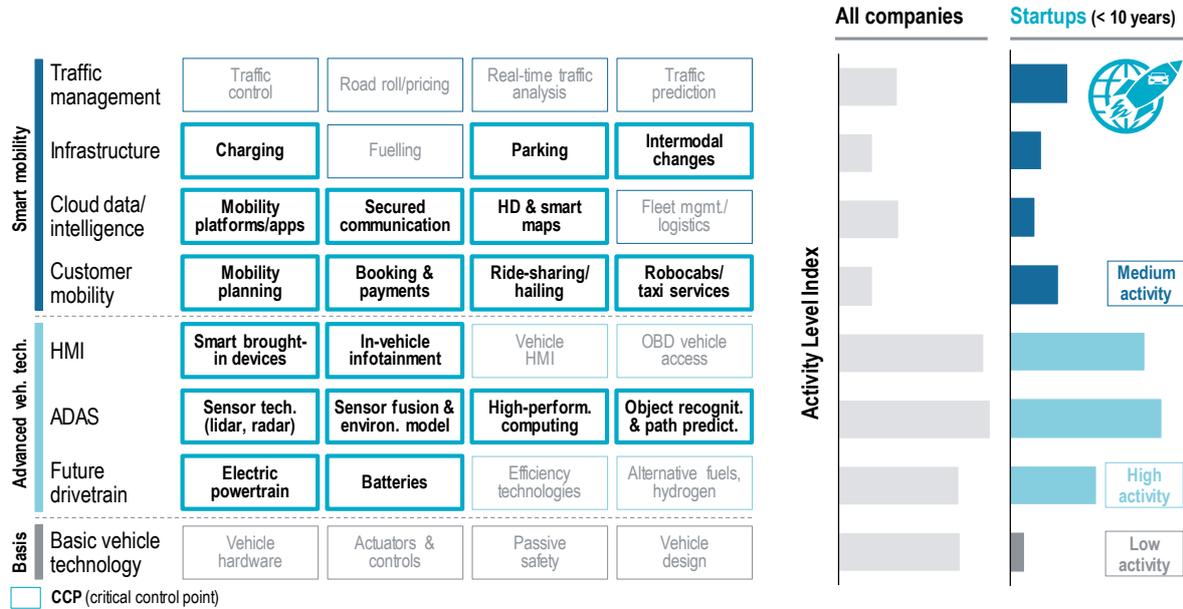


Source: Roland Berger

Israeli businesses operating in automotive and smart mobility will target critical control points for profit pools in the upcoming changes within the industry. Based on our research, we have developed an "activity index" that indicates the number of businesses, their stage of development and their level of maturity (see Figure 29).

The established Israeli automotive industry is strong on basic vehicle technologies. However, the advanced vehicle technologies and smart mobility sector consists mainly of young businesses founded within the last decade. Advanced driver assistance systems, infotainment solutions (closely linked to consumer electronics) and technologies related to electrified drivetrains are a strong focal area for many young startups. Other startups target the wider area of smart mobility, especially shared mobility services and traffic management. By contrast, very few young startups target the basic vehicle technology sector, as this established sector is highly competitive.

Figure 29: Israel's activity radar for critical control points, by company maturity



Source: Roland Berger

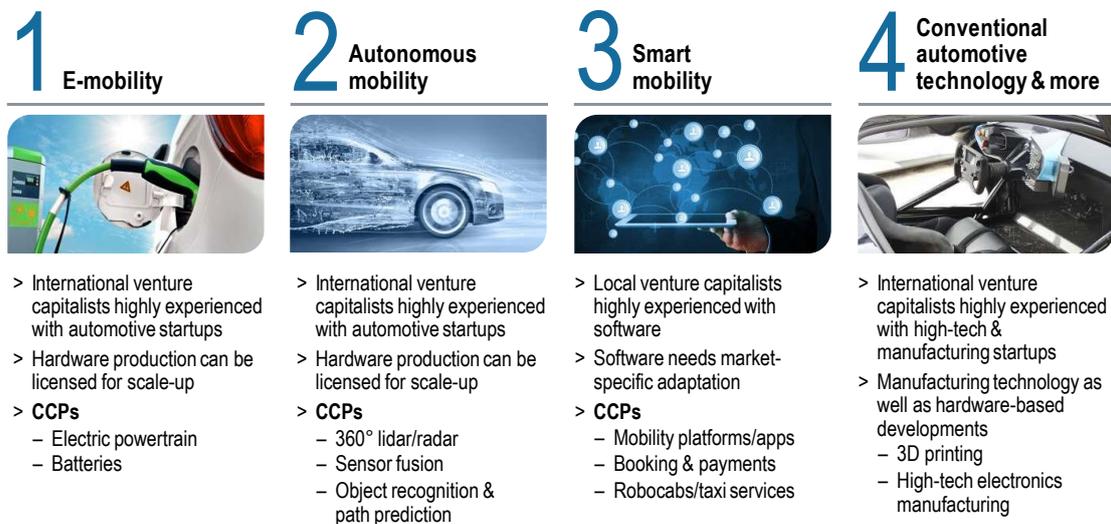
5. Growth opportunities

In light of the disruptive trends in the automotive industry and the potential of Israel's automotive and smart mobility industry, it is possible to sketch – on a very high level – multiple pathways for future growth. That said, it is obviously vital to perform a strategy assessment for each company on an individual basis. This section therefore discusses possible growth trajectories, first for startups from Israel and then for multinationals hoping to leverage the potential of Silicon Wadi.

5.1 International growth opportunities for Israeli companies

More than 5,000 startups in total and around 500 automotive-related startups have emerged in recent years. These companies have different options for growth, depending on whether they focus on hardware or software. E-mobility, partly autonomous mobility and conventional automotive technology topics are mostly hardware-related. Autonomous mobility startups too are often software-focused, as in the case of smart mobility startups. Figure 30 summarizes the critical control points for the growth of Israeli startups.

Figure 30: Mastering critical control points guarantees future growth opportunities



Source: Roland Berger

5.1.1 E-mobility

Businesses operating in the e-mobility sector are mostly based solely on hardware development. For this reason, they have a comparatively long time to market, with the result that their activities have not yet become a "market pull" topic internationally. Startups operating in this area need to address their products directly to OEMs and Tier 1 suppliers, as well as to industry newcomers such as Google. Regionally clustered business offices can help establish sales channels. Winning end customers opens the door for the corresponding supply chain.

Producing e-mobility hardware requires sizable investments and considerable experience in manufacturing. It therefore makes sense for startups to team up with international venture

capitalists (with broad networks in the automotive industry) and Tier 1 suppliers on production topics. Various models of cooperation between Tier 1 suppliers and startups are possible, depending on the precise component being developed. To avoid challenges arising from manufacturing issues, component production can be licensed to a Tier 1 supplier that has both manufacturing experience and the necessary processes, and that meets the requirements of the automotive industry. Not surprisingly, the critical control points for businesses in this sector are electric powertrains and high-voltage batteries.

5.1.2 Autonomous mobility

Startups in the autonomous mobility sector usually combine hardware and software development. Depending on the application, the software may be developed generically to operate with a variety of hardware applications. As with e-mobility, startups working in autonomous mobility should target established and new OEMs as well as Tier 1 suppliers. Regional sales offices will enable them to create links to customers and foster joint R&D work.

International venture capitalists with strong networks in the automotive industry may be good partners for combined hardware and software development. Local venture capitalists with strong connections to digital companies may also be good partners, helping startups align with the activities of new entrants such as Apple and Google, who are clearly active in this field. The challenges of scaling up production can be handled in the same way as for e-mobility.

The critical control points in this sector are areas such as radar and lidar sensors, software for sensor fusion, object recognition and path prediction. Software that can operate on multiple ECU platforms can also target for a wider spectrum of applications, as platform harmonization is still in its early days in this industry.

5.1.3 Smart mobility

Smart mobility startups mainly focus on software development, sometimes in combination with electronics hardware. Depending on the actual product and the way the company plans to interact with end customers, the best target to address may be an OEM, a Tier 1 supplier or the broader end-customer mass market.

Israeli venture capitalists have considerable experience with investments in software startups and are able to support these businesses in their development, especially through their regional and international networks. International venture capitalists are another option for startups in cases where international connections will be useful to the company.

Startups can use the experience they gain in the early years on the Israeli market to develop their product to a stage where it can be sold on global markets. The software will most likely need to be adapted for regional markets to take account of differences in HMI language and/or specific differences between countries, such as traffic signs.

The critical control points for smart mobility include mobility platforms and apps, booking and payment processes, robocabs and autonomous taxi services.

5.1.4 Conventional vehicle technology and other fields

Startups and established players in the conventional vehicle technology sector usually operate in areas such as manufacturing technology, combustion engine technology, measures to increase efficiency, lightweight materials, passive safety functions and alternative fuels.

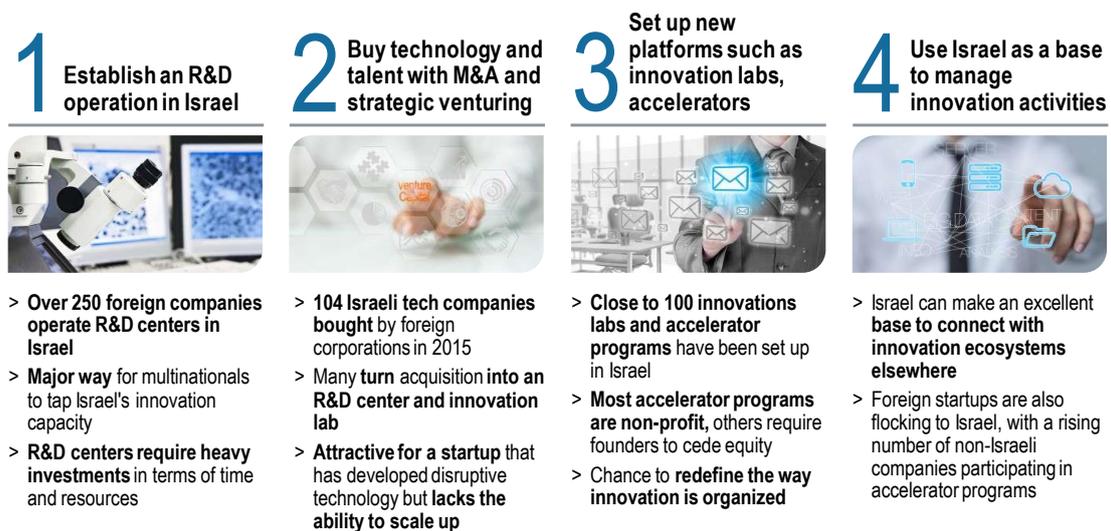
These companies lean toward the classic automotive industry, meaning OEMs and Tier 1 suppliers. International venture capitalists usually have more experience with the conventional automotive

industry than Israeli venture capitalists. The tremendous diversity of companies in this sector means that more than one growth strategy is possible. Here, we need a "five core capabilities" (or "5C") approach that assesses the individual company, its competitors, its customers, its collaborators and the climate.

5.2 Opportunities for international companies to invest in Israel

Hundreds of multinationals, mid-sized firms and smaller startups have already partnered with Israeli companies or set up facilities in the country, attracted by Israel's dynamic innovation ecosystem. As the ways companies innovate are themselves reinvented, so new options emerge. Figure 31 shows some of the main opportunities for non-Israeli companies to leverage Silicon Wadi.

Figure 31: Four ways to benefit from Israel's expertise



Source: Roland Berger

Collaboration between startups and very large companies can be a challenge when bringing together different standards, processes and modes of working. Furthermore, questions concerning culture or even trust may arise at the management and working levels. Existing cooperation such as that described above and below thus provides a solid testimonial background, as well as valuable orientation on how to overcome these not negligible challenges.

5.2.1 Establish an R&D operation in Israel

With over 320 foreign companies operating R&D centers in Israel, this continues to be a major way for multinationals to tap into Israel's innovation capacity. Companies who have taken this step include almost every major IT firm, from IBM and Microsoft to Deutsche Telekom and SAP. Intel, which arrived in 1974, is the country's largest tech employer today, running four development centers plus a chip factory that generates nearly ten percent of Israel's tech exports. Intel's Israel-based research has produced many of the company's milestone developments in semiconductor technology, from the 8088 processor used in the first PCs to the Pentium M. Today, a semiconductor cluster of over 1,000 startups and suppliers has grown up around Intel's presence in Israel.

R&D centers require heavy investments in terms of time and resources and need to be supplemented by other ways of generating innovation. Nevertheless, they remain an important avenue for companies looking to harness tech talent. Firms that have recently established or expanded their R&D activities in Israel range from Apple to Philips Healthcare.

5.2.2 Buy technology and talent through M&As and strategic ventures

Israel has become one of the world's largest markets for acquiring startups, with the overwhelming majority of the 104 Israeli tech companies bought in 2015 going to foreign corporations. Buying a startup can be an effective shortcut to acquire talent, plug technology gaps or graft a faster innovation culture into the acquiring company.

Many multinationals turn their Israeli acquisitions into R&D centers and innovation labs. Others merge startups with their existing R&D activities in Israel. When Facebook acquired its first two Israeli startups – Snaptu and face.com – it followed its usual practice of moving the newly acquired companies' management and development teams to the Facebook headquarters in Menlo Park. But in 2013, when Facebook bought mobile analytics specialist Onovo, the startup stayed in Israel, where it now forms the core of an expanding Facebook R&D presence. The benefits to Facebook include stronger ties to Israel's rapidly evolving ecosystem of startups in the field of mobile apps, cloud computing and face recognition. Similarly, when Google bought Waze for USD 1.15 billion in 2013, the mobile mapping specialist was integrated in Google's existing development facilities in Israel. Furthermore, in March 2017 Intel announced the acquisition of autonomous driving developer Mobileye for USD 15.3 billion – the largest acquisition of an Israeli company in the high-tech industry to date. This combination is expected to accelerate innovation for the automotive industry and position Intel as a leading technology provider in the fast-growing market for highly and fully autonomous vehicles.

Corporate venture capital has also been pouring into Israel. Axis Innovation, a Tel Aviv-based advisory firm, counts close to 100 multinationals investing in Israeli startups, including Samsung, General Electric, Robert Bosch and Deutsche Telekom. Axis CEO Ed Frank says investment has recently shifted from traditional IT into fintech, mobility and health. Foreign corporate investors are often very attractive to Israeli startups that have developed disruptive technology but lack the ability to scale up beyond Israel's tiny local market.

5.2.3 Set up new platforms such as innovation labs and accelerators

While incubators and accelerators are booming globally, they are rocketing in Israel. The list of major companies that have set up innovation labs and accelerator programs is nearing a hundred and seems to grow by the week. Visa, Citigroup, Barclays, Santander and RBS are just some of the companies working with Israeli startups on fintech and cyber-security. Cisco, IBM, Samsung, AOL, Yahoo and many others run accelerator programs in mobile services and IT.

In early-stage platforms such as incubators and innovation labs, new ideas are generated bottom-up, giving the parent company the option to pick and choose which ones to develop and scale up. High-profile incubators include Intel's Internet of Things Lab in Haifa and the Visa Europe Collab in Tel Aviv.

Most accelerator programs are non-profit, while others require founders to hand over equity in return for access to the multinational's mentors, products and customers. For the multinationals that connect with the startups channeled through these programs, this is a very flexible, small-footprint method of injecting startup DNA into their corporate culture and bypassing the often laborious processes that tend to slow them down.

Innovation platforms run by global brands are frequently magnets around which startup ecosystems coalesce. When Citigroup launched Israel's first fintech accelerator in 2013, it created a virtual fintech cluster around the participating startups. A similar cluster has been created in cyber-security, where hundreds of Israeli startups have sprung up. Jeremie Kletzki, in charge of business development at Tel Aviv-based Startup Nation Central, says Citi's model can be replicated in other sectors where global players have yet to arrive. In a sector where the innovation ecosystem is still fragmented or poorly defined, he says, a global player can set itself up at the center of a startup network.

Foreign companies are also using Israel as a laboratory to redefine the way they organize innovation. One trailblazer has been German auto maker BMW, whose Startup Garage combines a light organizational footprint with extreme flexibility and the opportunity to scale up quickly. If BMW's scouts see an interesting startup, they give it a supplier number and connect it to the go-to executives and engineers within their own organization. The startup is then plugged into the heart of BMW and gets a chance to sell and validate its prototype technology or mobility service for the next 12 weeks. Beyond that, there is no mutual commitment and no infrastructure. Just one year after launching, BMW's Startup Garage already attracts most of its startups not from Germany, but from the United States and Israel.

Other ways in which companies tap into Israel's innovation pipeline include hackathons, challenges, startup festivals and a variety of formats. Pfizer, Novartis and other pharmaceutical companies have staged digital-health hackathons as a way to connect with this fast-growing sector. For some companies, these events are a way to fight for talent and attract good startups. For others, they are a low-cost, low-footprint way to establish contact with the tech scene and show their presence, even without any on-the-ground representation in Israel.

5.2.4 Use Israel as a base for managing your innovation activities

Thanks to its strong, globally networked innovation sector, Israel can serve as an excellent base to connect with innovation ecosystems elsewhere. Microsoft Ventures manages startup accelerators in India, China and several other global locations from its accelerator in suburban Tel Aviv. Since 2015, Chinese IT giant Lenovo has been managing innovation partnerships all over Europe from its offices in Israel. Foreign startups, too, are flocking to Israel, with a rising number of non-Israeli companies participating in accelerator programs such as MassChallenge in Jerusalem.

Our partners in Israel tell us that they can often get faster and easier access to key players and decision-makers via their Israeli operations, where contacts are quick and informal, even between companies. There are also few cities in the world like Tel Aviv, where so many key technology and business players are constantly passing through.

The ability of non-Israeli companies to relocate key activities to Israel is still limited by the country's restrictive visa policies. On the other hand, the current government has begun to relax restrictions on non-Jewish arrivals. It has introduced an "innovation visa" for entrepreneurs and investors and is in the process of enabling more foreign tech workers to move to Israel.

5.2.5 Engage Israel's high-tech diaspora

Israeli tech companies are rapidly going global, establishing subsidiaries or even relocating abroad. California, New York, Boston and Berlin have emerged as major hubs for Israeli startups looking to access the US and European markets. This entrepreneurial diaspora – Israeli companies and their subsidiaries as well as Israeli entrepreneurs who have started their companies abroad – often retain development teams in Israel or are otherwise part of both countries' innovation ecosystems. They offer yet another way to engage with Israeli teams and technology.

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