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The ecosystem of computer science education in Israel: Possible implications for NYC

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Technion - Israel Institute of Technology

May 11, 2016

Israeli Software Startup Ecosystem

- How is it that Israel—a country of 7.1 million people, only sixty years old, surrounded by enemies, in a constant state of war since its founding, with no natural resources—produces more start-up companies than large, peaceful, and stable nations like Japan, China, India, Korea, Canada, and the United Kingdom?" [*The Economist*](#) notes that Israel now has more high-tech [start-ups](#) and a larger [venture capital industry](#) per capita than any other country in the world. ([Senor](#) & [Singer](#), 2011)



The Hi-Tech Industry: List of multinationals with R&D centers in Israel (April 2016)

W List of multinationals with: X

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List of multinationals with research and development centres in Israel


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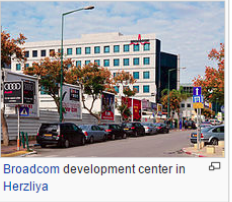
Find sources: "List of multinationals with research and development centres in Israel" – news · newspapers · books · scholar · JSTOR · free images (August 2015) *(Learn how and when to remove this template message)*

There are over 250 **foreign R&D Centers in Israel**.^[1]

Company	Country	Sector	Major acquisitions and activities
3M	 United States	Electronics	Attenti ^[2]
Alcatel-Lucent	 France	Telecommunication	LANNET, Chromatis Networks, Mobilitec ^[3]
Amazon	 United States	Internet	Aannapura Labs ^[4]
AOL	 United States	Internet	5min Media ^[5]
AMD	 United States	Semiconductors	Graphic Remedy ^[6]
Apple	 United States	Consumer electronics	Anobit, ^[7] PrimeSense ^[8]
Applied Materials	 United States	Semiconductors	Orbot Instruments, Opal Technologies, ^[9] Oramir Semiconductor ^[10]
ARM Holdings	 United Kingdom	Semiconductors	Sansa Security ^[11]
AT&T	 United States	Telecommunication	Interwise ^[12]
Autodesk	 United States	Software	R&D Center ^[13]
Barclays	 United Kingdom	Financial services	R&D Center ^[14]
BMC Software	 United States	Software	New Dimension Software, ^[15] Identify Software ^[16]
Broadcom	 United States	Semiconductors	VisionTech, M-Stream, Siliquent Technologies, Dune Networks, Percello, Provigent, SC Square ^[17]
ChemChina	 China	Chemicals	Makhteshim Agan ^[18]



Google development center in Matam, Haifa



Broadcom development center in Herzliya

Windows taskbar: 2:28 PM, 29-Apr-16

Technion Nation: Frenkel and Maital, January 2012

- 1/3 of Israel's 125 top business leaders are Technion graduates.
- 298 NASDAQ-listed companies with non-American origins
 - 121 (41 per cent) are Israeli
 - 59 of them are led/were founded by Technion graduates
- 1/4 of Technion graduates are either CEO's or VP's.
- 18.4 per cent of all graduates, work / worked in startup companies.



The Technion: Israel's Hard Drive, The New York Times, April 12, 2013)

The screenshot shows a web browser window displaying the New York Times website. The page is titled "Education Life" and features a navigation menu with categories like "WORLD", "U.S.", "N.Y. / REGION", "BUSINESS", "TECHNOLOGY", "SCIENCE", "HEALTH", "SPORTS", "OPINION", "ARTS", "STYLE", "TRAVEL", "JOBS", "REAL ESTATE", and "AUTOS". A prominent green banner advertises a Windows subscription offer: "Subscribe to The Times now on your Windows device and GET 30 DAYS FREE." Below this, the article title "The Technion: Israel's Hard Drive" is visible, accompanied by a large photograph of the Technion campus. To the right of the article, there is a "What's Popular Now" section with a Facebook login prompt and a link to "Academics Who Defend Wall St. Reap Reward". Another Windows subscription banner is visible at the bottom of the page.

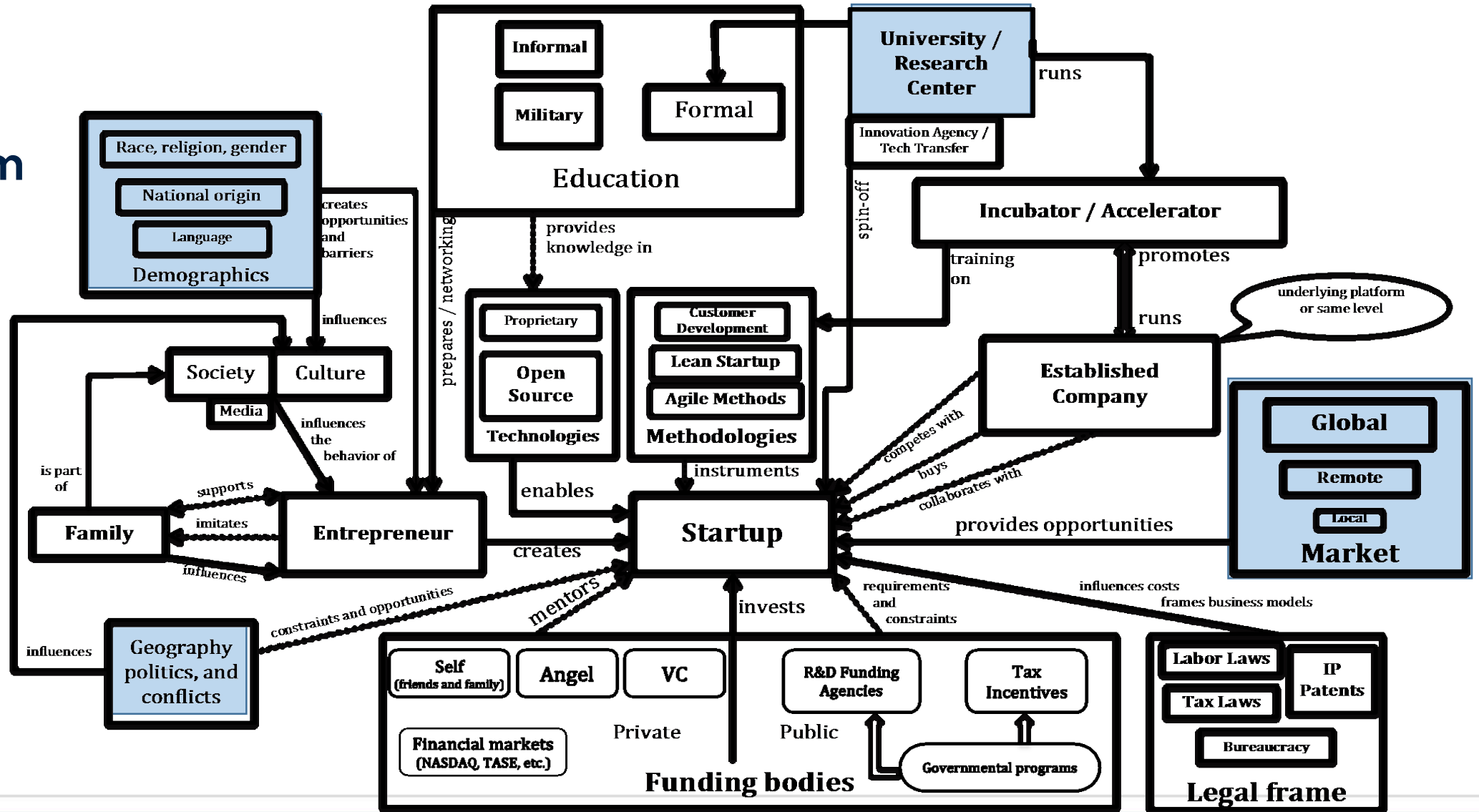


Shanghai Ranking: Israeli Universities – Computer Science (out of 7 universities)

	2009	2010	2011	2012	2013	2014	2015
Technion	17	15	15	18	18	18	18
Weizmann Institute	13	12	11	12	23	51-75	76-100
Hebrew University	25	21	26	27	28	51-75	76-100
Tel Aviv University	29	31	28	29	44	20	20

Israeli Software Startup Ecosystem

(Kon, Cukier, Melo, Hazzan, Yuklea, 2014)



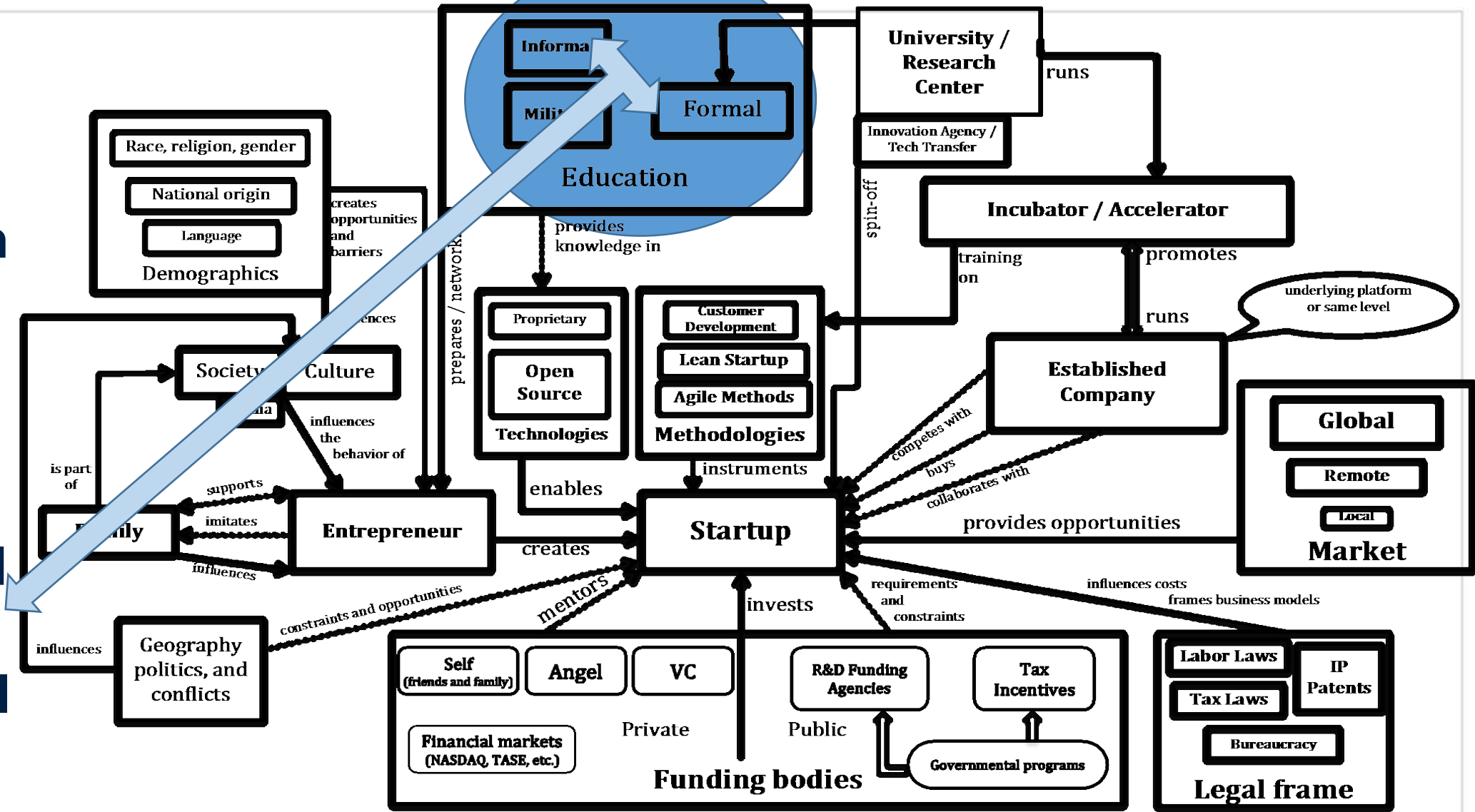
Click to LOOK INSIDE!



Israeli Software Startup Ecosystem

(Kon, Cukier, Melo, Hazzan, Yuklea, 2014)

Formal and in-formal high school STEM education



2006

The New Educational Imperative: Improving High School Computer Science Education

Using worldwide research and professional experience to improve U. S. Schools

By CSTA Curriculum Improvement Task Force



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Applications.

The success of the high school computer science curriculum in Israel is largely due to the care with which the government planned the implementation process and the resources that were put in place to support that implementation. This support included the development of course materials (learning materials for students and corresponding teacher guides) and an intensive in-service teacher training program (Gal-Ezer, et al. 1995; Haberman & Ginat, 1999).

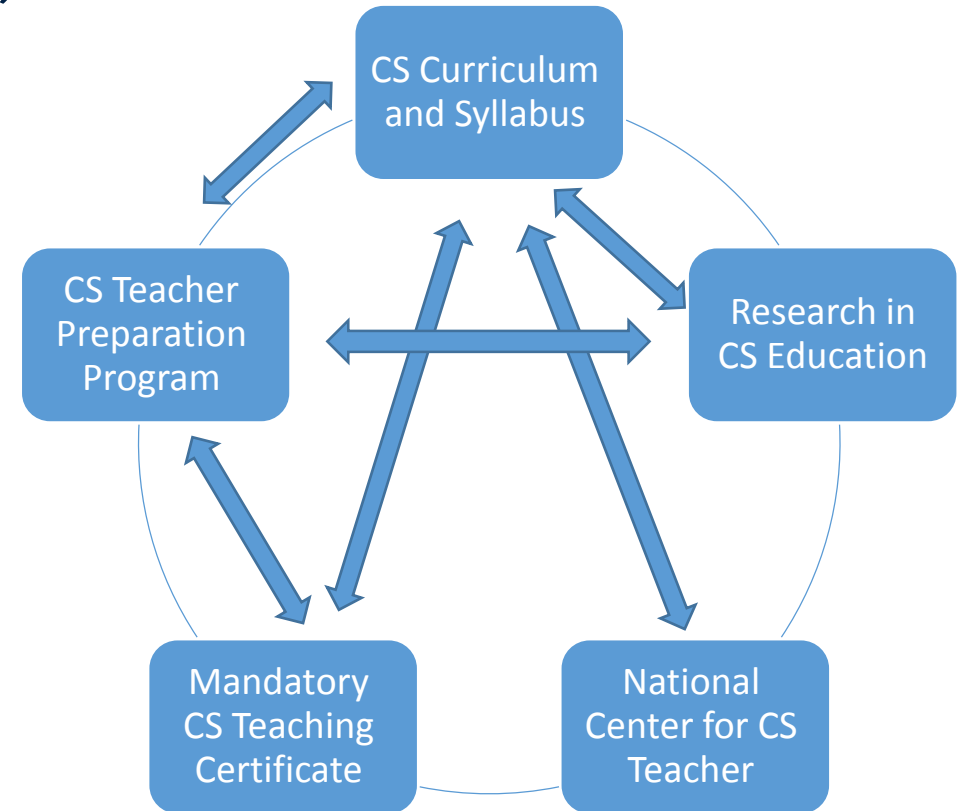
core curriculum
however, student
secondary school
and Italy, inform
no longer taught
to support learning
& Salkoski, 2004,

In Poland, a
primary schools
students also take
course that inclu

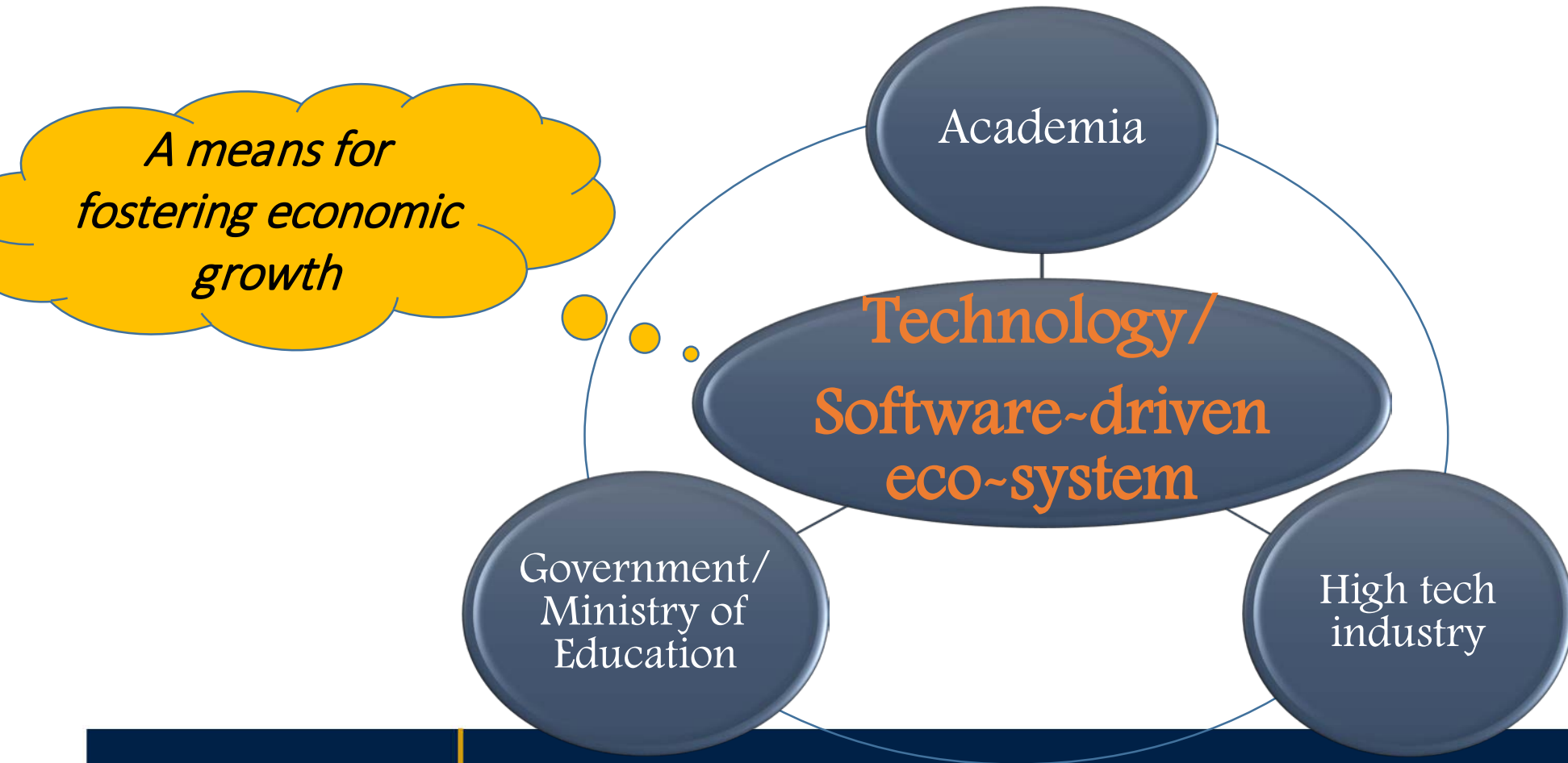
A model for high school Computer Science Education

(Hazzan, Gal-Ezer, Blum, 2008)

- A well-defined **curriculum**
- A mandatory **CS teaching license**
- **Teacher preparation programs**
- A **national center for CS teachers**
- **Research** in computer science education



Israel Eco-System of Technology



NYC and Israel

	Israel	NYC
Population		
General	8,476,600 (2016)	8,550,405 (2015)
Public education	1.4 millions	1.1 millions
Diversity	State (<i>Mamlachti</i>), state-religious (<i>Mamlachti dati</i>), Ultra-orthodox (Haredi), Arab	Asian, Black, Hispanic, White

NYC and Israel

	Israel	NYC
Population General Public education Diversity	8,476,600 (2016) 1.4 millions <i>State (Mamlachti), state-religious (Mamlachti dati), Ultra-orthodox (Haredi), Arab</i>	8,550,405 (2015) 1.1 millions Asian, Black, Hispanic, White
History	Technion's President Lavie : "Over one generation, we moved from an economy based on Jaffa oranges to an economy based on semiconductors."	Till 1970 ~ 1970-1990 ~1990- <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px solid #0070C0; border-radius: 10px; padding: 5px; background-color: #0070C0; color: white;">Marine transportation</div> <div style="border: 1px solid #0070C0; border-radius: 10px; padding: 5px; background-color: #0070C0; color: white;">Finance / Fashion / Media</div> <div style="border: 1px solid #0070C0; border-radius: 10px; padding: 5px; background-color: #0070C0; color: white;">Hi-tech / Silicon alley</div> </div>

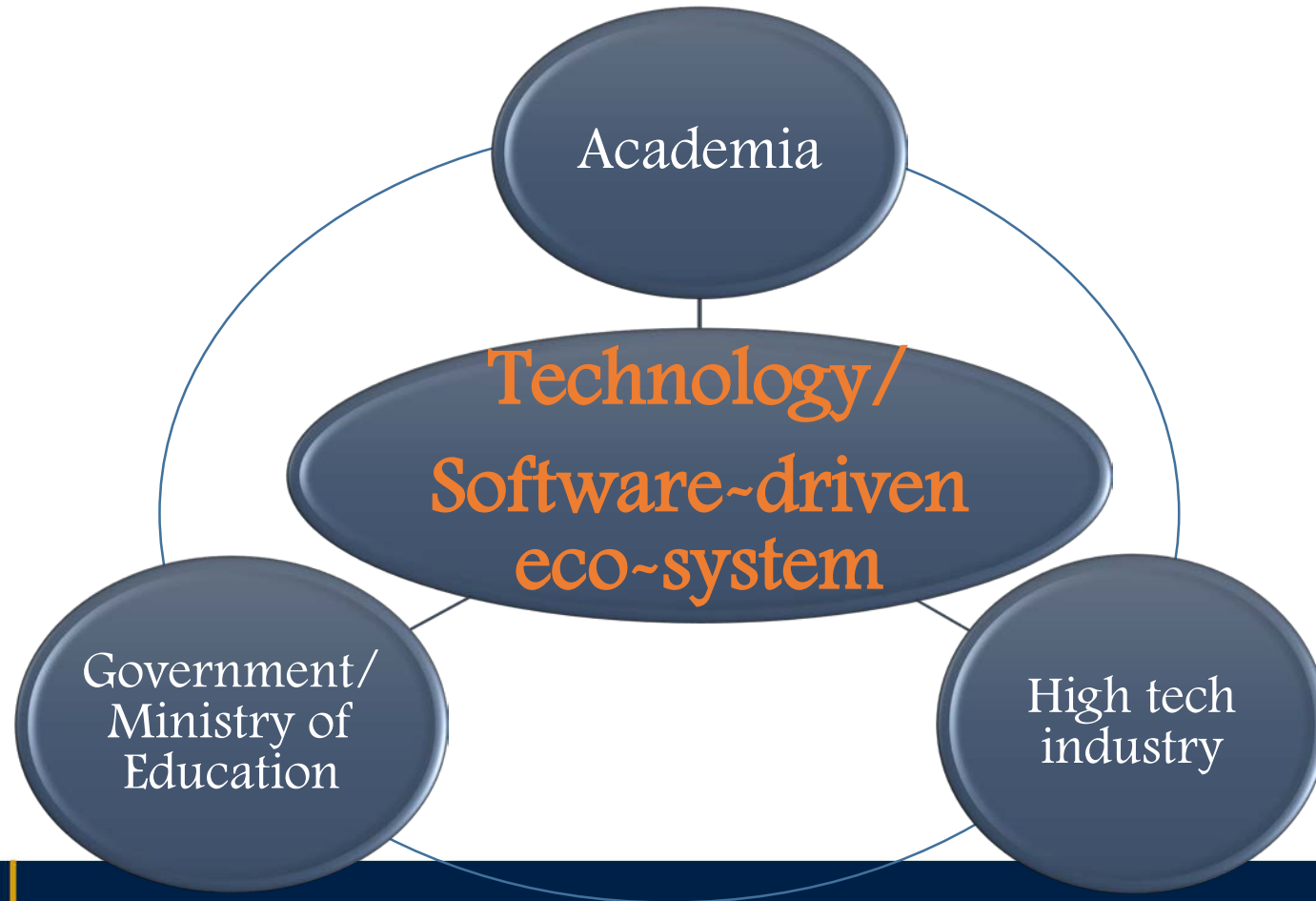
NYC and Israel

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Population Genera Public education Diversity	8,476,600 (2016) 1.4 millions <i>State (Mamlachti), state-religious (Mamlachti dati), Ultra-orthodox (Haredi), Arab</i>	8,550,405 (2015) 1.1 millions Asian, Black, Hispanic, White
History	<u>Technion's President Lavie</u> : "Over one generation, we moved from an economy based on Jaffa oranges to an economy based on semiconductors."	Till 1980 1980-2000 2000-
Academia: Applied Science University		CORNELL TECH HOME OF THE JOAN AND IRWIN JACOBS TECHNION-CORNELL INSTITUTE

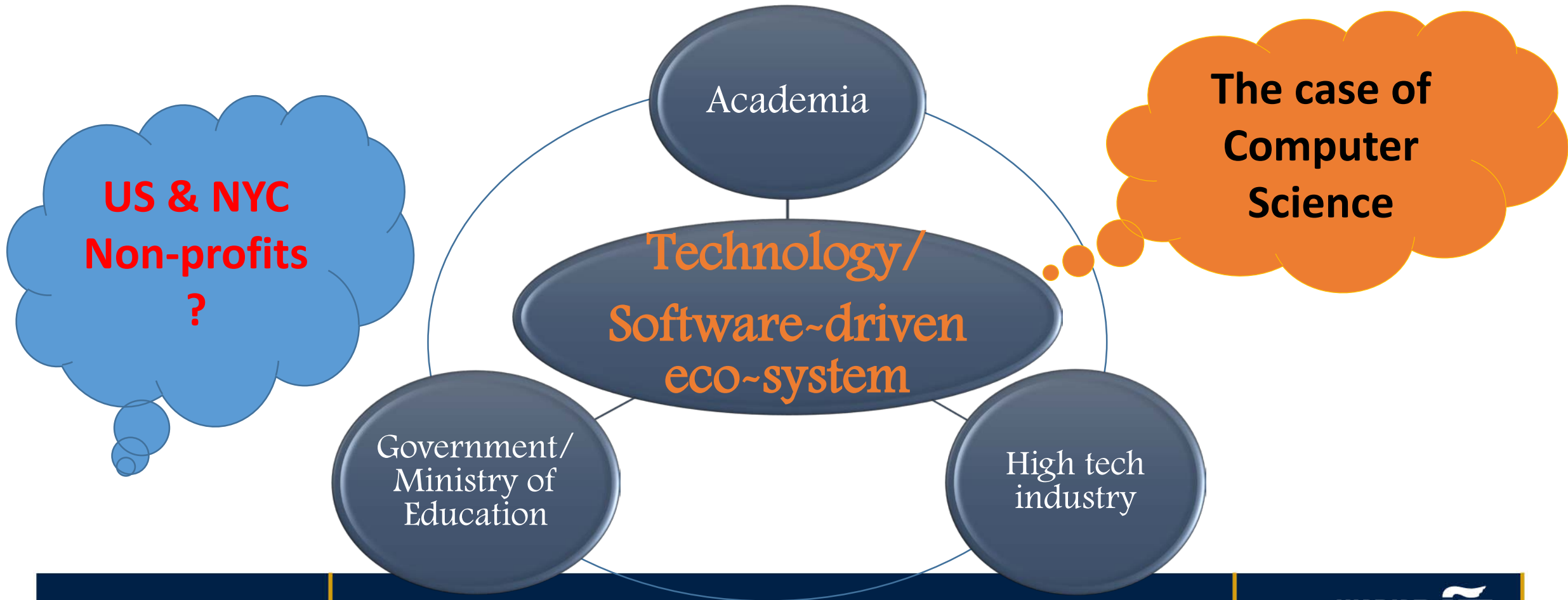
NYC Public Education – Ethnicity

Year	Total Enrollment	# Asian	% Asian	# Black	% Black	# Hispanic	% Hispanic	# Other	% Other	# White	% White
2011-12	1089537	164207	15.1%	320866	29.4%	435796	40.0%	10987	1.0%	157681	14.5%
2012-13	1094945	167068	15.3%	315400	28.8%	438712	40.1%	14640	1.3%	159125	14.5%
2013-14	1104479	169191	15.3%	312434	28.3%	444237	40.2%	18820	1.7%	159797	14.5%
2014-15	1122783	172268	15.3%	311966	27.8%	453172	40.4%	20787	1.9%	164590	14.7%
2015-16	1133963	175648	15.5%	307734	27.1%	459402	40.5%	23714	2.1%	167465	14.8%

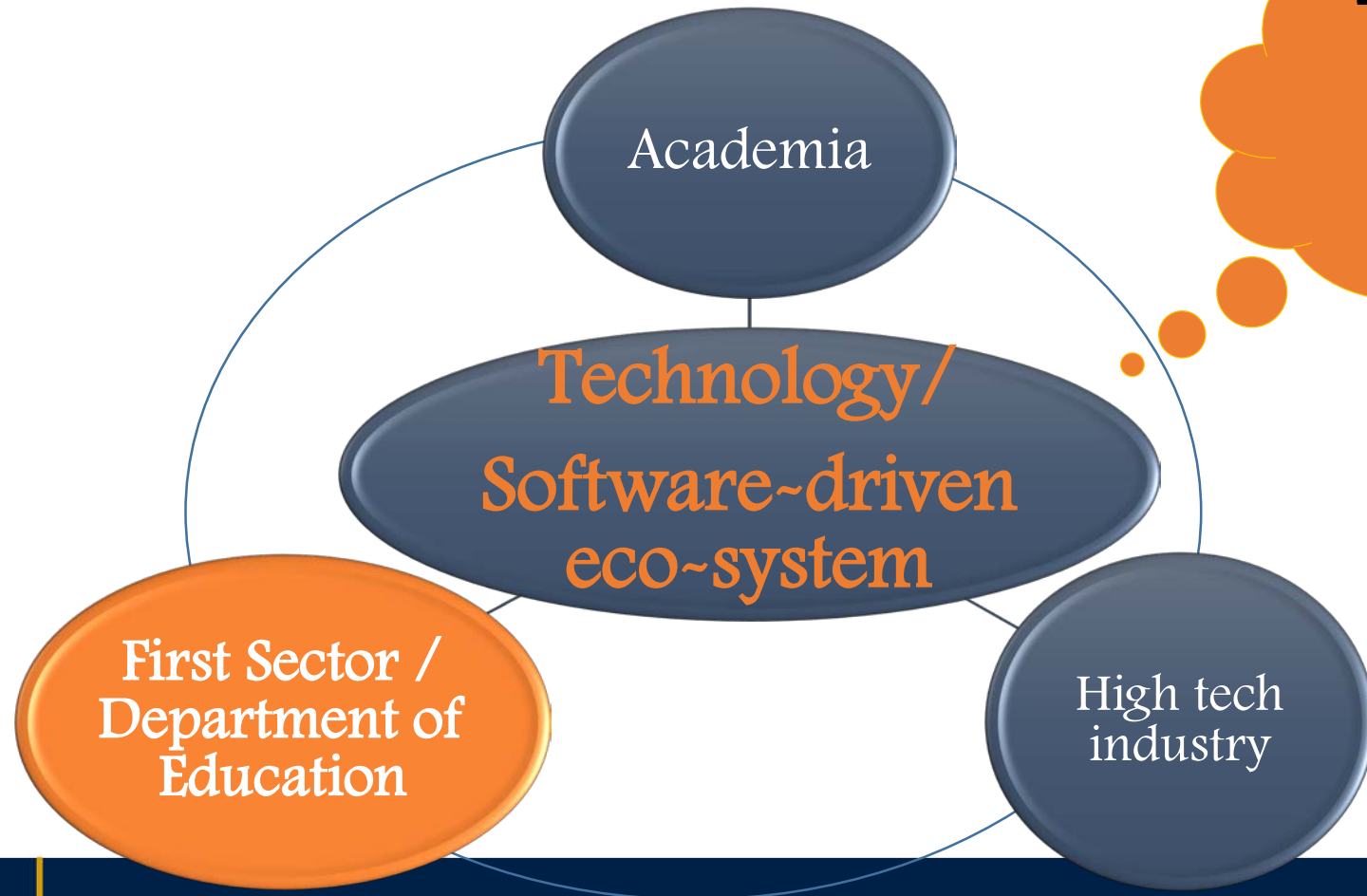
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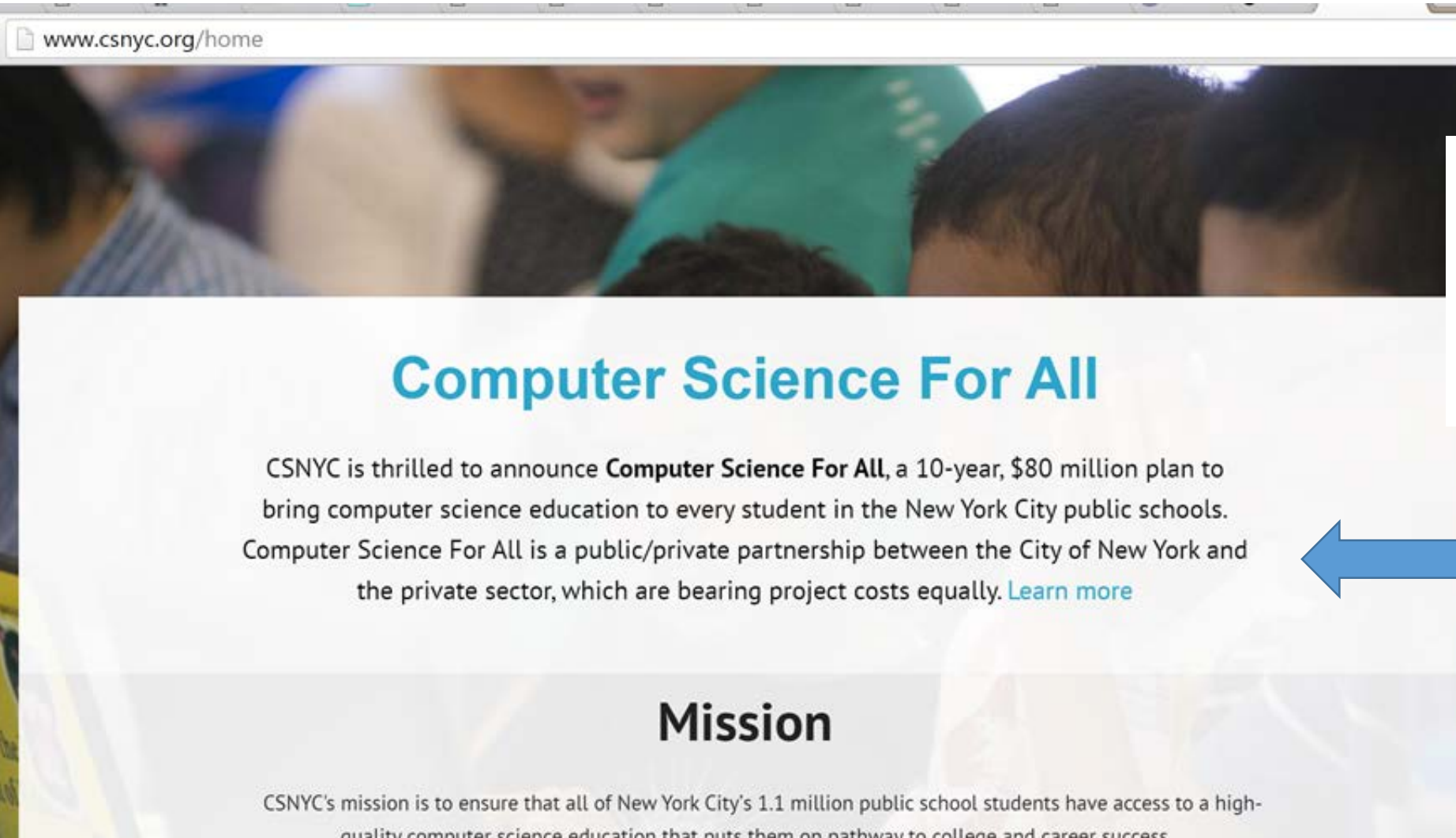
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NYC Eco-System of Technology



CS4ALL in NYC [announced in Sep 2015](#); Part of Mayor de Blasio's [Equity and Excellence](#) agenda



< CS4ALL >

POLITICS

Obama's Budget Urges a Deeper Commitment to Computer Education

By MICHAEL D. SHEAR JAN. 30, 2016



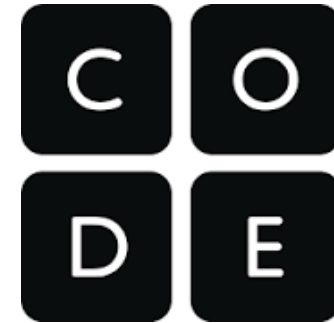
WASHINGTON — [President Obama](#) will call for spending \$4 billion to help states pay for computer science education in the schools when he presents his 2017 budget to Congress, administration officials say.

CS program / SE Schools in NYC

- [Academy for Software Engineering](#)
- [Bronx Academy for Software Engineering](#)
- [Software Engineering Program / DOE](#)
 - The goals of the program are:
 - (1) to increase the number of high school graduates, particularly from traditionally underrepresented groups, who are ready to enter new and emerging high-tech career pathways
 - (2) to develop students' computational thinking and problem-solving skills in real-world contexts.



Sample of Organizations involve in CS4AI



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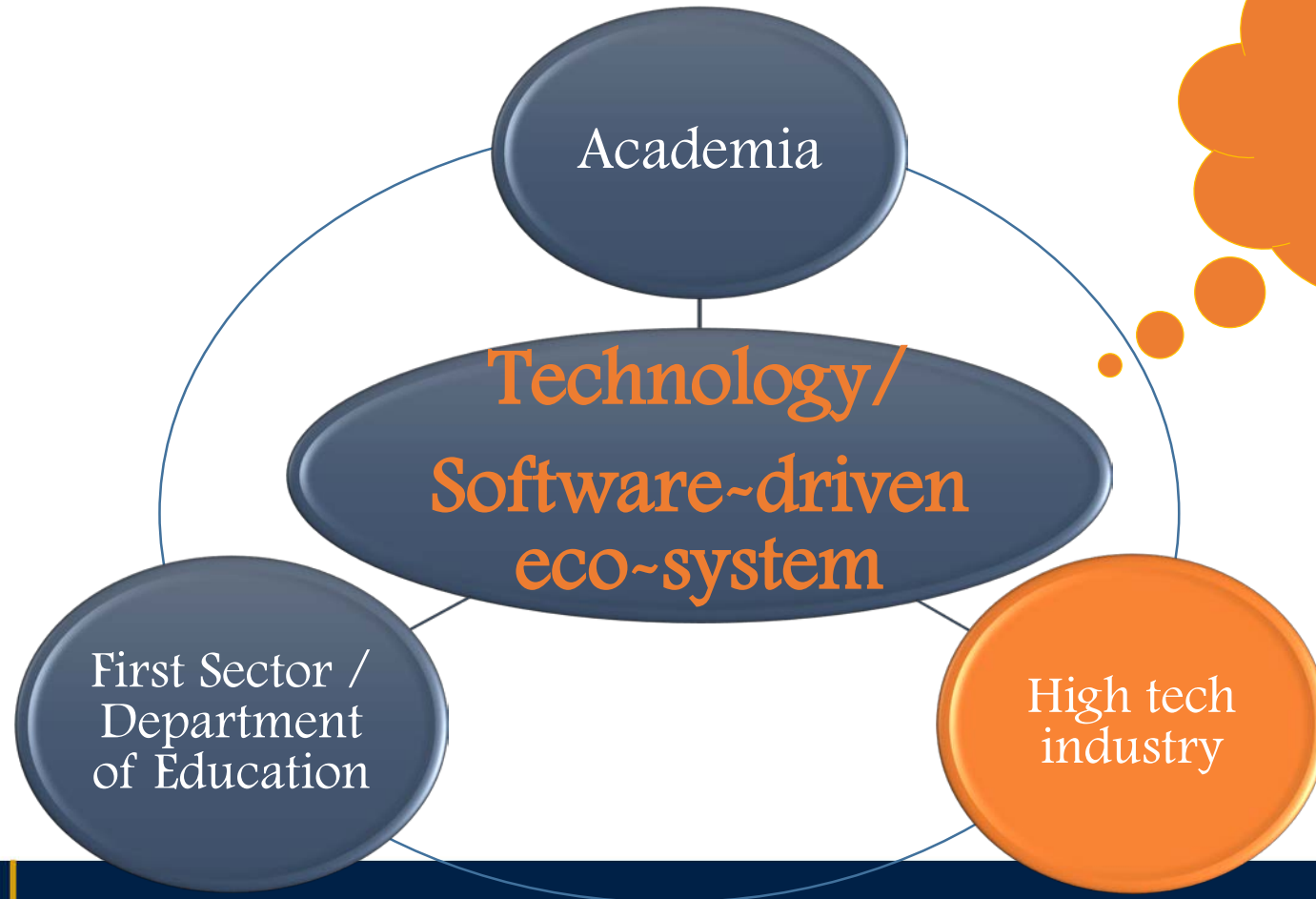
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A project of
Indiana University & New York University



NYC Eco-System of Technology



The case of
Computer
Science

THE POWER OF ENTREPRENEUR NETWORKS



How New York City Became the
Role Model for Other Urban Tech Hubs

superseded even Boston's by many measures to become the largest standalone urban tech hub in the United States.⁸

► **POISED FOR GREATER GROWTH.**

Between 2010 and 2013, the number of New York City tech employees grew by more than 26% annually.⁹ At this rate, based on 2013 tax rates and a \$100,000 average salary, the city could add nearly \$160 million annually in new tech employee income tax receipts by 2019 and over \$500 million by 2024.¹⁰ Assuming each of these new employees uses 100 square feet of office space, tech companies would need almost 450,000 square feet of additional office space annually by 2019 and 1.4 million square feet by 2024 to accommodate them, providing real benefit to industries beyond the tech sector.

used to attract neighboring suburbs are only useful to other cities that have world-class innovation hubs next door.

New York City's tech sector is a better role model for other cities. The city's tech sector has emerged in just decades, with many of its new companies using existing infrastructure and industries like advertising, media, and fashion platforms for growth. This approach allowed the city to set aside the uncertainty that it will birth the next corner chip, and instead focus on making media companies social and its advertising companies digital. By looking at its strengths, New York City has overcome the constraints facing post-industrial cities worldwide to accumulate the talent and capital at the core of its thriving urban tech sector.

%.⁷ New York City's tech sector has exceeded even Boston's by many measures to become the largest standalone tech hub in the United States.⁸

ROAD FOR GREATER GROWTH.

In 2010 and 2013, the number of New York City tech employees grew by more than 26% annually.⁹ At this rate, with 2013 tax rates and a \$100,000 average salary, the city could add nearly 1 million annually in new tech employees and increase tax receipts by 2019 and over 1 billion by 2024.¹⁰ Assuming each of these new employees uses 100 square feet of office space, tech companies would need almost 450,000 square feet of additional office space annually by 2019 and 1.8 million square feet by 2024 to accommodate them, providing real benefit to the city and beyond the tech sector.

Importantly, the strategies San Francisco used to attract neighboring suburban firms are only useful to other cities that have world-class innovation hubs next door.

New York City's tech sector is a much better role model for other cities. The city's tech sector has emerged in just two decades, with many of its new companies using existing infrastructure and industries like advertising, media, and fashion as platforms for growth. This approach has allowed the city to set aside the unlikely chance that it will birth the next computer chip, and instead focus on making its media companies social and its advertising companies digital. By looking at its own strengths, New York City has overcome the constraints facing post-industrial cities worldwide to accumulate the talent and capital at the core of its thriving urban tech sector.



Vs.
Silicon
Valley



New York City's Growing High-Tech Industry

Thomas P. DiNapoli
New York State Comptroller

More about the NYC Hi-Tech industry

Kenneth B. Bleiwas
Deputy Comptroller

Report 2-2015

April 2014

Highlights

- Nearly 7,000 high-tech companies in New York City provided more than 100,000 jobs during the third quarter of 2013, approaching the industry's record level of employment before the dot-com crash of 2000-2001.
- Job growth in the high-tech industry (33 percent) has been four times faster than the rate in the rest of the City's economy (8 percent) during the current economic recovery.
- The New York State Common Retirement Fund invested \$122.8 million in tech-related companies in New York City between 2007 and 2013, earning solid returns for the Fund while helping to create more than 1,300 new jobs.
- The high-tech industry in New York City is building synergies with other industries in the City's economy, helping to stimulate job growth. For example, job growth in advertising and public relations has grown by 25 percent in recent years.
- The average annual salary for workers in the high-tech industry was \$118,600 in 2012, compared to an average of \$79,500 for all other jobs in New York City (\$65,400 excluding the securities industry).
- By some estimates, there are as many as 150,000

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Silicon Alley

From Wikipedia, the free encyclopedia

Silicon Alley, centered in Manhattan, has evolved into a metonym for the sphere encompassing the New York City metropolitan region's high tech industries in information media, telecommunications, digital media, software development, biotechnology, game design, financial technology that are supported by the area's entrepreneurship ecosystem and venture capital

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Languages

The Flatiron District was the cradle of Silicon Alley, a metonymous for the New York metropolitan area's high-tech sector, which has since expanded beyond the city's boundaries.

...the vicinity of the Flatiron District, which has since expanded beyond the city's boundaries. It has also been called the Flatiron District, as well as New York City's 'Silicon Alley' or 'Silicon Alley'.

...y dubbed technical hub in downtown Manhattan; in an effort to attract investors, job ads with the Silicon Alley label. "Subject: NYC - SILICON 'ALLEY' POSITIONS."

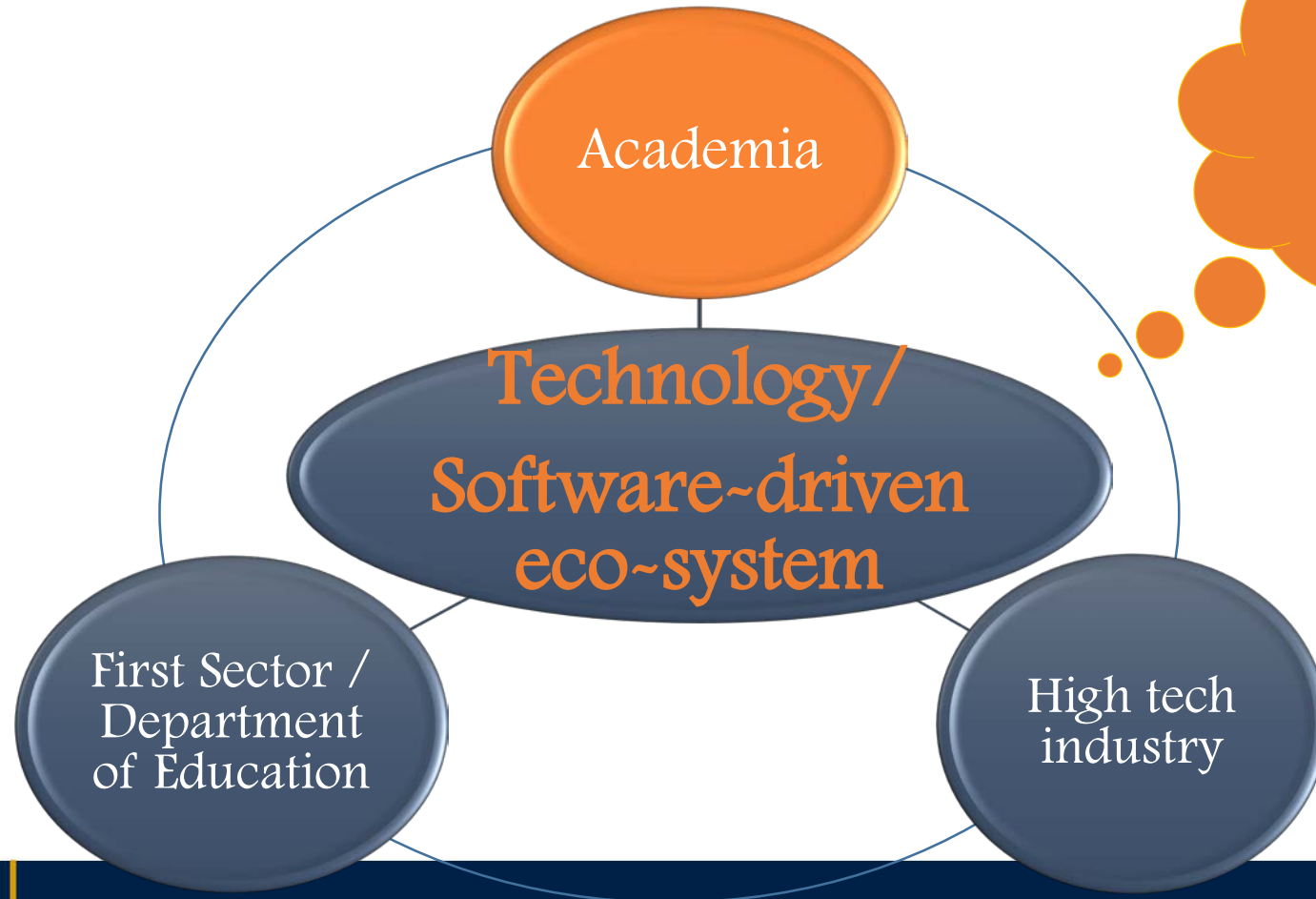
...kas. The first magazine to focus on venture capital opportunities in New York City was off from her @The Scene column with @NY and created...

Silicon Alley, centered in Manhattan, has evolved into a metonym for the sphere encompassing the New York City metropolitan region's high tech industries. High technology startup companies and employment are growing in New York City and across the metropolitan region, bolstered by the city's emergence as a global node of creativity and entrepreneurship, social tolerance, and environmental sustainability, as well as New York's position as the leading Internet hub and telecommunications center in North America.



The Flatiron District was the cradle of Silicon Alley, a metonymous for the New York metropolitan area's high-tech sector, which has since expanded beyond the city's boundaries.

NYC Eco-System of Technology



The case of
Computer
Science

Bloomberg's speech on July 19, 2011

- Bloomberg's plan to enable NYC to compete with Silicon Valley in 2011:
 - "We understand that we will not catch up to Silicon Valley overnight. **Building a state-of-the-art campus will take years - and attracting a critical mass of technology entrepreneurs will take even longer.** But - as with everything we have done - we are taking the long view. **We estimate that in its first 30 years, an applied science campus could spin-off some 400 new companies and create more than 7,000 construction jobs and more than 22,000 permanent jobs.**"

Changes in the role of higher education

- **MOOCs:** Emerged as a popular mode of learning in **2012**
- **Un-College:** A social movement that aims to change the notion that going to college is the only path to success; Founded in **2011**
- **Ivory tower, 2014:** A documentary film that questions the value of higher education in an era when the price of college has increased more than any other service in the US. It argues that the high cost of tuition is at a breaking point.



Additional Activates @ Technion Related to the Tech Eco-system

- **MABATIM - *Views* program**
 - Full study scholarship; no commitment
 - Additional Technion degree with teaching certificate in STEM
 - 36 credits (~MBA)
 - 2 years – 4 semesters
 - One day / 2 half-days
 - Launched – 2011
 - 100 Technion graduates each year
 - 3/4 of the UG students in our faculty are *Views* students (=Technion graduates)
- **MBA for school principals with science @ technology background**
 - collaboration with the Faculty of the Technion Industrial Engineering and Management

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1. With Diane Levitt: *TechEDGE in Israel and New York City: Higher Education's Role in Equity in the Tech Sector*

RESPECT 2016: Research on Equity and Sustained Participation in Engineering, Computing, and Technology

TechEDGE - Economic Development and Growth in the Tech Ecosystem

Higher education has a unique opportunity to act as a **convener** to build the robust multi-sector community needed to drive the **TechEDGE**.

My Work Here

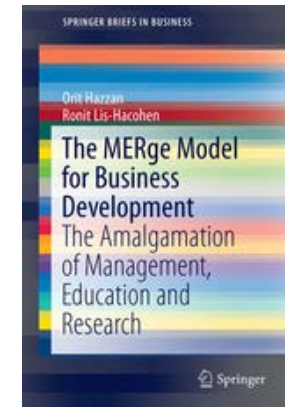
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1. TechEdge (with Diane Levitt)

2. With Deborah Estrin, J McLoughlin, Greg Pass:

Examination of the MEng in CS program by the MERge model

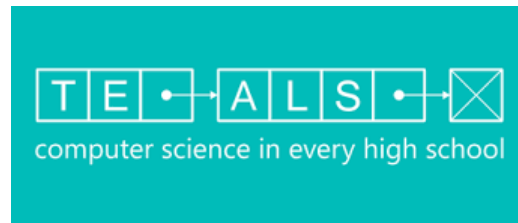


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ScriptEd >_



3. Tech volunteers – connecting
industry academia DoE



Thank you

Relevant references will be gladly shared.

Please email me oritha@technion.ac.il .