# THE HISTORY AND IMPACT OF UNIT 8200 ON ISRAELI HI-TECH ENTREPRENEURSHIP

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# Abstract

This thesis examines the Israeli Defense Force (IDF) military intelligence Unit 8200 and its propensity for producing successful high-tech entrepreneurs. The paper begins with a historical background of Unit 8200 and a description of its current state. It then introduces Entrepreneurial Orientation (EO) as a conceptual framework for analysis. To assess the EO of Unit 8200 alumni, three methods are utilized: semi-structured interviews with members of Israel's startup community supplemented by relevant media reports, computer-aided-textual-analysis (CATA) of Initial Public Offering (IPO) prospectuses from firms founded by Unit alumni, and financial ratio analysis of those same firms. The results show that these companies have a higher propensity for *autonomy*, *risk-taking*, and *innovativeness* than industry peers. It also showed a negative propensity for *proactiveness*.

## Acknowledgements

Foremost, I would like to thank my advisor, Dr. Ikenna Uzuegbunam, for his continued support and insights over the past year and a half. His guidance has been an invaluable asset to my research and the main catalyst for my academic progress this year. Our weekly meetings consistently furthered my understanding of business, entrepreneurship, and academic writing. I could not have asked for a better advisor.

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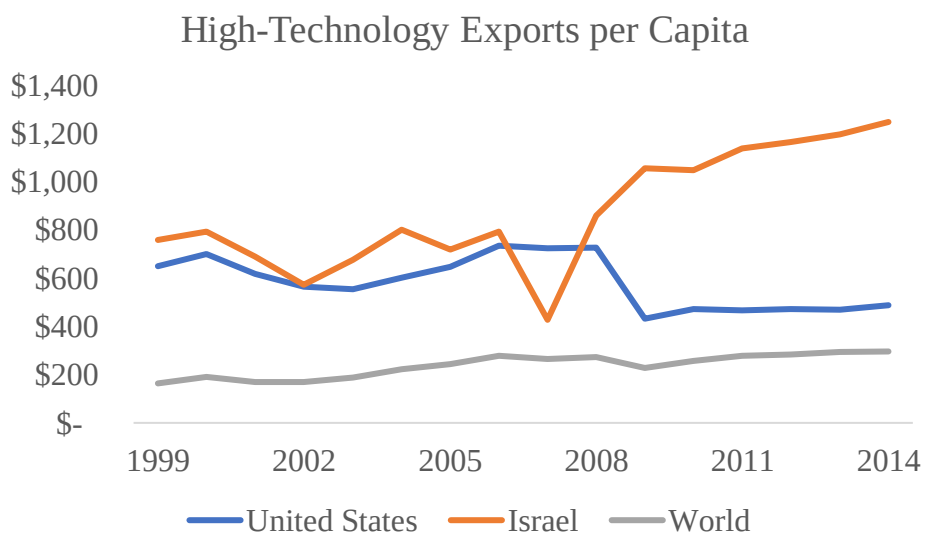
*"Immigrants are not averse to starting over. They are, by definition, risk takers. A nation of immigrants is a nation of entrepreneurs."*

*-Gidi Grinstein*

# Introduction

Today, Israel is home to one of the world's most thriving technology entrepreneurship ecosystems. Seventy-six Israeli companies are currently traded on the NASDAQ, behind only the United States and China. Israel exports $1,246 worth of hi-tech goods and services per capita compared to $488 for the U.S. and $295 for the rest of the world (The World Bank, 2016), see Figure 1. Israelis receive more than three times the venture capital funding per capita than the United States and almost ten times that of the United Kingdom (The World Bank, 2016).

**Figure 1: A Comparison of High-Technology Exports Per Capita**[1]

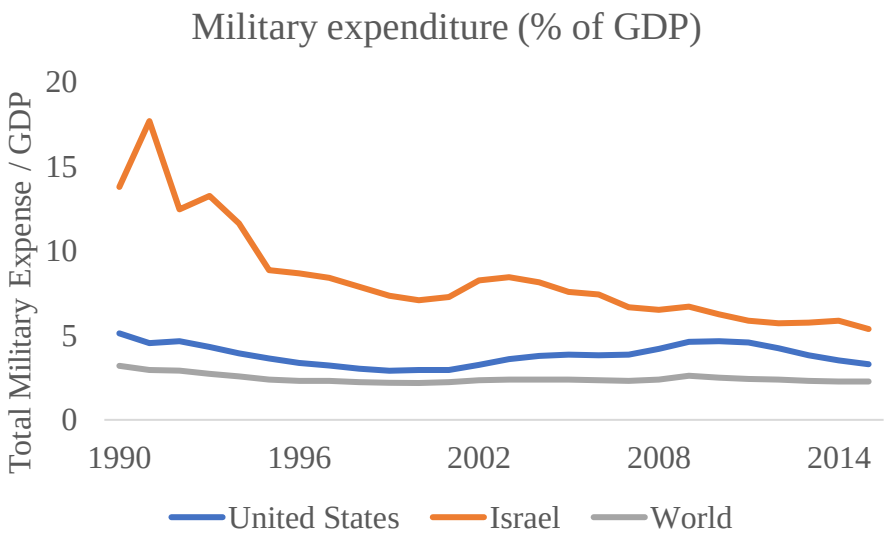



Dan Senor and Saul Singer outline several theories that explain Israel's marked technological success in their 2009 book, *Start-Up Nation: The Story of Israel's Economic*

[1]Data from The World Bank (2017)

*Miracle*. According to their analysis, the reasons for Israel's technological success include Israeli culture, the diversity of the country's people, the mandatory military service and the constant state of threat that consumes the lives of many Israelis (Senor & Singer, 2009). While it is likely a confluence of these factors, combined with government curation of a technology ecosystem, this paper will focus on one specific part of the Israeli technology ecosystem, the military. Specifically, this study focuses on the Israeli Defense Force (IDF) Unit 8200, and how it impacts the economic development of the nation.

**Figure 2: A Comparison between Military Expenditure as % of GDP**[2]




Unit 8200 is an elite military signals intelligence (SIGINT) unit in the Israeli Defense Force (IDF). It is widely considered one of the best military intelligence agencies in the world, on par with the United States' National Security Agency (NSA) (Kahana, 2006). The Unit is responsible for collecting intelligence from electronic signals and other communication systems used by foreign and domestic targets. This data is then used by Military Intelligence (MI) to assess potential threats to Israeli national security.

[2] Data from The World Bank (2017)

To effectively gather and decode this data, Unit 8200 must keep pace with and advance signals collection and encryption technology. This elite Unit recruits Israel's most promising young talent and provides them with advanced technological training that proves exceedingly beneficial in post-military careers. Many Unit alumni enter Israel's thriving, high-tech community with the experience, skills, network, and reputation to start or join entrepreneurial ventures.

Companies such as CheckPoint Systems inventor of the internet firewall, Palo Alto Networks, valued at over $14 billion, CyberArk, valued at almost $2 billion, and many more multibillion dollar companies were founded by former members of Unit 8200. The success of Unit alumni is undeniable, but why has this Unit been so successful in producing successful technology entrepreneurs? Though I expect that there are several factors that contribute to the entrepreneurial success of Unit 8200 alumni, my main thesis is that the unique Unit 8200 organizational culture, uniquely rooted in the Unit's history has been the most consequential, in this regard. Table 1 below describes some examples of notable Israeli companies founded by former members of Unit 8200.

**Table 1: Examples of Notable Israeli Companies (Source: Company Descriptions via FactSet**

| Company Name | April 2017 Market Cap (in millions) | Founder's Biography[3] |
|---|---|---|
| Palo Alto Networks, Inc. | $10,370.62 | **Nir Zuk:** Co-Founder, Chief Technology Officer and Director of Palo Alto Networks, Inc., since March 2005. He is a successful serial entrepreneur and a network security expert. Mr. Zuk has been affiliated with NetScreen Technologies, OneSecure, Check Point Software, Sumo Logic and Silicom Venture. He also architected and led the development of many products, including Check Point's flagship product, Firewall-1 versions 2.x and 3.x, as well as market leading VPN-1 product. He was a member of elite military intelligence Unit 8200, while in the IDF. He studied Mathematics at Tel Aviv University |
| CyberArk Software Ltd. | $1,751.10 | **Udi Mokady:** Co-Founded Cyber-Ark Software, Inc. in 1999, has been its Chairman of the Board since June 30, 2016 and serves as its Chief Executive Officer and President. He served in a military intelligence unit in the Israel Defense Forces. Mr. Mokady holds a Bachelor of Laws (LL.B.) from Hebrew University in Jerusalem, Israel and a Master of Science Management (MSM) from Boston University in Massachusetts. |
| Imperva, Inc. | $1,370.86 | **Amichai Shulman:** Co-founder of Imperva Inc. and has been its Chief Technology Officer since May 2000. He also served for eight years in various research and command positions in the Israel |

[3] Abbreviated biographies from Bloomberg Company Profiles

| | | |
|---|---|---|
| | | Defense forces. There he lead a number of data processing and command and control projects related to information security and later lead a team of information security research responsible for identifying new potential attack techniques and designing a mitigation pattern for them. Mr. Shulman earned a B.Sc. and M.Sc degrees in Computer Science from the Technion, Israel Institute of Technology. |
| Check Point Software Technologies Ltd. | $17,955.44 | **Gil Shwed:** Co-founder of Check Point Software Technologies Ltd. Mr. Shwed has received numerous prestigious accolades for his individual achievements and industry contributions, including an honorary Doctor of Science from the Technion - Israel Institute of Technology, the World Economic Forum's Global Leader for Tomorrow for his commitment to public affairs and leadership in areas beyond immediate professional interests and the Academy of Achievement's Golden Plate Award for his innovative contribution to business and technology. |
| Radware Ltd. | $707.08 | **Roy Zisapel:** Co-founder of Radware Ltd. and has been its Chief Executive Officer and President and a Director since May 1996. He was a team leader of research and development projects for RND Networks Ltd from February 1996 to March 1997. He was employed as a software engineer for unaffiliated companies in Israel from July 1994 to February 1996. He serves as a Director of Infogate On Line Ltd. Mr. Zisapel has a B.Sc. degree in mathematics and computer science from Tel-Aviv University. |

This paper examines the entrepreneurial culture that exists in Unit 8200 and places it in the context of existing entrepreneurial frameworks. The research relies on interviews with individuals that work in the Israeli entrepreneurial community, financial data from companies that were founded and have been led by Unit 8200 alumni, and from initial public offering (IPO) prospectuses that are analyzed using Computer Automated Textual Analysis (CATA) method.

To understand how Unit 8200 has become known around the world for producing top-tier entrepreneurial talent, it is important to examine its historical roots. This brief historical section outlines the major events and transformations that led to Unit 8200's current state. It concludes with an in-depth description, using secondary source interview data, of the current Unit 8200 culture.

## Historical Background

Unit 8200's history and the technology ecosystem is intertwined with the establishment of Israel itself. The country was founded in 1948 by members of the Jewish diaspora who sought a new life, a new opportunity, free from oppression in an independent Jewish state. These early founders left their homes across Europe to attempt to build a nation where Jewish people would be in the majority, rather than the consistently oppressed

and persecuted minority (Gratch, 2015). These early nation-builders were essentially entrepreneurs, except instead of building a company, they were building a nation (Senor & Singer, 2009).

To understand any Israeli culture attribute, one must know its origins. Israel was founded based upon the idea of Zionism. Zionism is defined by the Jewish Virtual Library as "the national movement for the return of the Jewish people to their homeland and the resumption of Jewish sovereignty in the Land of Israel" (Jewish Virtual Library, 2017). Zionism is inherently entrepreneurial. Israel is the "result of a conscious effort to build from scratch a modern reincarnation of an ancient nation-state" (Senor & Singer, 2009).

Gidi Grinstein, the founder of the Reut Institute, a Jewish think-tank based in Tel Aviv, notes "Immigrants are not averse to starting over. They are, by definition, risk takers. A nation of immigrants is a nation of entrepreneurs" (Grinstein, 2013). Roberts et al (2007) define entrepreneurship as "the pursuit of opportunity without regard to resources currently controlled" (Roberts, Stevenson, Sahlman, Marshall, & Hamermesh, 2007). Entrepreneurship is fundamental to Israeli existence and economic growth.

As with any entrepreneurial venture, there were risks. Unlike most start-ups, building a nation requires risking much more than capital or reputation; it involved risking lives to bring the Zionist vision into reality. Many Jews around the world were skeptical at the prospects of creating an entirely new nation in a desert, from nothing. Alon Gratch writes, "most Jews at the time didn't seem to oppose Zionism, they remained indifferent to it, viewing it as fantastic and impractical. Whenever they felt they had a choice, the vast majority of Jews preferred to stay in the Diaspora rather than move to the ancient

homeland" (Shindler, 2008). The rise of Hitler and ever increasing anti-Semitism around the world took away the option to stay in Europe for many Jews.

Theodor Herzl, the founder of modern Zionism, famously said, "If you will it, it is no dream." The attitude of these early Zionists still exists in modern Israeli society, and the nation's entrepreneurial beginnings have had a lasting impact on the nation's culture. Unit 8200, and its precursors, embodied this entrepreneurial spirit in order to ensure the safety of the country and stimulate modern economic development. This entrepreneurial spirit continues to drive innovation and has turned Israel into one of the most technologically advanced countries in the world.

Due to the secrecy of the Unit's work, many details about its origin and its involvement in Israeli affairs throughout its history remain unclear. Everything described in this paper is aimed at examining the origin of the cultural attributes of the modern-day Unit. Numbers and dates should be taken with some skepticism, but I hope the reader you will identify some general themes that will provide insight into its current position within the technological world.

**Pre-Independence Unit 8200 History**

Precursors to Unit 8200 predate the official founding of Israel in 1948. Arguably the first modern Jewish intelligence unit was the Netzah Yisrael Lo Yeshaker (NILI). In November of 1915, NILI, meaning "The Eternal One of Israel will not lie", was formed in Turkish controlled Palestine. The NILI served as a pro-British, clandestine spy agency and was created by Aharon Aaronsohn, a world-renowned agronomist, and several of his siblings (Florence, 2007).

At the outbreak of World War I, the Turks began to slaughter Armenians and deport Jews. This Turkish oppression led to Jewish famine and suffering in Palestine. Aaronsohn and his siblings hoped that the creation of NILI would aid the British invasion of Palestine and ease the Jewish suffering (Florence, 2007).

The NILI "spy-ring" collected intelligence under the guise of Aaronsohn's agricultural business. The spies provided valuable information to British officers on frigates, British warships, using signal lights off the Atlit coast. The information included inland weather patterns, Turkish formations and troop movements, railroads, and potential routes that the British could use in an invasion. This information proved valuable, but came at a cost to the original spy-ring as most of its original members were arrested and sentenced to death (Goldstone, 2007).

As anti-Semitism grew stronger in the run up to World War II, so did the Zionist movement. In 1920, the Haganah, an underground militia that later became the IDF, was formed to protect Jews under Ottoman rule. After the Ottomans were defeated, the British took control in Palestine. In 1929, a group of Jews in the Haganah formed the Shin Mem 2, which bugged Arab phone lines to gather intelligence about forthcoming riots over the disputed Western Wall in Jerusalem. This was the first instance of signals intelligence in what would become the State of Israel (Perman, 2004).

The 1929 Arab riots in Palestine, or the Buraq Uprising, resulted in the deaths of 133 Jews and 110 Arabs (Shindler, 2008). Most of the causalities were inflicted by British police trying to quell the riots. The Arab population was concerned with the influx of Jews resulting from the Zionist movement and the mounting anti-Semitism sweeping across Europe. The Jewish population realized they could no longer rely on British rule to protect

them. These violent riots fundamentally changed Haganah's importance in Palestine (Kahana, 2006).

The Haganah became a large organization that encompassed almost all the youth and adults in the existing settlements, as well as thousands from the major Palestinian cities. It began a comprehensive training program for its new members and ran officer training courses. It established arm depots, which were filled with light arms that flowed from Europe. It also gave rise to underground arm production facilities throughout Palestine (Friedman, 1997).

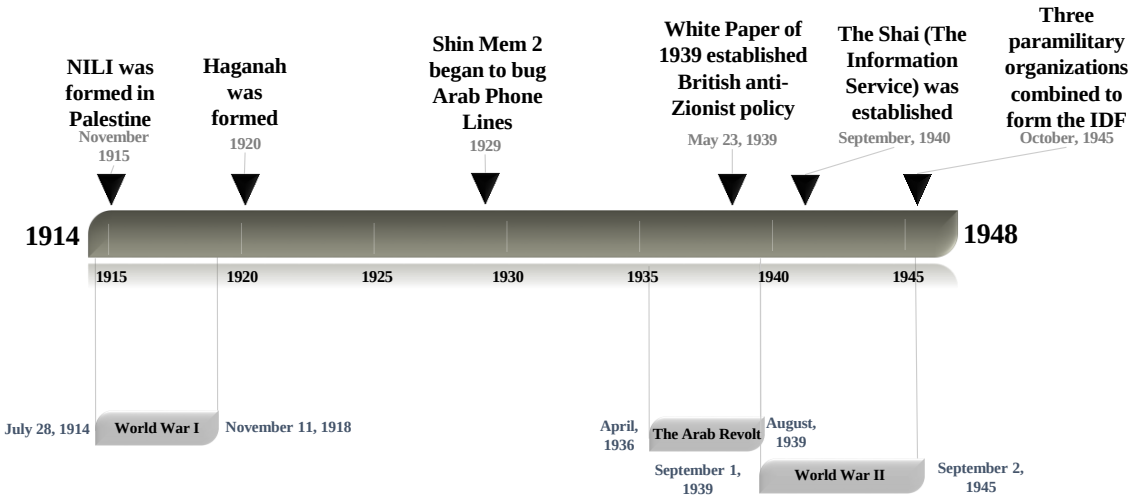
The Arab Revolt, 1936-1939, led the Haganah to further mature from a militia to a military force. The British administration did not officially recognize the Haganah, but the British Security Forces cooperated with the "Jewish Settlement Police," which was comprised of Haganah forces. Special Night Squads (S.N.S.), part of the Jewish Settlement Police, were established under the command of a British Intelligence officer named Orde Wingate. The S.N.S. protected the Jewish population from frequent Arab rioters that were regularly attacking Jewish and British forces. Wingate utilized intelligence gathered by the Haganah to organize preemptive, night raids on Arab forces (Shindler, 2008).

While working with the British against Arab attacks in Palestine, the Haganah formed the Mossad Le' Aliyah Beth (Mossad) to undermine the official British, anti-Zionist policy that was established in the White Paper of 1939. The Mossad Le' Aliyah Beth organized illegal Jewish immigration from all over Europe into Palestine. As World War II began, the Haganah formed voluntary units to fight alongside British forces. It also worked closely with British intelligence units on various commando missions throughout the Middle East (Shindler, 2008).

In June of 1940, Shaul Avigur, a leader in the Mossad Le' Aliyah Beth, sent a memorandum to the Haganah commanders proposing a joint countrywide information service. This proposal went into effect in September of 1940, and the Sheruth Yedioth, commonly known as Shai (The Information Service) was officially established. The British government, provided weapons, funding, and training from MI4, a department of the British Directorate of Military Intelligence responsible for aerial reconnaissance and interpretation (Kahana, 2006).

At the end of World War II, the continued British anti-Zionist policy prompted an open, organized struggle against the British Mandatory rule. The unified Jewish Resistance Movement, established in October, 1945, consisted of the Haganah and two other paramilitary organizations: Irgun Zevai Le'umi – Etzel, and Lohamei Herut Yisrael—Lehi. These would become the Israeli Defense Force (IDF) (Perman, 2004).

**Figure 3: History of Unit 8200 Precursors 1914-1948**




## Israeli Independence and the Founding of the Jewish State

In the spring of 1948, the British Mandate that had ruled Palestine for nearly 30 years came to an end. Passionate Zionists and Arab nationalists continued to fight, and the British were

unable to come up with a solution to solve the conflict. On May 14th, 1948 the British rule ended. At 4:00pm, David Ben-Gurion stood under a photograph of Theodore Herzl and proclaimed,

> *By virtue of our national and intrinsic right and on the strength of the resolution of the United Nations General Assembly, we hereby declare the establishment of a Jewish state in Palestine, which shall be known as the State of Israel* (Ben-Gurion, 1948).

Hours later, Arab armies from Egypt, Syria, Transjordan, Iraq, and Lebanon joined together and invaded the newly founded Israel (Shindler, 2008). From the early hours of Israel's modern birth, its very existence has been challenged. The country lacked infrastructure, manpower, and resources. Early Israelis fought for eight months against the Arab forces and not only defended its U.N. allotted 5,600 square miles, but also gained an additional 2,500 square miles in the Negev desert and Galilee. Over these 8 months, more than 6,000 Israelis were killed, which accounted for more than 1 percent of the global Jewish population (Shindler, 2008).

Israel was able to defeat the Arab forces partially due to the vast intelligence networks that the Haganah had developed throughout the previous decades (Perman, 2004). The Mossad continued to smuggle Jewish immigrants from around Europe to increase the size of its army. These networks were also helpful in smuggling weapons and ammunition to aid in the war effort (Shindler, 2008).

Israel's founding fathers knew that the country must be built upon knowledge, innovation, national pride, cunning, and imagination. One of these founding fathers was

David Ben-Gurion, the man who declared Israel's existence and became the nation's first Prime Minister (Perman, 2004).

David Ben-Gurion was twenty years old when he emigrated from Poland in 1906 to Petach Tikva, a Jewish community bordering modern day Tel Aviv. A lawyer by training, he was the national architect of modern Israel. His strength was his ability to organize, plan, and execute those plans. He was what Israeli's call a *bitzu'ist* (Senor & Singer, 2009).

A *bitzu'ist* is essentially someone who "gets things done." Leon Wieseltier, a Jewish writer and philosopher, writes

> *The bitzu'ist is the builder, the irrigator, the pilot, the gunrunner, the settler. Israeli's recognize the social type: crusty, resourceful, impatient, sardonic, effective, not much in the need of thought but not much in the need of sleep either* (Wieseltier, 1985).

This characteristic is prized in Israeli culture and was necessary for the survival of early Israel. After its independence, early Israelis began to build a country surrounded by enemy's who deny Israel's right to exist and frequently attack the new nation.

**Post-Independence Unit 8200**

Unit 8200 began as a collection of pre-independence intelligence and signals gathering groups that honed their technological skills on British and Arab adversaries. After independence in 1948, the Israeli military, now called the IDF, set up an electronic warfare unit in a green villa that was formerly inhabited by an Arab sheik in the old port town of Jaffa, just south of Tel Aviv. The group was given the codename "Rabbit" and put in charge of breaking codes and intercepting Arab communications. During this time, very few

countries possessed any ability to intercept and break codes. The U.S., U.K., and the Soviet Union were among the few countries with this ability (Perman, 2004).

This technological ability was not purchased from any other country, but rather developed by early Israeli computer engineers, some of whom had recently emigrated from the Soviet Union (Shamir, 2005). The Unit had some unique restraints that did not exist in the other technologically advanced countries, which included a lack technical experience, technological institutions, funds, and manpower. To compensate for these deficiencies, members of the Unit resorted to crude, albeit effective, techniques to monitor Arab communications. These techniques included stringing up an antenna made of metal wire between two poles, connected to an old Hallicrafter's S-38, a popular civilian radio in the 1930's and 40's. In 1949, the Unit developed a more sophisticated monitoring systems based on stolen BBC plans (Perman, 2004).

The Unit's scrappiness derived from necessity. Constant Arab guerilla attacks through the 1950's and 1960's provided ample incentive to gain a competitive edge over their enemies (Gewirtz, 2016). To ensure the security of their new nation, the military needed to know what their Arab neighbors were up to. This scrappiness and unwillingness to let their circumstance get in the way of their mission can be best described in Hebrew as *davka* (Gratch, 2015). *Davka* is hard to translate into English, but it can most accurately be described as "'despite' with a 'rub their nose in it' twist" (Senor & Singer, 2009). The Unit embodied this *davka* in its infancy and has kept that attitude through today (Perman, 2004).

In 1950, Unit 8200 was given a $15,000 budget and an additional $110,000 for electronic purchases abroad (Perman, 2004). This amount in 2016 USD amounts to around $1.25 million, which is a miniscule amount when trying to purchase the most advanced

computer systems in the 1950's. Partially due to the low budget and partially to maintain secrecy of its intelligence capabilities, the Unit developed most of its technology in-house (Perman, 2004).

From its beginning, Unit 8200 has developed its own hardware and software with few people and limited resources. Yair Cohen, former Unit 8200 commander during the 1980's, commented in a 2016 Forbes interview that when given a complex task "you need $300 million, but you only have $3 million. You cannot get ten people, you only have three people" (Behar, 2016). It is in these situations that are all too common for Unit 8200 missions that the *bitzua* attitude is essential.

In the early 1950's, the Unit had spread its listening bases out across Israel. The listening posts still contained unsophisticated equipment manned by inexperienced, albeit motivated and intelligent soldiers (Perman, 2004).

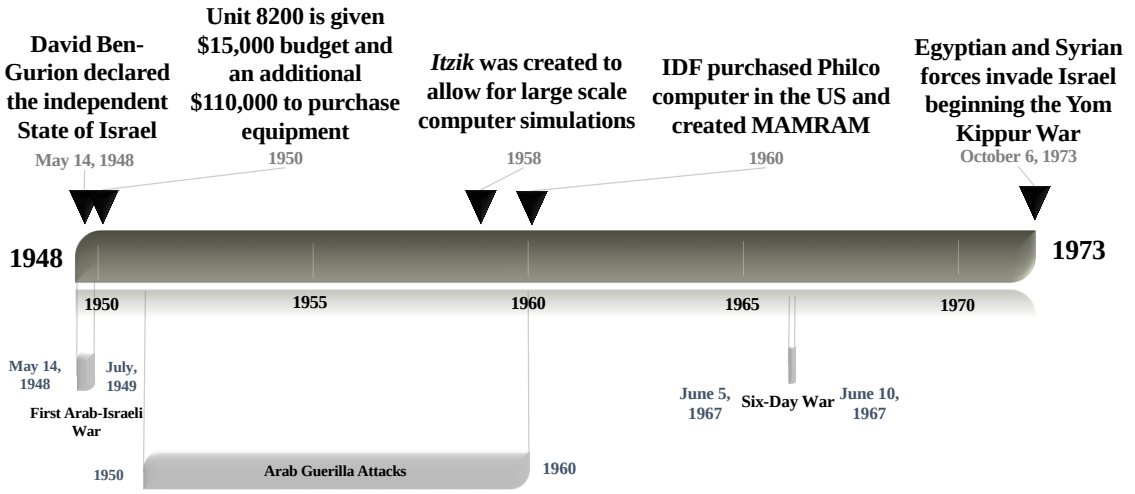
By 1959, the Unit gained access to more advanced computing technology. While much of the early Israeli computing research was conducted at the Weitzman Institute of Science, the military saw its potential and took over much of the early research. RAFAEL (the Hebrew abbreviation for Armament Development Authority) was the IDF unit that conducted much of the Israeli high-tech R&D in early computing. In 1956, RAFAEL developed one of the first analog computers in Israel. By 1958, this unit had created a computer called *Itzik* which allowed for large-scale simulations. By 1959, all the branches of the IDF, including Unit 8200, wanted access to this new technology (Breznitz, 2002).

In 1960, the IDF purchased a Philco computer in the United States and created "The Center for Computers and Mechanized Records" known as MAMRAM. Access to computers nudged Unit 8200 closer to its more modern reputation of hackers and complex

code breakers. The IDF utilized this computing power during the Six-Day War in 1967 when it was able to intercept and decipher the Egyptian and Syrian air force communications allowing for the smaller, less sophisticated Israeli air force to outmaneuver and control the airspace (Perman, 2004).

The successful, simultaneous defeat of Egyptian, Syrian, and Jordanian forces in a mere six-day campaign that substantially increased Israel's territory gave Israelis a sense of invincibility (Senor & Singer, 2009). This overconfidence extended to the Israeli Intelligence Corp and Unit 8200.

**Figure 4: Unit 8200 History 1948-1973**




## Yom Kippur War

On Yom Kippur[4] in 1973, Egyptian and Syrian forces poured over the Israeli border and killed 2,800 Israelis and injured more than 9,000 (Shindler, 2008). Israeli intelligence was completely surprised by this massive attack. They were only able to provide several hours of warning to the rest of the military, which was not enough time to mobilize an immediate

[4] Yom Kippur, or Day of Atonement, is one of the most important Jewish holidays. On this day, observant Jews will refrain from work, fast, and attend synagogue. The day is meant to atone from sins between man and God (Jewish Virtual Library, 2017).

defense. While Israel emerged from the eighteen-day war victorious, economic losses reached an estimated $7 billion (Sachar, 1994).

The Agranat Commission was created to investigate what caused this intelligence failure. The final diagnosis was two-fold. The first problem stemmed from the overconfidence brought about by the successful Six-Day War seven years earlier. It was called "the conception." Per this idea, Egypt "a) would not launch war against Israel before she had first ensured sufficient air power to attack Israel in depth, and in particular Israel's principal airfields, so as to paralyze the Israeli air force, b) that Syria would only launch an all-out attack on Israel simultaneously with Egypt" (Agranat Commission of Inquiry, 1974). Essentially, the commission concluded that this intelligence failure was based upon the false assumption that Egypt would not attack Israel at the time.

The second problem is tangentially related to the first. Some managing officers had dismissed early warning signs from lower-level soldiers that could have been used to initiate a much quicker response.

This intelligence failure goes against two core Israeli cultural values: *Rosh Gadol* and *Chutzpah*. *Rosh Gadol* literally translates to "big head", but to Israelis it has a more positive connotation "signaling that the bearer of this head is capable of seeing the big picture, of taking responsibility and initiative, or demonstrating leadership, and going beyond the job description of the call of duty" (Kordova, 2012). It also connotes a certain distaste for formal authority and places more responsibility on an individual rather than a system (Perman, 2004). Members of the Israeli intelligence community failed to see that one of their underlying assumptions was incorrect. All the analysis that occurred after this base assumption was therefore rendered useless (Gewirtz, 2016).

Rank and file soldiers also failed to make their findings heard, which goes against a second Israeli value of *Chutzpah. Chutzpah* most closely means audacity. Leo Rosten describes *chutzpah* as "gall, brazen nerve, effrontery, incredible 'guts,' presumption plus arrogance such as no other word and no other language can do justice to" (Rosten, 1968). More c*hutzpah* could very well have prevented this attack from being as devastating as it was (Perman, 2004).

Upon the publication of the Agranat Commission report, the head of Israeli intelligence and the Prime Minister of Israel were both forced to resign, and sweeping changes were made to the intelligence system. A new unit was established under Military Intelligence called *Ipkha Mistabra*, or "Devil's Advocate." This unit was created to provide alternative explanations to intelligence reports from the main Military Intelligence establishment. Organizationally, it countered the groupthink that contributed to the intelligence failure (Kahana, 2006).

The fiasco of the Yom Kippur War left an indelible mark on the culture of Unit 8200 and the rest of the IDF. While questioning of authority was tolerated to a certain extent prior to the war, it became expected after. The invincibility that the Israelis had after the Six-Day War was also gone.

**Table 1: List of Israeli Cultural Terms**

| Term | Definition |
|---|---|
| *Davka* | "'despite' with a 'rub their nose in it' twist"<br>- (Senor & Singer, 2009) |
| *Bitzua* | "gets things done" - (Senor & Singer, 2009)<br>"crusty, resourceful, impatient, sardonic, effective" - (Wieseltier, 1985) |
| *Chutzpah* | "audacity" - (Senor & Singer, 2009)<br>"gall, brazen nerve, effrontery, incredible guts" - (Rosten, 1968) |
| *Rosh Gadol* | "signaling that the bearer of this head is capable of seeing the big picture, of taking responsibility and initiative, or demonstrating leadership, and going beyond the job description of the call of duty" - (Kordova, 2012) |

## Post Yom Kippur War: Modern Unit 8200 Organizational Culture

After the Yom Kippur War in 1973, and the dramatic changes that resulted from the Agranat Commission Report, Unit 8200 began to take on its modern structure and organizational culture (Perman, 2004). In addition to the organizational changes, the Unit has also grown to be the largest, single unit in the IDF (Behar, 2016). The remainder of this section will describe aspects of Unit 8200 as an organization as it relates to the screening, training, motivation, and network.

### *Screening*

Israel has a mandatory military service requirement for most (there are racial and religious exceptions) of its citizens. When an Israeli citizen turns 18 and finishes high school, the men are conscripted for 32 months and the women for 24 months (Central Intelligence Agency, 2017). Elite units, including Unit 8200, require extended time to compensate for additional training.

One of the most cited explanations for the Unit 8200 alumni success is the rigorous screening process that each candidate must go through before being admitted to the Unit (Senor & Singer, 2009). To establish where a candidate would fit in the IDF, each individual is given a *Kaba* score. The *Kaba* score is comprised for three parts for men and two parts for women (IDF, 2016). The three sections are the DAPAR, the TZADAK, and the TZHAR. In conjunction, these tests are used to evaluate and place young israeli's into the various IDF units.

The *DAPAR* is the psychometric test that is administered in the initial interview with IDF. It makes up 50 percent of a male's score and 60 percent of a female's score. These tests are similar to the SAT or ACT require for admission to most American colleges

(The College Board, 2016). It is divided up into math, reading comprehension, instructions, word analogies, and shape analogies.

The *TZADAK* is the initial interview that includes a physical and mental assessment. This will consist of data verification, i.e. birthday, education level, etc., a personal interview to assess your motivation to be in a combat unit, and a medical examination. The TZADAK makes up 33 percent of the *Kaba* for males, but does not count toward the female's score.

The last part of the *Kaba* is the *TZHAR*, or the Initial Education Score. This score represents how much formal education a candidate has. It makes up 17 percent of the *Kaba* for men and 40 percent for women (IDF: Nefesh B'Nefesh, 2015).

The *Kaba* is scored on a scale from 41-56. Scores that range from 52-56 allow you to be an officer. Unit 8200 places special emphasis on the DAPAR score and usually only allows candidates who score in the 89$^{th}$ percentile or above to enter (IDF: Nefesh B'Nefesh, 2015). Since the DAPAR makes up such a large percentage of the *Kaba*, Unit 8200 candidates are highly sought after throughout the IDF. Candidates with language, coding, or computer abilities and a desire to join an intelligence unit are therefore more likely to be placed in Unit 8200.

To put in perspective, the percentile equivalent SAT composite score to the Unit 8200 DAPAR requirement would be a 1300 or higher, or a 28 on the ACT (The College Board, 2016). While individuals *Kaba* score are confidential, the minimum score required to enter Unit 8200 is, on a percentile basis, similar to the lower threshold for Ivy League schools. As with collegiate admission, the ultimate decision for admission into Unit 8200 rests with the Unit's recruitment team.

Similar to US-base collegiate recruitment, Unit 8200 invests substantial resources recruiting the top-level talent. One former 8200 recruiter equates the selection process to "NBA scouts tracking kids in high school and college" (Perman, 2004).

In summary, admission into Unit 8200 is highly selective, and because of the exit opportunities it provides, is extremely competitive (Behar, 2016). Inbal Arieli, a Unit alumnus, serial entrepreneur and venture capitalist, explains in a 2016 Forbes interview that, "The Harvard Business School has a great screening process, but it depends on who applies. Unit 8200 can take the top 1 percent of the 1 percent of the country" (Arieli, 2016).

Arieli also points out that the Unit 8200 screening process differs from equivalent spy agencies, i.e. NSA, because it focuses on raw potential rather than previous experience. She contends:

> *The screening process at the NSA largely focuses on experience, but what does a 17- year-old know about intel challenges? Nothing. A high school kid is busy with movies, boys, girls, fashion, sports—that's your world—and you're not busy with terror in Syria or nuclear facilities in Iran, so experience and know-how are not relevant because they don't exist* (Arieli, 2016).

A recruit's lack of experience is not necessarily detrimental. Nadav Zafrir, former commander of Unit 8200 and founder/CEO of Team8, a Tel Aviv-based cyber security think tank, recalls that "every year, Unit 8200 gets this influx of young, smart, motivated and passionate men and women looking at problems from an entirely new perspective. We don't tell them that other people have tried to solve the same problem many times and failed" (Zafrir, 2016).

While a fresh perspective can be helpful, recruits still lack much of the technical prowess that is necessary to do their job well. In order to teach those skills, the Unit has put in place a demanding training program designed to prepare the candidate for real-world situations that have life and death consequences.

*Training*

New Unit 8200 recruits are enrolled in an intensive, six-month training program at a compound in Glilot, just north of Tel Aviv. While much of the specific training methodology is secret, interviews conducted over the past several years give an idea of how the Unit trains its recruits.

One Unit alumni recalls 16 to 18 hour days and because of the classified nature of much of the work, Unit leaders allow for minimal dropouts (Perman, 2004). Behar describes it as, "essentially a boot camp for the mind" (Behar, 2016). Arieli notes that, "[The new recruit] is put into a small team where they study, brainstorm, train, analyze, and solve problems, from early in the morning to very late at night" (Arieli, 2016).

The officers in charge of training are often are only a couple of years older than the new recruits. These officers utilize a teaching approach developed by the IDF's computer training school known as MAMRAM during the 1980's called Planning by Situations (PBS), similar to the case-study approach used by The Harvard Business School (Breznitz, 2002). According to Breznitz, PBS is "a pragmatic holistic approach to the creation and teaching of discrete bodies of processional knowledge." This method focuses on what qualities and skills are necessary for the student to acquire in order to do their job. These qualities and skills are known as "the professional components."

In order to ensure adequate mastery of these *professional components*, instructors form the course around the "summarizing exercise", which is essentially the final project that is designed to mimic the required responsibility of the graduate (Breznitz, 2002). In the case of Unit 8200, instructors often combine technical and intelligence problems. A team of new recruits might, for example, have to build a piece of software that decrypts an enemy transmission, then analyze the transmission and provide a potential course of action (Perman, 2004). After this training, soldiers are placed in different sub-units in 8200. While their individual responsibilities might vary, the fundamentals of their work remain the same.

*Motivation*

Soldiers in Unit 8200 provide the SIGINT necessary for the national security of Israel. The responsibility to protect your country, your friends, and your family provides plenty of motivation to soldiers. In addition to national defense, many Unit 8200 soldiers are motivated by the success of 8200 alumni (Senor & Singer, 2009). Avishai Abrahami, the CEO and co-founder of Wix, Inc. and 8200 alumnus, explains:

> *Just from my generation, there are more than 100 guys from the unit that I personally knew who built startups and sold them for a lot of money. There was a team of ten people in our room in the unit. I call it the magic room because all of them created companies where the average market cap is half-billion dollars.*

With this financial incentive, Unit 8200 soldiers are motivated to learn the technical skills necessary to create the next big company. Since soldiers are aware that they are working

with some of Israel's brightest minds, they are incentivized to build up a network during their time in the Unit (Perman, 2004).

*Network*

In Israel, it is often said that 'everybody knows everybody.' The mandatory military service allows for most Israelis to come together and share a common experience. This common experience is frequently leveraged later for business and other interactions where 'who you know' is important. Because Unit 8200 is a collection of intelligent, technologically advanced soldiers, that network proves to be extremely valuable.

Unlike most units in the IDF, Unit 8200 has a formal, organized alumni organization. The organization is led by 8200 alumni who are prominent in the Israeli entrepreneurial community. With over 14,000 alumni around the world, the network is utilized by companies and individuals for talent acquisition and collaboration (Unit 8200 Alumni Association, 2017).

This network provides quick and easy access to some of the most technologically advanced minds in Israel and around the world. For example, 8200 EISP is an accelerator based in Tel Aviv that leverages the Unit 8200 alumni association connections. It provides early-stage startups access to a workshop led by Unit 8200 alumni, access to the 8200 alumni network for talent recruitment, personal mentoring from current and former 8200 members, and access to the Unit 8200 Alumni Association events for networking purposes (8200 EISP, 2017). These valuable perks have made 8200 EISP one of the most competitive accelerators in Israel (Senor & Singer, 2009).

The next section provides a theoretical background on entrepreneurship with a particular focus on Entrepreneurial Orientation (EO). EO will be used as the conceptual framework for analysis.

# Theoretical Background

To properly examine Unit 8200 as an entrepreneurial phenomenon, we must place it in the broader context of current academic research on entrepreneurship. This section will provide a theoretical background of key concepts and existing frameworks that will help to place my findings in academia. This section will cover the meaning of entrepreneurship from various perspectives and the factors that lead to successful entrepreneurship.

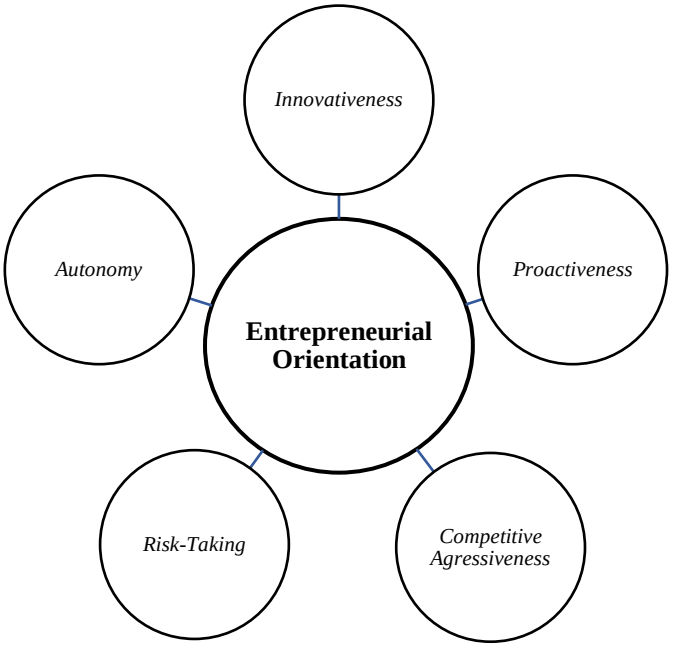
Defining entrepreneurship is a difficult task. The dictionary definition of an entrepreneur is "one who organized, manages, and assumes the risks of a business or enterprise" (Merriam-Webster, 2017). While this definition touches upon some of the responsibilities of an entrepreneur, it fails to give a sufficient definition to further academic study.

### Entrepreneurial Orientation View

Entrepreneurial Orientation (EO) is one of the most established constructs in entrepreneurial research (Wales, 2016). Anderson et al. (2009) provide a broad definition of EO describing it as "a firm's decision-making practices, managerial philosophies, and strategic behaviors that are entrepreneurial in nature" (Anderson, Anderson, Covin, & Slevin, 2009). Historically, these behaviors have been categorized into three dimensions: innovativeness, proactiveness, and risk taking (Colvin & Slevin, 1989). More recently, two additional dimensions have been added to the framework: competitive aggressiveness and autonomy (Lumpkin & Dess, 1996). Various studies have found that organizations that

demonstrate high EO perform better. Wang (2008) describes EO as "a key ingredient for firm success" (Wang, 2008). This section will provide a description of these five dimensions and what qualities each represents.

**Figure 5: Entrepreneurial Orientation Dimensions**




*Innovativeness*

Successful entrepreneurs are often referred to as innovators because they disrupt the status quo and generally make improvements on previous technologies or processes. *Innovativeness* describes "the tendency to engage in and support new ideas, novelty, experimentation, and creative processes that may result in new products, services, or technological processes" (Lumpkin & Dess, 1996). Often innovativeness manifests itself is in a manager's willingness to throw out previously held beliefs and explore new ways to do things. 'That's how it has always been' is not a phrase uttered at innovative firms or by innovative people.

*Proactiveness*

*Proactiveness* describes a firm's ability to "[act] in anticipation of future problems, needs or changes" (Lumpkin & Dess, 1996). In other words, do firm decisions *shape* the environment by introducing new products, technologies, or processes, or does the firm simply *react* to the changing environment (Miller & Friesen, 1982). While some research argues that an entrepreneurial firm is "*first* to come up with 'proactive innovations" (Miller P. , 1987), further research has shown that a firm can demonstrate proactive qualities without necessarily being the first to act. Miller and Camp (1986) find that the second firm to enter a new market is just as likely to be successful as the first firm (Miller & Camp, 1986).

*Risk-Taking*

*Risk-taking* has always been synonymous with entrepreneurship. Richard Cantillon (1734) was the first to use the term 'entrepreneurship' argued that main factor that differentiates entrepreneurs from employees was the uncertainty of self-employment (Cantillion as referenced by Lumpkin & Dess, 1996). Today, the term has become slightly more refined, and refers to a firm's willingness to make large and risky resource commitments to ventures that operate in uncertain environments (Lumpkin & Dess, 1996).

*Autonomy*

The modern, prototypical entrepreneur is a highly motivated, self-determined whiz kid with a novel idea who is able to create a successful business from it i.e. Steve Jobs, Jeff Bezos, Elon Musk, etc. These entrepreneurs demonstrated a significant amount of autonomy when bringing their ideas to reality. Autonomy refers to "the independent action

of an individual or a team in bring forth an idea or a vision and carrying it through to completion" (Lumpkin & Dess, 1996).

*Competitive Aggressiveness*

Startups and other new business ventures are often defined by their aggressive nature toward competitors. Stinchcombe (1965) argues that young firms are particularly susceptible to the "liability of newness" and must establish a presence in its industry (Stinchcombe & March, 1965 as referenced by Lumpkin & Dess, 1996). *Competitive aggressiveness* describes "a firm's propensity to directly and intensely challenge its competitors to achieve entry or improve position, that is, to outperform industry rivals in the marketplace."

**Measuring Entrepreneurial Orientation**

Entrepreneurial orientation is typically measured using a seven-point scale survey developed by Colvin & Slevin (1989). These surveys are distributed to companies, and employees are asked to provide responses based upon their perception of the firm's entrepreneurial orientation. When it is not possible to obtain a sample size large enough to determine EO, other measures can be used. Below are secondary measures of EO. Table 2 uses financial ratios to determine scores, while Table 3 uses qualitative measures. Note that there are only quantitative measures for three of the five EO dimension.

**Table 2: Quantitative Measure of Entrepreneurial Orientation**

| Dimension | Metric | Calculation |
|---|---|---|
| Innovativeness | R&D as percent of sales (Miller P. , 1987) | R&D/Revenue |
| | # of specialists in firm (Hage, 1980) | Count specialists |

| | | |
|---|---|---|
| | # of new product or service introductions (Colvin & Slevin, 1989) (Miller & Friesen, 1982) | Count new products and service introductions |
| Proactiveness | Cash flow per dollar of net income (Colvin & Slevin, 1989) | Cash flow from investing / net income |
| Risk-taking | Idiosyncratic risk of firms share price (Fama & Babiak, 1968) | Beta vs. Benchmark |

**Table 3: Qualitative Measures of Entrepreneurial Orientation**

| Dimension | Measure |
|---|---|
| Innovativeness | "Willingness to discard old beliefs and explore new alternatives" (Karagozoglu & Brown, 1988).<br><br>"Commitment to acquiring, developing, and deploying technology" (Zahra & Covin, 1993). |
| Proactiveness | "Does it shape the environment (high score) by introducing new products, technologies, administrative techniques, or does it merely react?" (Miller & Friesen, 1982)<br><br>"A firm's tendency to lead rather than follow a new development" (Colvin & Slevin, 1989). |
| Risk-taking | "The degree to which a firm chooses a safe alternative vs. a more attractive but risky one" (Brockhaus, 1980). |
| Autonomy | "The degree of discretion or choice individuals have about the methods and procedures they use in completing their work" (Breaugh, 1999). |
| Competitive Aggressiveness | "The way that companies engage with its competitors, distinguishing between companies that shy away from direct competition with other companies and those that aggressively pursue their competitors' target markets" (Schillo, 2011). |

In the preceding analysis, I highlighted Unit 8200's history, especially as it relates to how its historical and cultural attributes can help explain entrepreneurial success of Unit 8200 alumni. Following this, I presented a theory of how Entrepreneurial Orientation is assessed and it contributions to success in entrepreneurship. Juxtaposing the theory of

Entrepreneurial Orientation in the context of Unit 8200 will suggest the following broad proposition, which I examine further in this study:

**Proposition:** *Firms founded by Unit 8200 alumni will exhibit a higher degree of entrepreneurial orientation than their industry peers.*

# Methodology

By its nature, Unit 8200 is a secretive organization with limited publicly available data. Entrepreneurs, by the nature of their work, are extremely busy. The combination of these two factors makes it difficult to obtain relevant, accurate data necessary for academic research. Because of these inherent difficulties, this study uses three different methods to assess the EO of Unit 8200 alumni: semi-structured interviews with members of Israel's startup community supplemented by relevant media reports, computer-aided-textual-analysis (CATA) of Initial Public Offering (IPO) prospectuses from firms founded by Unit alumni, and financial ratio analysis of those same firms. None of these methods can independently answer the proposed question, but in conjunction they provide a more cohesive argument.

The Unit 8200 founded companies will be compared to the non-Unit 8200 founded industry peers on each EO dimension. Scores from different EO dimensions cannot be compared to each other because components of financial ratios and CATA dictionary are not the same.

### Primary and Secondary Interview Data

The first method uses primary and secondary interview data. Primary data was collected from two individuals with close ties in the Israeli entrepreneurial community.

One interviewee is a current CEO of a technology start up in Tel Aviv that works with several Unit 8200 alumni and the other interviewee is a professor of entrepreneurship at an Israeli University. These interviews were conducted using a semi-structured approach outlined in Cohen & Crabtree, 2006. Interview audio was recorded and transcribed for analysis.

Per university requirements, an Internal Review Board (IRB) expedited review was completed. This required successful completion of the Collaborative Institutional Training Initiative (CITI) program and an application detailing the interview recruiting process and any questions that might be asked. These interview questions can be seen below. Due to the semi-structured format, all of these questions may not have been asked and follow up questions may not appear on the list. The list, however provides a general idea of the interview content.

**Figure 6: IRB Approved Semi-Structured Interview Questions**

1. What is your current relationship with the IDF?
2. What is your current relationship with Unit 8200?
3. What are your perceptions of Unit 8200?
4. How do Unit 8200 alumni differ from non-Unit 8200 alumni?
5. How has your involvement with the Unit changed over time?
6. What are the differences in the entrepreneurial ideation process between Unit-8200 and non-Unit 8200 members?
7. What are the differences in available resources between Unit-8200 and non-Unit 8200 members?
8. How do you think your experience in the IDF affected your post-military career?
9. What criteria do you look at in order to determine success of a venture?

The secondary source data was collected from the popular press coverage of Unit 8200. The most relevant stories about Unit 8200 and its alumni were collected and quotes from 8200 personnel were extracted and subsequently used for analysis. While there are inherent biases that exist in using reporters' selected quotes, when considered in combination with

primary interviews, other scholarly research, and financial data, I believe that it can paint a clearer picture of this phenomena.

**Financial Analysis of Entrepreneurial Orientation**

The quantitative method used in this study aims to assess the Entrepreneurial Orientation (EO) of publicly traded companies founded and managed by Unit 8200 alumni. Ideally, private company data would be used to measure factors that contribute to EO, but this data is not publicly available. Five companies were selected for study: CyberArk Software Ltd., Imperva, Inc., Wix.com Ltd., Check Point Software Technologies Ltd., and Palo Alto Networks, Inc. These companies were all founded by Unit 8200 alumni as determined by personal biographies on company websites and corroborated by media reports.

**Table 4: Unit 8200 Founded Companies Used in Study**

| Company Name | Year Founded | Business Description[5] |
|---|---|---|
| CyberArk Software Ltd. | 1999 | CyberArk Software Ltd. (CyberArk) provides information technology (IT) security solutions that protect organizations from cyber-attacks. |
| Imperva, Inc. | 2002 | Imperva, Inc. provides cyber-security solutions that protect business-critical data and applications whether in the cloud or on premises. |
| Wix.com, Ltd | 2006 | Wix.com Ltd. (Wix) is a Web development platform enabling businesses and organizations to take businesses, brands and workflow online. |
| Check Point Software Technologies Ltd. | 1993 | Check Point Software Technologies Ltd. (Check point) develops, markets and supports a range of products and services for information technology (IT) security. |
| Palo Alto Networks, Inc | 2005 | Palo Alto Networks, Inc. offers a next-generation security platform. The Company's security platform consists of three elements: Next-Generation Firewall, Advanced Endpoint Protection and Threat Intelligence Cloud. |

[5] Descriptions from Thompson Reuters.

Comparable companies were selected based upon the following criteria: a) NAICS code of 511201, 541511, or 541512, b) founded between 1990 and 2008, and c) traded on U.S. exchanges i.e. NASDAQ or NYSE. The NAICS codes were selected from the Unit 8200 industry classifications. 116 comparable companies were found matching those three criteria. For list of comparable companies and accompany business descriptions, see Appendix 1.

**Table 5: NAICS Code Descriptions**

| NAICS Code | Description[6] |
|---|---|
| 511201 | Software Publishers: This industry comprises establishments primarily engaged in computer software publishing or publishing and reproduction. |
| 541511 | Custom Computer Programming Services: This U.S. industry comprises establishments primarily engaged in writing, modifying, testing, and supporting software to meet the needs of a particular customer. |
| 541512 | Computer Systems Design Services: This U.S. industry comprises establishments primarily engaged in planning and designing computer systems that integrate computer hardware, software, and communication technologies. |

This study measured the three original EO measures as stated in Lumpkin and Dess 1996: Innovation, Risk Taking, and Proactiveness. Miller & Le-Breton Miller (2011) provide objective ways to measure these traits. *Innovativeness* was calculated using *research & development* / *revenue* from 2011-2016. *Proactiveness* was calculated using *cash flow from investing* / *net income* from 2011-2016. *Risk Taking* was calculated using a rolling 2-year quarterly beta from 2011-2016 (Fama & Babiak, 1968). Employee data was collected as a proxy for company size to control for this variable. Company age was also used as a control.

[6] Descriptions from US Census Bureau (2007)

**Computer Aided Text Analysis (CATA)**

Computer Aided Text Analysis (CATA) measures the propensity of certain, predetermined words in a text. *Diction* software was developed by Roderick P. Hart to be used in rhetorical analysis (Hart, 2001). More recently, these methods have been adopted by other academic fields including management and entrepreneurship. CATA is particularly helpful in these fields because of the historically low survey response rate as shown in Baruch, 1999. Short, et al., 2010 developed methodology for creating and validating new dictionaires (See Table 6) using EO as their test case. See their work for full methodology.

The dictionary developed by Short et al. tested EO in *S&P 500* and *Russell 2000*® letters to shareholders. Because letters to shareholders is not a required SEC filling (although a common practice for larger companies), this study was not able to gather enough data to perform analysis. In substitution, this study examines prospectus documents from the firm's Initial Public Offering. Specifically, the Security and Exchange Commission (SEC) reqired 'business' section was examined. In this section, the company describes the operation of the business and strategies for future growth to potential investors.

**Table 6: Expert Validated Words Relevant to Entrepreneurial Orientation**

| **Entrepreneurial Orientation Dimension**[7] | **Content Analysis Words with Expert Validation** from *Short, J. C., Broberg, J. C., Cogliser, C. C., & Brigham, K. H. (2010). Construct Validation Using Computer-Aided Text Analysis (CATA): An Illustration Using Entrepreneurial Orientation. Organizational Research Methods, 13(2), 320-347.* |
|---|---|
| Autonomy | At-liberty, authority, authorization, autonomic, autonomous, autonomy, decontrol, deregulation, distinct, do-it-yourself, |

[7] This dictionary was developed by Short et al (2010) to identify entrepreneruial orientation in publically traded companies' Letters to Shareholders. DICTION software was used to assess compare these companies to S&P 500 and Russel 200 benchmarks. For full methodogy, see Short et al, 2010.

| | |
|---|---|
| | emancipation, free, freedom, freethinking, independence, independent, liberty, license, on-one's-own, prerogative, self-directed, self-directing, self-direction, self-rule, self-ruling, separate, sovereign, sovereignty, unaffiliated, unattached, unconfined, unconnected, unfettered, unforced, ungoverned, unregulated |
| Competitive aggressiveness | Achievement, aggressive, ambitious, antagonist, antagonistic, aspirant, battle, battler, capitalize, challenge, challenger, combat, combative, compete, competer, competing, competition, competitive, competitor, competitory, conflicting, contend, contender, contentious, contest, contestant, cutthroat, defend, dog-eat-dog, enemy, engage, entrant, exploit, fierce, fight, fighter, foe, intense, intensified, intensive, jockey-for-position, joust, jouster, lock-horns, opponent, oppose, opposing, opposition, play-against, ready-to-fight, rival, spar, strive, striving, struggle, tussle, vying, wrestle |
| Innovativeness | Ad-lib, adroit, adroitness, bright-idea, change, clever, cleverness, conceive, concoct, concoction, concoctive, conjure-up, create, creation, creative, creativity, creator, discover, discoverer, discovery, dream, dream-up, envisage, envision, expert, form, formulation, frame, framer, freethinker, genesis, genius, gifted, hit-upon, imagination, imaginative, imagine, improvise, ingenious, ingenuity, initiative, initiator, innovate, innovation, inspiration, inspired, invent, invented, invention, inventive, inventiveness, inventor, make-up, mastermind, master-stroke, metamorphose, metamorphosis, neoteric, neoterism, neoterize, new, new-wrinkle, innovation, novel, novelty, original, originality, originate, origination, originative, originator, patent, radical, recast, recasting, resourceful, resourcefulness, restyle, restyling, revolutionize, seethings, think-up, trademark, vision, visionary, visualize |
| Proactiveness | Anticipate, envision, expect, exploration, exploratory, explore, forecast, foreglimpse, foreknow, foresee, foretell, forward-looking, inquire, inquiry, investigate, investigation, look-into, opportunity-seeking, proactive, probe, prospect, research, scrutinization, scrutiny, search, study, survey |
| Risk-Taking | Adventuresome, adventurous, audacious, bet, bold, bold-spirited, brash, brave, chance, chancy, courageous, danger, dangerous, dare, daredevil, daring, dauntless, dicey, enterprising, fearless, gamble, gutsy, headlong, incautious, intrepid, plunge, precarious, rash, reckless, risk, risky, stake, temerity, uncertain, venture, venturesome, wager |
| Additional inductively derived words | Advanced, advantage, commercialization, customer-centric, customized, develop, developed, developing, development, developments, emerging, enterprise, enterprises, entrepreneurial, exposure, exposures, feature, features, founding, high-value, initiated, initiatives, innovations, innovative, introductions, launch, |

| | |
|---|---|
| | launched, leading, opportunities, opportunity, originated, outdoing, outthinking, patents, proprietary, prospects, prototyping, pursuing, risks, unique, ventures |

# Results

Overall, the results of the financial and CATA analyses found that the EO dimensions most associated with alumni of Unit 8200 are Risk-Taking and Autonomy. This is complemented by primary and secondary interview data. While not demonstrated in either statistical analysis, Innovation was also a common theme in the interview data. Proactiveness was shown to be negatively correlated with Unit 8200 alumni by the financial analysis. Competitive Aggressiveness was not shown to be significant by the statistical analyses or the interview data. The following will delve deeper into the results of the study. [8]

**Table 7: Summary Results of Financial Analysis**

| Financial Analysis | Innovation | Proactiveness | Risk-Taking* |
|---|---|---|---|
| **Unit 8200** | 21.27 | -0.21 | 1.73 |
| **Peer Group** | 28.63 | 2.57 | 1.18 |
| **Difference** | -7.36 | -2.78 | 0.55 |
| **% Difference** | -29.51% | -235.84% | 37.89% |

**Table 8: Summary Results of Computer-Automated-Textual-Analysis**

| CATA Analysis | Autonomy* | Comp. Aggressiveness | Innovation | Proactiveness | Risk-Taking |
|---|---|---|---|---|---|
| **Unit 8200** | 1.11 | 1.61 | 2.72 | 1.05 | 0.3 |
| **Peer Group** | 0.52 | 1.77 | 3.54 | 1.01 | 0.2 |
| **Difference** | 0.59 | -0.16 | -0.82 | 0.04 | 0.1 |
| **% Difference** | 72.74% | -9.52% | -26.19% | 3.86% | 41.32% |

[8] * Denotes P-Value of <.1 meaning slightly significant.

*Autonomy*

In the CATA analysis, Unit 8200 founded companies had a 72.74 percent higher Autonomy score than the peer group. This result is slightly significant with an R of 0.46, an R^2 of 0.21, and a P value of 0.08.

This result is consistent with the interview results where interviewees often mentioned independence from structure as a driving force within the Unit. Avishai Abrahami, CEO and Co-Founder of Wix, Inc. and former Unit 8200 soldier, said in a 2016 Forbes interview,

> *There's nobody around to tell you how to do it. The culture inside, and it's by design, is that your superiors just tell you to go figure it out. That gives you the huge freedom to think differently. It's you or nobody else. And when you're an entrepreneur, that's the most important skill. When you do 5 or 10 or 20 of those projects, you've just built 3 things that could be a startup.*

Dor Skuler, CEO and Co-Founder of Intuition Robotics and former officer in Unit 8200 adds:

> *Nobody tells you exactly what to do. They tell you, 'This is the problem, go figure it out.' With a crazy deadline. So you're inventing, being entrepreneurial and only understanding what you were doing after the fact. But you have to do it, because you don't have any other choice to meet the mission you were given.*

Throughout the interviews, former Unit 8200 soldiers emphasized the freedom the Unit's commanding officers give to the young soldiers. This freedom is not exclusive to Unit 8200, but rather built into the IDF structure itself. Edward Luttwak, a military historian notes,

> *The IDF is deliberately understaffed at senior levels. It means that there are fewer senior officers to issue commands. Fewer senior officials means more individual initiative at the lower ranks. (Luttwak quoted in Senor & Singer, 2009.)*

Luttwak goes on to point out that the ratio of senior officers to combat troops in the US Army is 1 to 5, but in the IDF it's 1 to 9. Interviewees claimed that this flattened hierarchy made individual autonomy necessary.

*Competitive Aggressiveness*

The CATA analysis showed that Unit 8200 founded companies had a 9.52 percent lower Competitive Aggressiveness score than the peer group. This result is not significant with an R of 0.14, an R^2 of 0.02, and a P value of 0.62. The interview data does not support a high Competitive Aggressiveness score. Interviewees spoke more about the cooperation that exists in Israel, especially amongst Unit 8200 alumni. One interviewee stated,

> *I think that because many people in 8200 felt they were really lucky to gain experience in the army and then became successful entrepreneurs that they had the feeling that they need to give back to society. All the 8200 alumni, this is what they are doing. EISP[9] and 8200 is not only for the people from the Unit, it's for all people. They are very supportive. It's a very important rule that they need to give back to the community.*

[9] EISP is an accelerator based out of Tel Aviv that was founded by former Unit 8200 soldiers to leverage the expertise of the alumni network.

*Innovativeness*

In this CATA analysis, Unit 8200 founded companies had a 26.19 percent lower Innovation score than the peer group. This result is not significant with an R of 0.22, an R^2 of 0.05, and a P value of 0.43. The financial analysis resulted in Unit 8200 founded companies scoring 29.51 percent lower than their peer group with a P value of 0.35.

The interview results paint a slightly different story. Many interviewees talk about the need to be creative because many tasks they are assigned to complete while in service need a new solution. Not only are the tasks complicated, but the resources are limited. Yair Cohen, former commander of Unit 8200 explains:

> *You need $300 million, but you only have $3 million. You cannot get ten people, you have only three people. And you need to look at the future and try to analyze what will be, before your enemy will start to purchase and to use this thing.*

When asked about some of the more complicated projects he had worked on while in the Unit, Dor Skuler notes:

> *I think about that sometimes. Why was that possible? It's totally nuts. But we didn't know any better. [The product] didn't need to be perfect. It could be buggy, it can crash—and you'd need to manually reset systems. But we actually had a working solution in the field in days or in weeks sometimes. Truly unique, magical moments.*

The innovation that exists in the Unit is also cultivated through structure and personnel turnover. Nadav Zafrir, CEO and Co-Founder of Team8, a cyber security think-tank, notes:

> *Every year, Unit 8200 gets this influx of young, smart, motivated and passionate men and women looking at problems from an entirely new*

> *perspective. We don't tell them that other people have tried to solve the same problem many times and failed.*

Rami Efrati, a former Unit 8200 officer, explains that some of the need to innovate is inherent when working in intelligence. "In intelligence, you can't work only by the rules, you need to be open-minded. We teach them how to work outside of the box."

While the statistical tests do not show a propensity for innovation, the interview data demonstrates that the Unit is focused on cultivating an innovative environment. The amount of cutting edge technology that comes out from the Unit underscores this emphasis on innovation.

*Proactiveness*

The CATA analysis showed that Unit 8200 founded companies had a 3.86 percent lower Proactiveness score than the peer group. This result is not significant with an R of 0.02, an R^2 of 0.00, and a P value of 0.93. The financial analysis resulted in a 235.84 percent lower Proactiveness score with a P value of 0.46.

The interview results mildly support the, albeit not very significant, statistical findings. Several of the interviewees noted that many companies founded by former Unit 8200 soldiers fail to scale. One interviewee remarked:

> *You find in a lot of Israeli companies, especially ones founded by Unit 8200 in the cyber security space, that the leaders don't plan well for scaling. In part, Israel's geopolitical position causes many companies to be acquired by mostly U.S. based companies. Often time's Israeli founders would rather sell and move to America, than scale up their business in Israel. In other*

> *instances, those founders simply cannot manage a larger, less nimble company. That lack of foresight really hurts the Israeli economy.*

Interviewees also explained that Israel was "a startup nation, not a scale up nation" and that some of the qualities that make Unit 8200 alumni successful do not work well for a more mature businesses. The interviewees also noted that Israel has come a long way since the technology boom in the 1980's. Yigal Erlich, one of the most prominent venture capitalists in Israel, spoke about that time saying, "While Israel was very good at developing technologies, Israelis didn't know how to manage companies or market products."

*Risk-Taking*

In the CATA analysis, Unit 8200 founded companies had a 41.32 percent higher Risk-Taking score than the peer group. This result is not significant with an R of 0.14, an R^2 of 0.02, and a P value of 0.63. The financial analysis showed a 37.89 percent higher Risk-taking score, with a P value of 0.08.

The interview results strongly support the statistical findings. Interviewees spoke about how their experiences in the Unit allowed them to put their entrepreneurial work into perspective. Many expressed the sentiment that it is much easier to take risks with business ventures when they had just finished three years working with life and death consequences.

Kira Radinsky, a former Unit 8200 officer and co-founder of SalesPredict, a predictive sales-retention tool, explains that she operates her business the same way she operated while in the Unit. "Either you win or you are dead. It doesn't look as scary to take a risk because I took much bigger risks before" (Behar, 2016).

## Discussion of Results

The goal of this study was to identify why Unit 8200 alumni have been so successful in their entrepreneurial pursuits. The results of the financial and CATA analysis, the study identified two EO dimensions that Unit 8200 alumni-founded companies exhibit in excess of their peers: Autonomy and Risk-Taking. These analyses also showed a negative relationship with Proactiveness. Based upon the interview data, it can be concluded that Unit 8200 alumni demonstrate a large degree of Innovativeness even though it was not demonstrated in the quantitative methods. This discussion will be organized by EO dimension and will tie in key findings from the historical introduction.

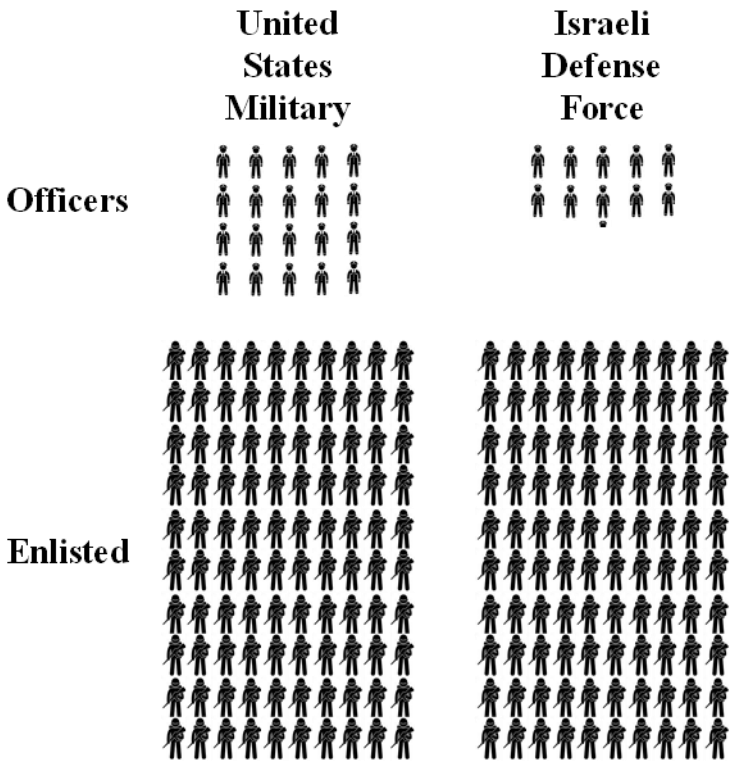
Lumpkin & Dess (1996) define Autonomy as "the independent action of an individual or a team in bring forth an idea or a vision and carrying it through to completion." This dimension of EO is important in startups when resources, both human and financial, are in short supply. In the CATA, Unit 8200 members demonstrated a higher propensity for Autonomy than their industry peers. Throughout the interviews this quality was not only attributed to former members of Unit 8200, but also to Israeli culture more broadly.

Recall the description of Israel's first Prime Minister and forefather of the nation, David Ben-Gurion. He has been called by many a bitzu'ist, or someone who "gets things done" (Wieseltier, 1985). This quality is especially admired in a nation that was built so quickly from very little, while under extreme external threats.

Members of Unit 8200 not only grew up in a society in which this quality was admired, but also worked in a unit where this quality was necessary to be successful. Many of the interviewees spoke about complex tasks they were assigned to and simply told to 'get it done.'

The flat hierarchy that exists in the Unit and the IDF more broadly places large responsibilities on a few, young people. As stated by Edward Luttwak, the IDF's officer to enlisted ratio is 1 to 9 compared to the US Military's 1 to 5. This flattened hierarchy provides young soldiers with opportunities to complete tasks with more limited oversight.

**Figure 7: Officers to Enlisted per 100-Man Company:**




The combination of societal traits and the unique working environment that members of Unit 8200 encounter during their years of service, likely encourage a high degree of Autonomy in 8200 alumni-founded companies.

The financial and CATA analyses did not find any difference between Competitive Aggressiveness and Unit 8200-founded companies. Many of the interviewees, however, noted that the Unit 8200 professional network was integral to their entrepreneurial success. After completing their service in Unit 8200, many alumni receive their first job offers

through the extensive network. Some jobs posting are even directed specifically at Unit 8200 alumni.

Because the IDF has mandatory reserve requirements for its citizens, many working professionals are often serve as teachers and mentors within the IDF (Breznitz, 2002). This creates more of a collaborative atmosphere within Israel than you might see in other countries.

While the financial and CATA analyses did not show excess Innovativeness for unit 8200 founded firms, it is important to note that financial metric used to assess this dimension, R&D / Sales, shows what percentage of sales is used for research and development. It does not measure the output of this R&D. It is possible that Unit 8200 alumni could simply be more efficient with the R&D that they do spend. In order to corroborate this, a future study would have to examine the firms output in the form of patents, trademarks, new product offering, etc.

Based upon the interview and secondary data, members of Unit 8200 are not afraid to 'break things.' The structure of the Unit, and the IDF more broadly, cultivate and encourage innovation. Teams work in small groups on task-oriented projects much like many Silicon Valley startups. The flat hierarchy and *chutzpah* demonstrated by Unit members create an environment where all assumptions are questioned and no idea is thrown out without the proper reasoning. Superior officers may be ahead in the chain of command, but Unit 8200 soldiers value the quality of ideas more than a strict hierarchy.

One of the interviewees pointed out that while the IDF might have a less formal hierarchy than the U.S. Military, in Israeli society, the military is the most formal institutions in the country. Perhaps innovation is encouraged when societal informality is

combined with a professional, technologically advanced institution with an eminently important mission.

Lumpkin & Dess (1996) describe *Proactiveness* as a company's ability to"[act] in anticipation of future problems, needs or changes" (Lumpkin & Dess, 1996). Because Unit 8200 soldiers are generally on the cutting edge of technology, it is hard to argue that they do not display proactive behavior. After all, military intelligence is, by its nature, proactive. Soldiers must anticipate future threats and propose new defense strategies.

Where Unit 8200 members seem to lack is not in *product proactiveness*, but rather in *business proactiveness*. Interviewees commented that Israeli companies, especially some of the high-tech firms founded by 8200 alumni, were product focused not business focused. This leads to the inability for some of these companies to scale successfully. More often than not, Israeli tech companies are purchased by U.S.-based technology conglomerates. Google, Apple, Microsoft, IBM, and Cisco are some of the largest purchasers of Israeli tech. While these acquisitions make the founders exceedingly wealthy, perhaps if the company growth was better managed, these smaller tech firms could grow into larger, more mature Israeli-based companies.

The propensity for a company to take large-scale risks is a large determinant of future success. In technologically based companies, it can be argued that it is even more important. The nature of this highly competitive industry creates an environment where if a company is risk-adverse in its early stages, it will not succeed. Even when controlling for industry, the results showed an increased propensity for risk among firms founded by former 8200 soldiers.

In a battlefield environment, taking risk is par-for-the-course. While the risk that Unit 8200 soldiers face on a daily basis may not be the same as an infantryman, lives of their countrymen and women are at stake. The risks that Unit soldiers take are much more technical, but the scale of the consequences is likely much higher. One would expect an individual who has spent a significant amount of time under high pressure, risky scenarios to be more comfortable with risk in a business than someone who has not experienced that environment.

There are several limitations that are inherent to studying a military intelligence organization and its ties to entrepreneurship. A major limitation is the inability to identify all of the alumni from the Unit. While some self-identify as Unit 8200 alumni, many do not. This makes it hard to know whether the conclusions drawn from the study of a few is representative of the whole Unit.

While financial ratios can be useful in analyzing a company's input compared to peers within its industry, it does not measure the output. The efficiency of the allocated capital could vary drastically and would not be captured in the financial analysis.

Another limitation inherent to studying entrepreneurship is the limited access to private company financial data. This study utilizes publicly traded companies to assess the entrepreneurial orientation of its founder and CEO's. A sample of only companies that have reached an IPO is biased. Most startups fail and even Unit 8200 alumni are not immune to this reality. In an ideal world, this study would be conducted on a wide range of private companies from different industries. Even with these quantitative limitations, the interview data fills the holes and adds much needed color to the data.

# Conclusion

Unit 8200 is an elite military intelligence Unit that produces some of the best technological talent in the world. The evidence from popular press accounts support this notion. The results of this study show that alumni, in general, excel in three of the five entrepreneurial orientation dimensions outlined by Lumpkin & Dess (1996): *Risk-Taking, Autonomy* and *Innovativeness.* The EO framework is intended to assess a company's tendency to act in certain ways that have been determined to be entrepreneurial.

Company founders are integral in setting the managerial tone for a firm's entrepreneurial orientation. According to dominant entrepreneurial literature, a founder's prior experience informs or imprints the actions they take in a new venture. The prior experience in Unit 8200 seems to condition these founders to be comfortable higher levels of risk than their industry peers. The prevailing Unit cultural stance to embrace new ideas, no matter who or where they come from, and the willingness to openly question any assumptions, seems to inform their future orientation toward innovation.

Dan Senor and Saul Singer's *Start-Up Nation: The Story of Israel's Economic Miracle* sought to identify the "secret sauce" that made Israel the technological hub that it is today. They concluded that:

> *The secret of Israel's success is the combination of classic elements of technology clusters with some unique Israeli elements that enhance the skills and experience of individuals, make them work together more effectively as teams, and provide tight and readily available connections within an established and growing community* (Senor & Singer, 2009).

Unit 8200 is a concentrated microcosm and important driver of the larger Israeli success story. The Unit embraces and embodies the *chutzpah*, *rosh gadol*, *davka*, and *bitzua* that make Israeli culture so unique.

Unit 8200 is a unique gathering of highly-intelligent, technology-orientated, motivated individuals who exist in an environment in which they are given advanced technical training, hands-on military experience, and a powerful professional network, all at the age of eighteen. Combine these elements with a society that elevates leaders who demonstrate bold, resourceful, and inventive tendencies, and it produces some incredible entrepreneurs.

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# Appendix

## Appendix 1: Descriptions of Peer Group for Financial Analysis

| Company Name | Business Description |
|---|---|
| Accelrys, Inc. | Accelrys, Inc. develops and commercializes scientific informatics software products and services for industries and organizations that rely on scientific innovation. |
| Alarm.com Holdings, Inc. | Alarm.com Holdings, Inc. engages in the provision of wireless and web-enabled security system technology. |
| AutoNavi Holdings Ltd. | AutoNavi Holdings Ltd. provides digital map content and navigation and location-based solutions in China. |
| Amber Road, Inc. | Amber Road, Inc. provides cloud-based global trade management solutions. |
| Apigee Corporation | Apigee Corp. provides application programming interface and predictive big data analytics technology. |
| AppFolio Inc Class A | AppFolio, Inc. provides web-based property management software. It offers software solutions for small and medium-sized businesses in the property management and legal industries or verticals. |
| Arotech Corporation | Arotech Corp. provides defense and security products for the military, law enforcement and homeland security markets, including advanced zinc-air and lithium batteries and chargers, and multimedia interactive simulators and trainers. |
| A10 Networks, Inc. | A10 Networks, Inc. engages in the provision of application networking solutions. It offers cloud storage, enterprise solutions, security products, data center, application delivery, load balancing, and distributed denial of service protection. |
| athenahealth, Inc. | athenahealth, Inc. provides cloud-based business services and mobile applications for medical groups and health systems. It also provides ongoing billing, clinical-related, and other related services to customers. |
| Brightcove Inc. | Brightcove Inc. engages in providing cloud services for video which enable customers to publish and distribute video to Internet-connected devices. It offers a family of products that revolutionize the way organizations deliver video experiences. |
| BlackLine, Inc. | BlackLine, Inc. provides financial close automation software solutions to the SAP market. It offers finance controls and automation and unified cloud for finance and accounting. |
| Bridgeline Digital, Inc. | Bridgeline Digital, Inc. is an information technology company, which engages in the development of iAPPS web engagement management product platform and related digital solutions. |
| Box, Inc. Class A | Box, Inc. provides an enterprise content platform that enables organizations to securely manage enterprise content while allowing easy, secure access and sharing of this content from anywhere, on any device. |

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|---|---|
| BroadSoft, Inc. | BroadSoft, Inc. provides software and services that allow mobile, fixed-line, and cable providers to deliver voice and multimedia services. Its products include BroadWorks, BroadCloud and BroadTouch. |
| Callidus Software Inc. | Callidus Software, Inc. offers cloud software services. Its product includes CallidusCloud, a software that enables organizations to drive performance and productivity across their business with its Hiring, Learning, Marketing, and Selling clouds. |
| Calix, Inc. | Calix, Inc. provides broadband communications access systems and software for fiber and copper-based network architectures that enable communications service providers to transform their networks and connect to their residential and business subscribers |
| Coupa Software, Inc. | Coupa Software, Inc. develops and provides cloud-based financial applications. It produces software solutions for sourcing, procurement and expense management that help companies control their spending. |
| COPsync, Inc. | COPsync, Inc. engages in the operation of real-time, law enforcement mobile data information system |
| CounterPath Corporation | CounterPath Corp. engages in the provision of desktop and mobile VoIP software products and solutions. |
| CSG Systems International, Inc. | CSG Systems International, Inc. engages in providing business support solutions serving the communications industry. |
| Cornerstone Ondemand, Inc. | Cornerstone OnDemand, Inc. engages in the provision of learning and talent management solutions delivered as software-as-a-service. |
| CommVault Systems, Inc. | CommVault Systems, Inc. is a data management software company which develops and distributes software applications for data protection, information governance and discovery. |
| CYREN Ltd. | CYREN Ltd. engages in the provision of cloud-based security solutions. Its products include web and electronic mail security, cyber intelligence suite, malware attack detection, mobile security, uniform resource locator filtering, phishing intelligence feed, and anti-spam. |
| Tableau Software, Inc. Class A | Tableau Software, Inc. engages in the provision of analytics and data visualization software. |
| Determine, Inc. | Determine, Inc. operates as a global provider of SaaS enterprise contract lifecycle management, strategic sourcing, supplier management, and procure-to-pay solutions. |
| eFuture Holding, Inc. | eFuture Holding, Inc. engages in the development and provision of software applications and social shopping network services. It offers supply chain solutions and operates omni-channel cloud service and myStore mobile application. |
| eGain Corporation | eGain Corp. provides cloud-based and on-site customer interaction software solutions. The company operates business in one segment development, license, implementation and support of its customer service infrastructure software solutions. |
| Envestnet, Inc. | Envestnet, Inc. engages in the provision of integrated portfolio, wealth management technology, practice management and reporting solutions to financial advisors and institutions. |
| Everbridge, Inc. | Everbridge, Inc. provides mass notification solutions. |
| Five9, Inc. | Five9, Inc. provides cloud software for contact centers. |
| Finjan Holdings, Inc. | Finjan Holdings, Inc. engages in the investments in, and development of cybersecurity technologies and intellectual property. The company was founded on January 2006, and is headquartered in East Palo Alto, CA. |
| Great Elm Capital Group, Inc. | Great Elm Capital Group, Inc. engages as an intellectual property company which focuses on the mobile industry. |
| Glu Mobile Inc. | Glu Mobile, Inc. designs, markets and sells mobile games. |
| Sungy Mobile Limited. | Sungy Mobile Ltd. provides mobile Internet products and services. The firm focuses on applications and mobile platform development. |
| Gravity Co., Ltd. Sponsored ADR | Gravity Co., Ltd. engages in the development and publishing of online games, software and other related services. It operates through the following business fields: Online Games Development Business, Game Publishing Business, Mobile Business, Multi Platform Business, One Source Multi Use Business and the Internet Protocol Television Business. |
| Gridsum Holding, Inc. | Gridsum Holding, Inc. provides data analysis software for multinational and domestic enterprises and government agencies in China. |
| Guidance Software, Inc. | Guidance Software, Inc. provides digital investigative solutions. |
| Greenway Medical Technologies, Inc. | Greenway Medical Technologies, Inc. provides technical solutions and services for healthcare customers. It offers electronic healthcare record, ambulatory healthcare, clinical research business solutions and services. |
| Guidewire Software, Inc. | Guidewire Software, Inc. provides software products for property and casualty insurers. |
| Intellicheck Mobilisa, Inc. | Intellicheck Mobilisa, Inc. is a technology company. It is engaged in developing and marketing wireless technology and identity systems for various applications, including mobile and handheld access control and security systems for the government, military and commercial markets. |
| Imprivata, Inc. | Imprivata, Inc. engages in the provision of healthcare information technology security solutions that offers authentication management, fast access to patient information, and secure communications technologies to the healthcare industry. |

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|---|---|
| King Digital Entertainment Plc | King Digital Entertainment Plc develops and publishes casual games on digital platforms. |
| KongZhong Corp. Sponsored ADR | KongZhong Corp. is an online game developer and operator in China. It operates through the following segments: Internet Games, Mobile Games, and WVAS. The Internet Games segment deals with mobile internet and entertainment sites. The Mobile Games segment develops and publishes downloadable and online mobile games. |
| LivePerson, Inc. | LivePerson, Inc. engages in the provision of mobile and online messaging solutions. It operates through the following segments: Business, Consumer, and Corporate. |
| Manhattan Associates, Inc. | Manhattan Associates, Inc. designs, builds and delivers supply chain commerce solutions that drive top line growth by converging front-end sales with back-end supply chain execution and efficiency. |
| Medidata Solutions, Inc. | Medidata Solutions, Inc. provides cloud based solutions for life sciences that enhance the efficiency of customer's clinical development processes from concept to conclusion, optimizing their research and development investments. |
| Mimecast Limited | Mimecast Ltd. provides cloud security and risk management services for corporate information and email. It develops proprietary cloud architecture to offer email security, continuity and archiving capabilities |
| MiX Telematics Limited Sponsored ADR | MiX Telematics Ltd. engages in the provision of fleet an mobile asset management solutions. It operates through the following geographical segments: Africa, Europe, Americas, Middle East and Australia, and Brazil. |
| Majesco | Majesco provides software solutions for the insurance industry. It offers core insurance software solutions for Property & Casualty/General Insurance, Life, Annuities & Pensions and Group/Employee Benefits providers, allowing them to manage policy management, claims management and billing functions. |
| MIND C.T.I. Ltd. | MIND C.T.I. Ltd. develops, manufactures, markets and implements real-time and off-line convergent billing and customer care software solutions for various types of communication providers, including traditional wireline and wireless, voice over IP, or VoIP, and broadband IP network operators, LTE operators, cable operators and mobile virtual network operators, or MVNOs. |
| Model N, Inc. | Model N, Inc. engages in the provision of revenue management cloud solutions for the life science and technology industries. It solutions include two complementary suites of software applications: Revenue Management Enterprise and Revenue Management Intelligence. The Revenue Management Enterprise suite serves as the system of record for and automates the execution of, revenue management processes such as pricing, contracting and incentive and rebate management. |
| Materialise NV Sponsored ADR | EMaterialise NV provides additive manufacturing software and 3D printing services. It operates through the following business segments: Materialise Software, Materialise Medical & Materialise Manufacturing. |
| NetSuite Inc. | NetSuite, Inc. engages in the provision of cloud-based business management application and omnichannel commerce software suites. |
| The9 Ltd. Sponsored ADR | The9 Ltd. engages in developing and operating online games and related services. It also involves in mobile advertising and mobile application education businesses. |
| ServiceNow, Inc. | ServiceNow, Inc. engages in the provision of enterprise cloud computing solutions. |
| NQ Mobile, Inc. | NQ Mobile, Inc. engages in the provision of mobile Internet services. It operates its business through the Consumer and Enterprise segments. |
| NetEase, Inc. Sponsored ADR | NetEase, Inc. engages in the provision of online internet technology services. It operates through the following business segments: Online Games, Advertising, e-mail Services and E-commerce. |
| NetSol Technologies, Inc. | NetSol Technologies, Inc. provides information technology and enterprise application solutions. It operates through the following geographical segments: North America, Europe, and Asia-Pacific. |
| Nuance Communications, Inc. | Nuance Communications, Inc. provides voice and language solutions for businesses and consumers around the world. Its solutions are used in healthcare, mobile, consumer, enterprise customer service and imaging markets. |
| Open Text Corporation | Open Text Corp. is an independent software company that provides software products and services that assist organizations in finding, utilizing, and sharing business information from any device. |
| Paycom Software, Inc. | Paycom Software, Inc. provides cloud-based human capital management software solutions delivered as Software-as-a-Service. |
| Points International Ltd. | Points International Ltd. engages in the provision of ecommerce and technology services. It offers a range of white label or private branded e-commerce services and Points Loyalty Wallet. |
| Park City Group, Inc. | Park City Group, Inc. is a software-as-a-service provider. |
| Premiere Global Services, Inc. | Premiere Global Services, Inc. provides conferencing and collaboration software and services. It offers solutions for IT, sales, marketing, small business and enterprises. |
| Perfect World Co., Ltd. | Perfect World Co., Ltd. is an online game developer and operator based in China. It develops online games based on proprietary game engines and game development platforms. |
| Q2 Holdings, Inc. | Q2 Holdings, Inc. engages in the provision of cloud-based virtual banking solutions. Its services offers security, advisory, web services, custom services, and end user marketing solutions. |
| Red Hat, Inc. | Red Hat, Inc. engages in the provision of open source software solutions.. |
| RingCentral, Inc. Class A | RingCentral, Inc. engages in the provision of a cloud unified communication, and collaboration solutions to support the increasing mobile and distributed workforce. It also offers a open platform which integrates with current business applications. |
| RealNetworks, Inc. | RealNetworks, Inc. creates innovative applications and services that make it easy to connect with and enjoy digital media. It provides the digital media services and applications to consumers, mobile carriers and other businesses. It operates through the following segments: RealPlayer Group, Mobile Entertainment, and Games.. |

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| RealPage, Inc. | RealPage, Inc. engages in the provision of software solutions for the rental housing industry. |
| Rapid7 Inc. | Rapid7, Inc. engages in the business of security risk intelligence. It primarily provides security data and analytics solutions. |
| Rosetta Stone Inc. | Rosetta Stone, Inc. engages in the provision of technology based language learning solutions. |
| inContact, Inc. | inContact, Inc. povides cloud contact center software solutions. The firm operates through two segments: Software and Network Connectivity. |
| SINA Corp. | SINA Corp. engages in the provision of online and mobile media services. It operates through the following segments: Portal Advertising, Weibo, and Others |
| Sonic Foundry, Inc. | Sonic Foundry, Inc. engages in the provision of video capture, management, and webcasting solutions in education, business, and government. |
| Splunk Inc. | Splunk, Inc. engages in the development and provision of software solutions |
| Support.com, Inc. | Support.com, Inc. engages in the provision of cloud-based software and services, which enables technology support for a connected world. |
| SolarWinds, Inc. | SolarWinds, Inc. provides information technology solutions. |
| Atlassian Corp. Plc Class A | Atlassian Corp. Plc operates as an enterprise software company, which engages in the designing, developing, licensing, and maintaining of software. |
| TIBCO Software Inc. | TIBCO Software, Inc. provides electronic business infrastructure software products. |
| Top Image Systems Ltd. | Top Image Systems Ltd. engages in the provision of enterprise content management solutions. It offers technology to automatically transform any information into electronic data |
| Talend SA Sponsored ADR | Talend SA provides data integration and cloud software solutions. It offers open sources middleware solutions for data migration, synchronization, governance and warehousing, as well as for cloud computing and process-based applications. |
| Tangoe, Inc. | Tangoe, Inc. engages in the provision of communications lifecycle management, and software and related services. |
| Take-Two Interactive Software, Inc. | Take-Two Interactive Software, Inc. is a developer, marketer and publisher of interactive entertainment for consumers around the globe. |
| Textura Corp. | Textura Corp. provides on-demand business collaboration software to the commercial construction industry. |
| Monotype Imaging Holdings Inc. | Monotype Imaging Holdings, Inc engages in development, marketing, and licensing of technologies and fonts. |
| VMware, Inc. Class A | VMware, Inc. provides the development and application of virtualization technologies with x86 server-based computing, separating application software from the underlying hardware. |
| Varonis Systems, Inc. | Varonis Systems, Inc. provides innovative software platform that allows enterprises to map, analyze, manage and migrate their unstructured data. It operates through the following segments: United States, EMEA, and Rest of the World. |
| VirtualScopics, Inc. | VirtualScopics, Inc. provides quantitative imaging solutions currently serving the pharmaceutical, biotechnology and medical device industries. It provides image analysis software tools and applications which are used in detecting and measuring specific anatomical structures and metabolic activity using medical images. |
| Web.com Group, Inc. | Web.com Group, Inc. engages in the provision of Internet services and online marketing solutions for small to medium-sized businesses. Its solutions include domains, hosting, website design and management, search engine optimization, online marketing campaigns, local sales leads, social media, mobile products, and eCommerce solutions. |
| xG Technology, Inc. | xG Technology, Inc. engages in the development of patented wireless communications and spectrum sharing technologies. It operates through the following segments: Broadcast, Sports and Entertainment, and Government/Surveillance. |
| Allot Communications Ltd. | Allot Communications Ltd. engages in the development and provision of mobile, fixed, and enterprise networks. It operates through the following geographical segments: Europe; Asia and Oceania; Americas (excluding the United States); |
| Arista Networks, Inc. | Arista Networks, Inc. provides cloud networking solutions. Its extensible operating system supports cloud and virtualization solutions, including VMware NSX, Microsoft System Center, OpenStack and other cloud management frameworks. |
| Concur Technologies, Inc. | Concur Technologies, Inc. provides integrated travel and expense management solutions for companies of all industries, sizes and geographies. Its solutions provide detailed information to help its customers effectively negotiate with vendors, create budgets, and manage compliance. |
| Barracuda Networks, Inc. | Barracuda Networks, Inc. engages in the development and provision of security systems and data protection solutions. It offers cloud-connected applications and solutions for security threats, network performance, and data storage. |
| Convergys Corporation | Convergys Corp. engages in the provision of relationship management solutions. It focuses on customer management through every customer interaction. |
| Cyan, Inc. | Cyan, Inc. develops software-defined networks. Its solutions include high-capacity, multi-layer switching and transport platforms as well as a carrier-grade software-defined networking platform and applications. |
| Jiayuan.com International | Jiayuan.com International Ltd. is engaged in the operation of an online dating platform. It operates through the following segments: Online Services, Events and VIP Services, and Other Services. |

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| Digital River, Inc. | Digital River, Inc. provides e-commerce solutions and markets shareware software products. It offers e-commerce solutions to various companies in software, consumer electronics, computer games, publishing, travel, music, video games, electronic toys, housewares, medical equipment, power tools and direct-selling and other markets. |
| EnerNOC, Inc. | EnerNOC, Inc. engages the provision of energy intelligence software and demand response solutions It offers software-as-a-service or SaaS which improve how enterprises manage and control energy costs for their organizations. |
| EPAM Systems, Inc. | EPAM Systems, Inc. provides software product engineering, technology consulting and digital expertise to clients. |
| Exa Corporation | Exa Corp. develops, markets and supports simulation software for the fluids engineering marketplace. It engages in software products development and provider of professional services. |
| Sourcefire, Inc. | Sourcefire, Inc. provides intelligent cyber security solutions for information technology, environments of commercial enterprises, including healthcare, financial services, manufacturing, energy, education, retail and telecommunications companies, and federal, state and local government organizations. |
| HealthEquity Inc | HealthEquity, Inc. offers solutions for managing health care accounts for health plans, insurance companies and third-party administrators. |
| Immersion Corporation | Immersion Corp. is an intellectual property and software licensing company, which engages on creation, design, development and licensing of patented haptic innovations and software that allow people to use their sense of touch more fully when operating a wide variety of digital devices. |
| Leaf Group Ltd. | Leaf Group Ltd. is an Internet company, comprised of various marketplace and media properties. |
| Meru Networks, Inc. | Meru Networks, Inc. designs and develops networking equipment for wireless LAN systems. The company was founded by Nicholas Mitsakos and Vaduvur Bharghavan in January 2002 and is headquartered in Sunnyvale, CA. |
| Medical Transcription Billing Corp. | Medical Transcription Billing Corp. is a healthcare information technology company, which provides integrated suite of proprietary web-based solutions, together with related business services, to healthcare providers practicing in ambulatory care settings. |
| NCI, Inc. Class A | NCI, Inc. engages in the provision of enterprise services and solutions. |
| ePlus inc. | ePlus, Inc. operates as a holding company with interest in providing technology products and services, flexible leasing solutions and enterprise supply management solutions. |
| Silver Spring Networks, Inc. | Silver Spring Networks, Inc. operates as a networking platform and solutions provider for smart energy networks. |
| VASCO Data Security | VASCO Data Security International, Inc. engages in the design, development, and markets security solutions that secure and manage access to digital assets and protect transactions |
| Verint Systems Inc. | Verint Systems, Inc. engages in the provision of actionable intelligence. It operates through the following segments: Enterprise Intelligence Solutions, Cyber Intelligence Solutions, and Video and Situation Intelligence Solutions. |
| WidePoint Corporation | WidePoint Corp. provides information technology based products, services and solutions. It |
| Ixia | Ixia engages in the development and provision of network testing, visibility, and security solutions. It offers security products, training, test consulting and applications, and cloud services. |
| Yahoo! Inc. | Yahoo!, Inc. operates as a digital media company that is focused on informing, connecting, and entertaining users through research, communications, and digital content products. |