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„The Value of Synergies in Mergers & Acquisitions. A Value Estimation of Intel´s Potential Synergies in the Acquisition of Mobileye."

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List of abbreviations

ADAS	Advanced driving assistance systems
AI	Artificial intelligence
B	Billion
CAGR	Compounded annual growth rate
CAPEX	Capital expenditures
CAPM	Capital asset pricing model
CEO	Chief executive officer
CFO	Chief financial officer
CPU	Central processing unit
DCF	Discounted cash flow
EBIT	Earnings before interest and taxes
EBITDA	Earnings before interest, depreciation and amortization
INTC	Intel ticker symbol
IoT	Internet of things
IPO	Initial public offering
K	Thousand
M	Million
M&A	Mergers and acquisitions
MBLY	Mobileye ticker symbol
NWC	Net working capital
NYSE	New York Stock Exchange
ODM	Original design manufacturers
OEM	Original equipment manufacturers
PC	Personal computer
R&D	Research and development
ROA	Return on assets
ROE	Return on equity
SIA	Semiconductor Industry Association
WACC	Weighted average cost of capital
WSTS	World semiconductor trade statistics

1 Introduction

Several conducted studies in the past years covering M&A activity show that most acquisitions destroy value for the acquiring company´s shareholders rather than create it (Mueller, 1995; Mussati, 1995; Hitt et al., 2009).

Even though in many cases the company's performance after the deal was significantly below its performance before the deal, the executive continue to enter this high risk game and make more and bigger deals almost on a daily basis. Some companies have even included M&A as a natural part of their growth strategy, and perform more than ten acquisitions on a yearly basis (Eccles, Lanes & Wilson, 1999).

The main reason why companies involve into M&A´s is to achieve synergies and to create an added value. The term synergy comes from the Greek word *synergos*, συνεργός, meaning "working together, cooperation"[1] In a business context it was first applied by Ansoff (1965) in his book Corporate Strategy. He proposed a meaningful framework for the evaluation of merger and acquisition synergy. He describes synergy as the effect that results from the combination ("integration") of individual parts, where the value of the combined business entity is larger than the sum of its separate units or in other words “2+2=5” (Ansoff, 1965).

This leads to the conclusion that M&A´s should theoretically always improve the organization´s performance. However, the reality indicates that this is not always simple (Zhou, 2011). Although the major potential synergies are recognized before the deals and large sums of money are invested in M&A´s, many acquisitions fail to generate synergy (Bradley, Desai & Kim 1988; Sirower & Sahni, 2006). Some researchers have started to question if synergies exist at all. But if they had not been so successful, these acquisitions would not have taken place to such a large extent.

So how do companies actually create and ultimately measure synergies? The purpose of this thesis is to bridge the academic research and frameworks to a real-life acquisition case: the acquisition of Mobileye by Intel.

Intel Corporation and the Israeli autonomous vehicle technology firm Mobileye announced on March 13, 2017 that they had entered into a definitive agreement pursuant

[1] Dictionary, O. E. (2007). Oxford English dictionary online. Retrieved from: https://en.oxforddictionaries.com/definition/synergy

to which Intel would acquire Mobileye. Intel commenced a tender offer to acquire all of the issued and outstanding ordinary shares of Mobileye for $63.54 per share in cash, which represents a fully-diluted equity value of approximately $15.3 billion. Intel paid a premium of approximately 44 times Mobileye's earnings. This acquisition is one of the largest in the fast-growing market for highly and fully autonomous vehicle technology.

Intel has been a global leader in the microchip markets for years, but has recently been struggling as people have progressively turned to the mobile world, where its chips lost out to competitors. Now, it seems that the company is moving to the market for autonomous driving. Intel estimates the vehicle systems, data and services market opportunity to be up to $70 billion by 2030 (Lanctot, 2017). Even though the company has not been a significant player in the industry, it has already made a few investments and signed several partnership deals.

Mobileye is one of the leading companies in the development of computer vision and machine learning, data analysis, localization and mapping for Advanced Driver Assistance Systems and autonomous driving. It was founded in Jerusalem in 1999, and has signed deals with several automakers for the use of its vision and camera technology. It develops a technology which implements machine learning to avoid barriers on the road. This technology of integrated cameras, chips and software for driver-assist systems are the main components for autonomous cars.

The combination of these two companies is expected to create a compelling value proposition for the automotive industry. However, some investment analysts remained skeptical about the potential synergies between Intel and Mobileye, and rated the acquisition's price as too high.

1.1 Goal of the thesis

Using theoretically identified practices in valuing synergies, this thesis tries to evaluate the potential synergies between the two companies, in order to calculate the present value of the synergies and to evaluate if the paid premium was justified.

1.2 Research question

This thesis has the purpose to give an answer to the following questions after reviewing relevant literature and analyzing practical empirical results:

What is the net present value of the synergies that could potentially arise in Mobileye´s acquisition and do they justify the paid acquisition premium?

1.3 Methodology and data

In order to answer the research question, a detailed financial and strategic analysis of both companies will be performed. Selected academic theories on value creation through M&A activity will be taken into consideration while analyzing the acquisition. The general approach regarding synergies valuation will be based on the proposition of Damodaran (2006). He suggests valuing both the target and the acquirer individually in the DCF framework, then calculating the value of the combined firm without synergies and finally, after assessing the impact of the transaction on both income statement items and balance sheet items calculate the combined firm value including synergies. The valuation theory and financial statement analysis will be based on the theories presented by Berk & DeMarzo (2007), Damodoran (2006) and Drake & Fabozzi, (2012). All modelling will be done in Excel in a form of an event study. The thesis will try to highlight synergies of investing in Mobileye, from Intel´s perspective. It will be based on public information only, and would not be able to grasp confidential information such as strategic development not communicated to the market. Additionally, financial platforms like Yahoo Finance and Thomson One will be used to obtain financial data on market- or firm-specific events. The official government sites will be used to obtain statistical data and estimates.

1.4 Structure of the paper

The paper is organized as follows: Chapter 2 presents a description of industries where both of the companies operate in, including a description of both companies as well as the peer group. Chapter 3 describes the strategic analysis, including the strategic fit of both companies while Chapter 4 presents a financial analysis of both companies. The process and details of the transaction as well as stock movements of the companies are described in Chapter 5. In Chapter 6 the stand-alone valuations of the companies using the discounted cash flows model and multiples valuation are presented. A detailed literature study on synergies and synergies valuation, including the analysis and valuation of the potential synergies in the case of Intel and Mobileye will be described in Chapter 7. Chapter 8 will try to measure the success of the acquisition so far. Finally, the thesis is concluded in Chapter 9.

2 The Industry

Capturing the current state of the industry is not an easy task but it is critical in order to understand the changes that take place across the entire supply chain of the industry. Intel and Mobileye companies are both in the technology sector, but not in the same industry. This makes the acquisition more complex. Therefore, a structured approach was performed while describing the industry in order to understand and capture all the relevant details which triggered the acquisition.

2.1 Semiconductors industry

2.1.1 Industry overview

The semiconductor industry was formed around 1960 and involves companies engaged in the design and fabrication of semiconductor devices. The semiconductor industry has exploded in size over the past two decades. According to the Semiconductor Industry Association the semiconductor sales increased from $132.0 billion in 1996 to the highest-ever annual sales in 2017, totaling $412.2 billion (Figure 1). This represents a compound annual growth rate of 4.8% p.a. which is also expected to be up in the future. According to the president and CEO of the Semiconductor Industry Association, the market growth was driven “by macroeconomic factors, industry trends, and the ever increasing amount of semiconductor technology in devices the world depends on for working, communicating, manufacturing, treating illness, and countless other applications” (Rosso, 2017, para.2).

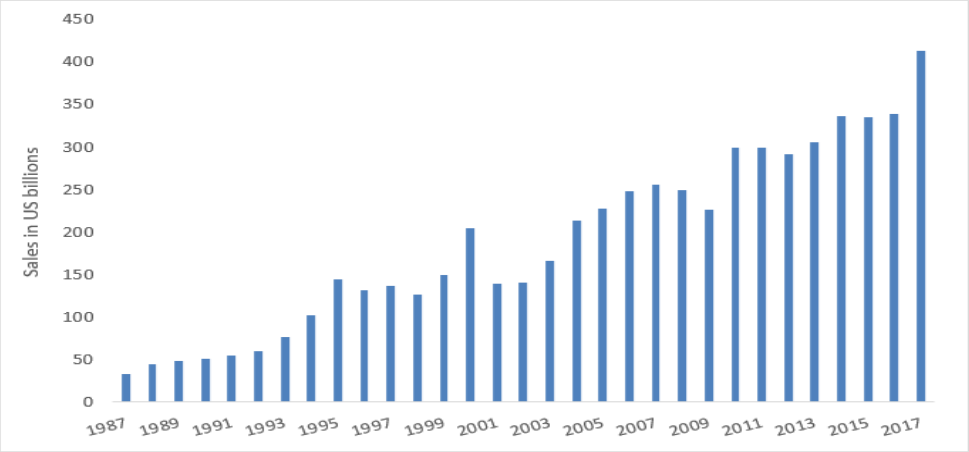

Figure 1 Global semiconductors sales 1987-2017. Source: SIA, WSTS 2017, Own contribution

Figure 2 shows market shares of the largest industry players. Despite the massive growth of a number of semiconductor giants, Intel kept its position as global semiconductor market share leader by the end of 2016.

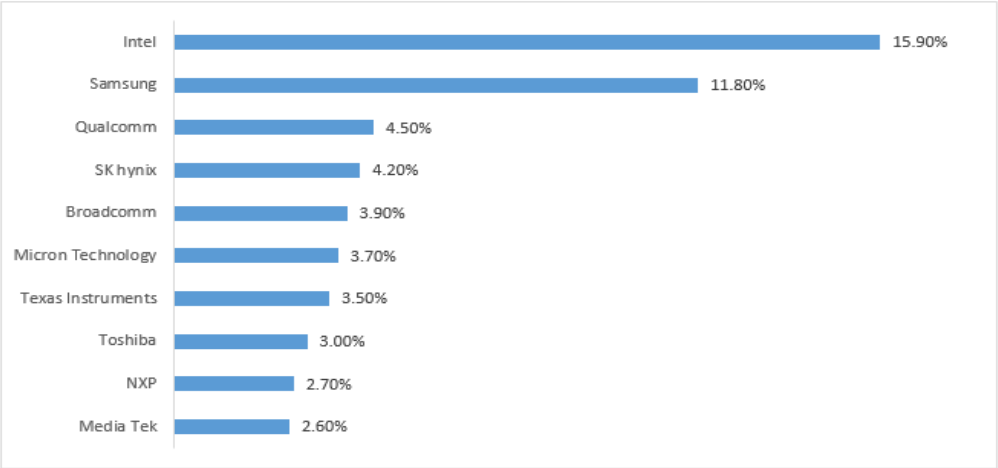

Figure 2 Global market share of the largest semiconductor vendors in 2016. Source: Statista, own contribution, 2017

The global semiconductor industry is dominated by the USA, Japan, South Korea, Taiwan, China and the European Union with the growing importance of new Asian markets and players (Figure 3). China and Japan were the only two regions with the annual sales increase of 9.2 and 3.8 percent, respectively. All other regional markets, Asia Pacific/All Other, Europe, and the U.S. experienced a decrease in sales compared to 2015 by -1.7, -4.5 , and -4.7 percent, respectively (SIA, 2017).

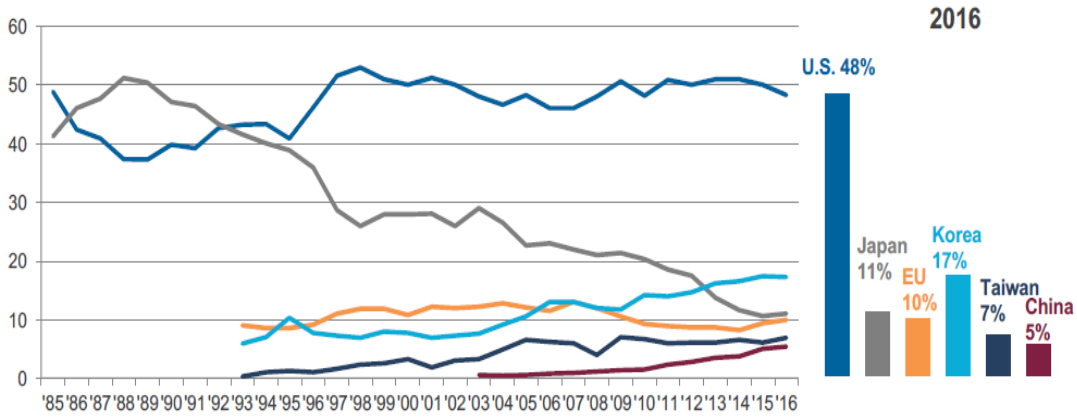

Figure 3 Semiconductors market by region 2016. Source: SIA, 2017

2.1.2 Industry classification

2.1.2.1 End-use application

Products ultimately purchased by consumers like personal computers or smartphones drive the demand in the semiconductors industry (SIA, 2017). The industry contains the following categories, classified by end-use application:

- Data processing: chips used in servers, computers, printers, and related hardware
- Communications: chips used in wired and wireless communication equipment such as smartphones, tablets, and broadband equipment
- Consumer electronics: chips used in household appliances, LCD TVs, and gaming consoles
- Industrial: chips used in scanning devices such as bar code scanners and point-of-sale terminals, medical devices such as patient monitors and ultrasound imaging, and power supply equipment
- Automotive: chips used in electronic automotive components such as power steering and lighting
- Military and civil aerospace: a specialized segment where integrated circuits related to a particular application are built

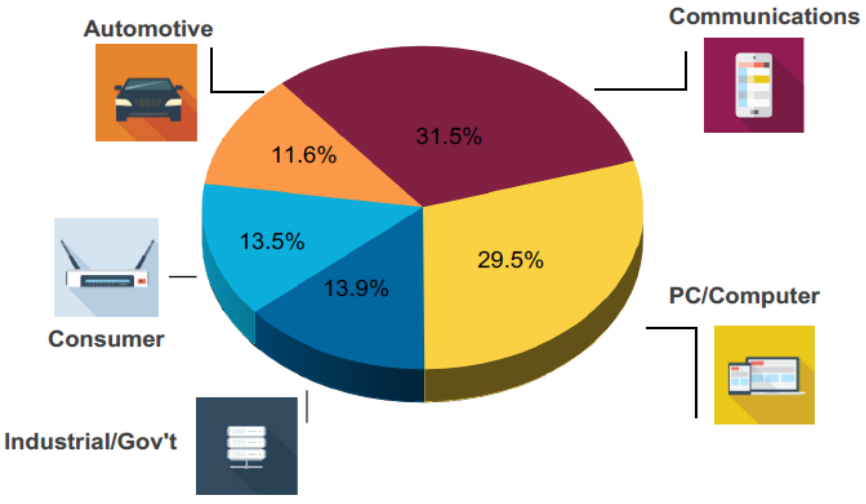

Figure 4 Percent of semiconductor demand by end-use 2016. Source: SIA, 2017

As shown in Figure 4, Communications and computing were the biggest consumers of electronics systems in 2016, while automotive was the fastest growing part. This is due

to the increase in the consumption of electronic components for safety, infotainment, navigation and fuel efficiency (SIA, 2017).

2.1.2.2 Product segments

The fast industry growth leads to the development of more advanced products and technologies for end-use industries. The largest product category by sales in 2016 was Logic with $91 billion in 2016, or 27.0 percent of the total semiconductor market (Figure 5). Logic, Memory, Analog together account for 64% of semiconductors sales (SIA, 2017).

Sensors was the fastest growing segment, with an increase of 22.7 percent in 2016. Besides sensors, digital signal processors ($2.9 billion/12.5 percent increase), diodes ($2.5 billion/8.7 percent increase), small signal transistors ($1.9 billion/7.3 percent), and analog ($47.8 billion/5.8 percent increase) also experienced a growth in sales (SIA, 2017).

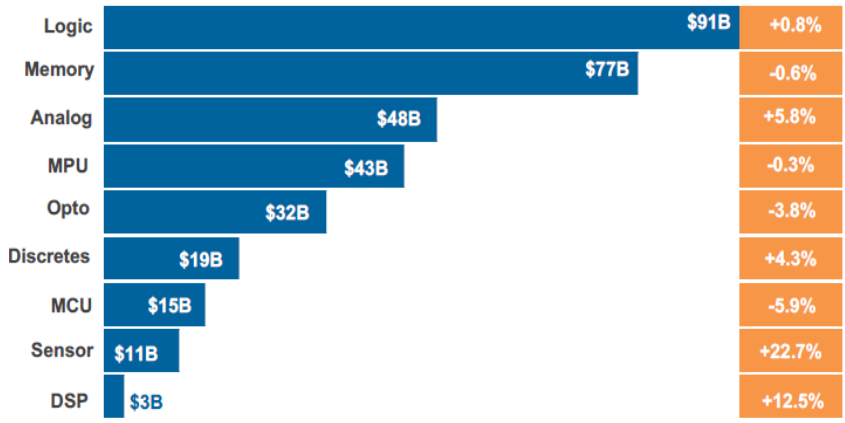

Figure 5 Distribution of worldwide semiconductors sales by product segment 2016. Source: SIA, 2017

2.1.3 Industry trends

The semiconductors industry is becoming increasingly competitive and subject to rapid technological and market developments, changes in industry standards, changes in customer needs, and frequent product introductions and improvements.

According to Nasdaq (2017), the emerging future drivers are products like smart-home applications, Ultra 4K HD TVs, , wearable fitness devices, automated driver-assist capabilities, which are also referred to as the Internet of Things.

The Internet of Things (IoT), is completely transforming the semiconductor industry and semiconductor companies could benefit from the IoT's expansion perhaps even more than other industry players. Semiconductors are used for a wide range of aspects of cloud

integration and connectivity, like computing, sensors, communications, and interactivity. However, semiconductor companies will have to go beyond their traditional focus on silicon, as chips only represent a small fraction of the value chain and instead provide comprehensive solutions, for instance, those that involve security, software, or systems-integration services in addition to hardware (McKinsey & Co., 2015). According to this, McKinsey &Co. (2015) proposed three different approaches to a business model for the IoT, as presented in Figure 6.

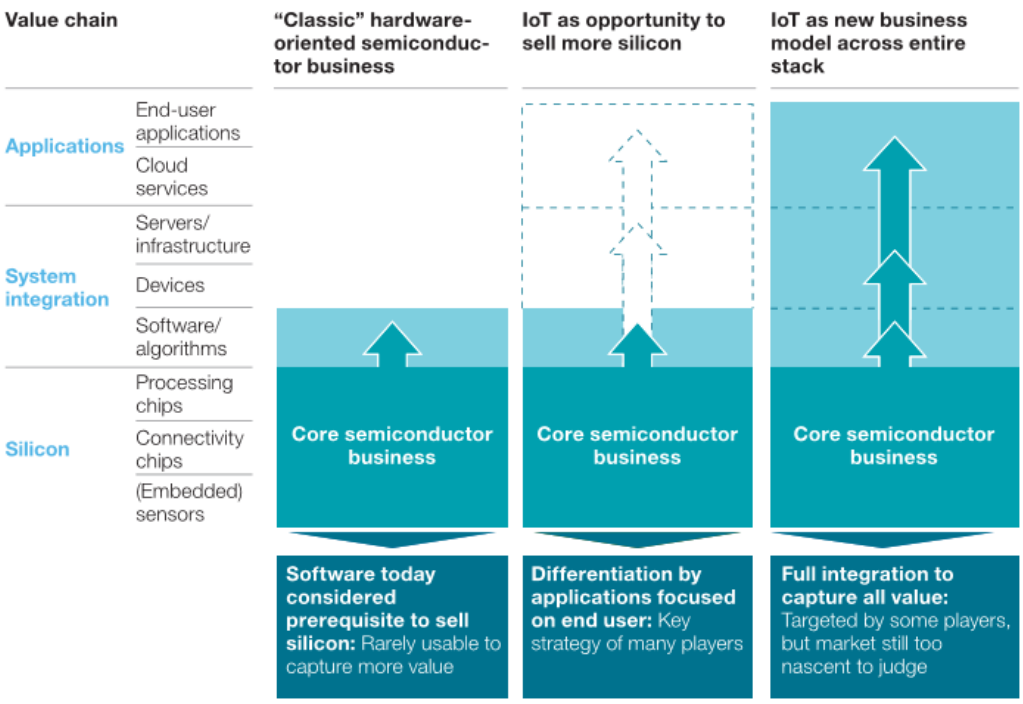

Figure 6 Semiconductor players' approaches to a business model for the IoT. Source: GSA and McKinsey&Co. Collaboration, 2015

Analyst show that the current Internet of Things installed base of connected devices is in the range of 7 billion to 10 billion and is forecasted to increase by about 15 to 20 percent annually over the next few years, reaching 26 billion to 30 billion by 2020 (McKinsey & Co., 2015).The McKinsey Global Institute (2015) estimated that the IoT could generate $4 trillion to $11 trillion in value globally in 2025, with a semiconductors revenue growth in smart cities of 8.9%, wearables 17.1%, industrial Internet 24.1%, connected homes 21.3% and connected vehicles 32.9%.

This reflects the IoT's transformational potential in both business-to-consumer and business-to-business applications. All of this could help the semiconductor industry to

maintain or surpass the average annual revenue increase of 3 to 4 percent reported over the past decade (McKinsey & Co., 2015).

2.1.4 Mergers and acquisitions

In order to be competitive in the new emerging IoT market, semiconductor companies can either try to use/develop their own products or undertake business combinations, including mergers, asset acquisitions and strategic partnerships with advanced players to gain broader expertise in software or the cloud.

As developing own product can be time consuming a well as cost intensive, semiconductor seem to rather perform mergers and acquisitions. This is reflected in the recent number of M&A in the industry. A huge number of M&A's worth hundreds of billion dollars have taken place over the last few years. A study conducted by Chen et al. (2016), analysts at McKinsey, showed that between 2001 and 2005, semiconductor companies conducted only about 7 deals per year, with an average value of $0.4 billion each. By contrast, from 2011 to 2014, they completed about 15 deals per year, and the average industry M&A deal site was almost $1.3 billion. (Chen et al, 2016).
As presented in Figure 7 M&A activity peaked in 2015 and 2016 with many large deals announced, and an average deal size of $4.9 billion in 2015 and $3.4 billion in 2016.

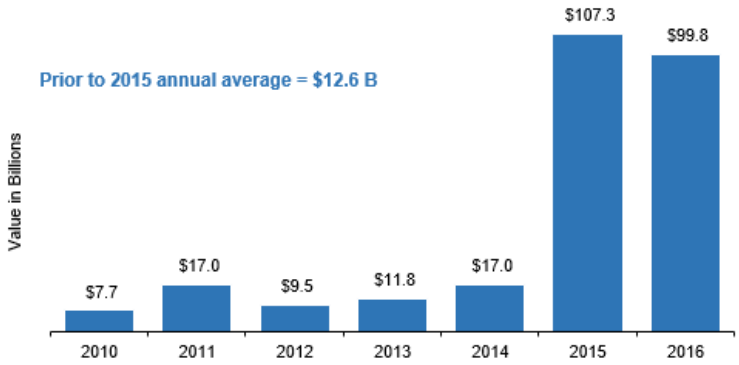

Figure 7 Value of semiconductors mergers and acquisitions 2010-2016. Source: Statista, own contribution 2017

2.2 Automotive/Autonomous driving industry

2.2.1 Industry overview

The automotive industry has been established long time ago and it has evolved ever since, but the major transformation is happening now as cars evolve from cars driven by humans

to self-driven cars. The driving force behind the autonomous automobile industry is the fast developing technology, the Internet of Things (Krasniqi and Hajrizi, 2016).

Today's cars have already been built in systems that can link to smartphones, offer emergency roadside assistance, register real-time traffic alerts, but this is about to change even dramatically. Besides that, autonomous cars are not some futuristic car, as some of them, like Googles' Waymo or Tesla's cars, are already on the road.

The evolution prediction of connected cars presented in Figure 8 shows us the car evolution path based on technology penetration and later developments.

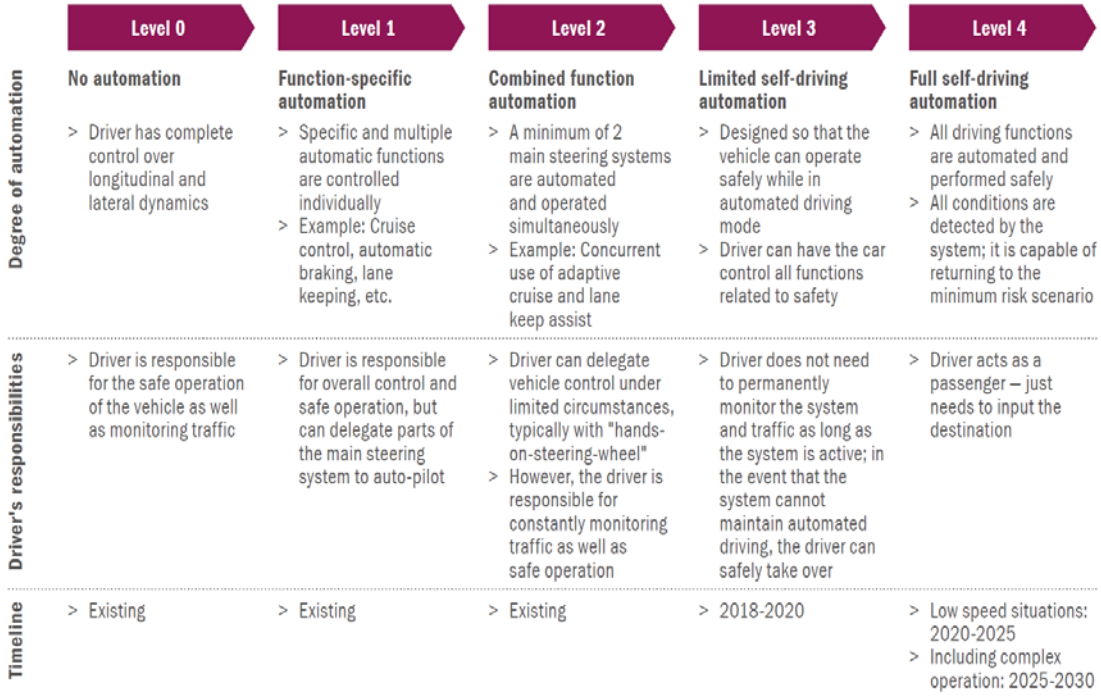

Figure 8 Car evolution path. Source: Roland Berger, NHTSA (National Highway Traffic Safety Administration), 2014

IoT will not only transform the automobile industry but will also change the industry overall supply chain, triggering a power struggle between traditional carmakers, giant tech companies as well as ambitious startups. Driven by the increasing demand for the new digital technologies used in autonomous cars, a list of companies from outside the traditional automotive supply base are playing an important role in providing all manner of automotive systems (Ninan et al, 2015).

The potential of the autonomous is huge with direct impacts on many sectors. McKinsey & Co. (2016a) study estimates that, once technological and regulatory issues have been resolved, up to 15 percent of new cars sold in 2030 could be fully autonomous. In the study McKinsey &Co. (2016b) estimates the car data market to grow to $450 - $750

billion by 2030. Figure 9 shows how the industry is likely to change between 2015 and 2030, if current trends continue as expected.

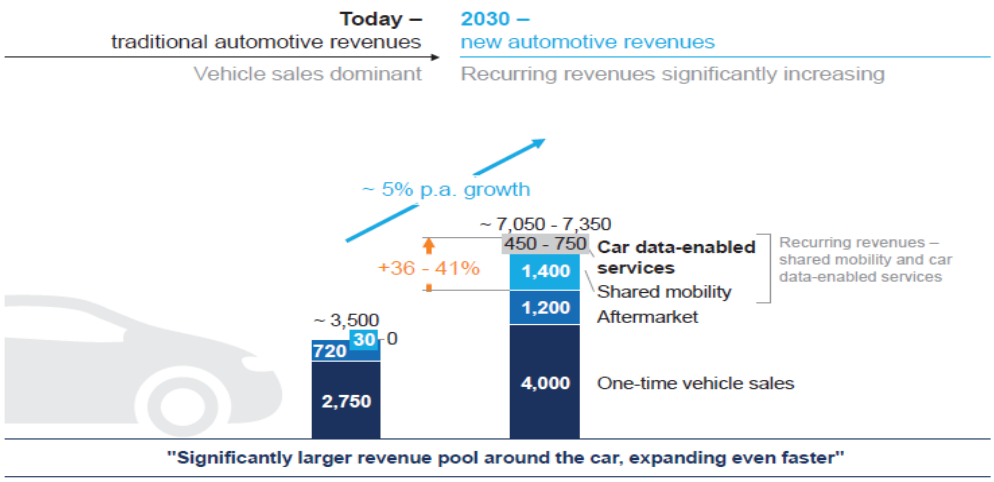

Figure 9 The automobile industry transformation change 2015 -2030. Source: McKinsey, 2016b

2.2.2 Industry classification

The autonomous driving industry is evolving to include a wide range of technologies and services, which PwC Strategy& study (2016, Pg. 14) grouped as follows:

Consumer services include the Internet- and cloud-based services connected to the driving experience. Some of the services are general Internet services like entertainment, e-commerce, social platforms, and healthcare while others are more specific to auto travel, and include services like ride sharing, car sharing, and navigation-related services (such as searching for a nearby accommodation and booking a room there).

Connected car packages which use advanced features to improve car's operation, will be offered as bundles. Currently, most of them are provided as built-in features, but they might also come in the form of an aftermarket service or be made available through smartphone apps. The safety package today includes features such as automatic braking systems, collision protection, and emergency assistance. This package also covers vehicle management services like fuel-efficient driving, remote maintenance and other capabilities.

Supply-side technologies support the provision of the previous two groups by providing the underlying systems that connect the car to the world. Supply-side technologies include advanced driver assistance systems (ADAS); the human–machine interface (HMI);

infotainment support; and the enabling services that provide access to connectivity, computing, and the cloud.

Such systems were provided by traditional suppliers in the past, but will increasingly be provided by newer technology companies, and even carmakers themselves, (if they can integrate vertically fast enough).

2.3 Peer group

This section will present a selection of the main peers of Intel and Mobileye. These peers will be used later in the financial analysis, as well as relative valuation. When selecting peers, it is crucial that the companies are comparable in terms of economic outlook and characteristics.

The competition in the autonomous vehicles market has been increasing all the time. This is not a surprise, given the huge potential in the market. Besides traditional carmakers (VW, Nissan, Honda, etc.) and traditional technology suppliers (Continental, Robert Bosch, Delphi, Autoliv Inc., etc.) there is an increasing number of software developers, start-ups and other technology providing companies entering the industry. The change in the competition structure is depicted in Figure 10.

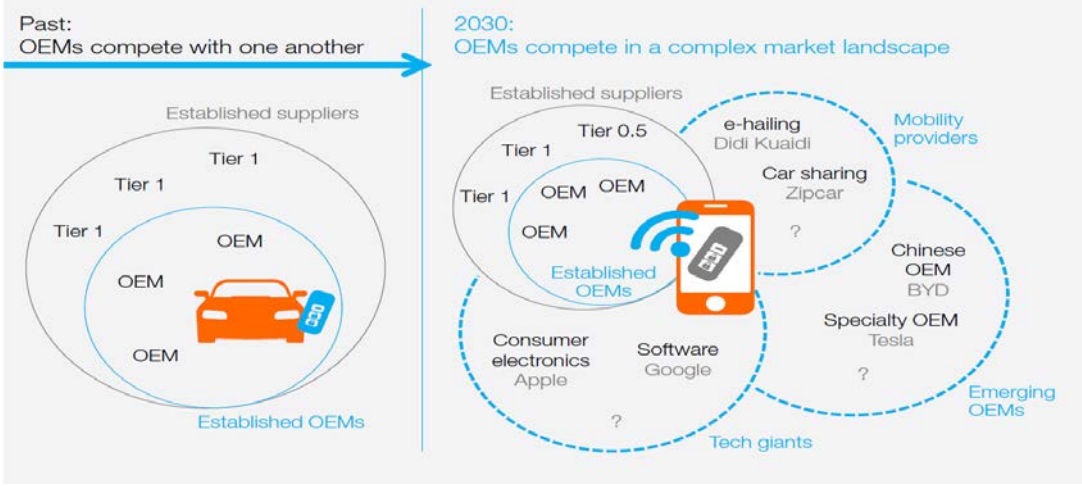

Figure 10 Competition change in the automobile industry. Source: McKinsey, 2016a

However, the issue of lacking perfect peers must be addressed as there are few truly comparable companies. The selection of core peers, includes other chip companies that have made investments in autonomous driving: Qualcomm, NXP, and Nvidia.

2.3.1 Qualcomm

Qualcomm is a U.S. telecommunications and semiconductor manufacturer. The company is a leader in the commercialization of a digital communication technology including connected telematics, WiFi, and car infotainment. The company is headquartered in San Diego, California (Qualcomm Website/About).

By 2016, Qualcomm had over 220 operational offices worldwide with 33,500 employees serving in those offices. The company is a fierce competitor in the technology sector with its revenue of 23.55 billion dollars and net income of 5.70 billion dollars. While the manufacture of chips provides the majority of its revenue, most of its profit is a result of patent licensing (Qualcomm Annual Report, 2016).

On October 27, 2016, Qualcomm announced a definitive agreement under which it will acquire NXP. The company will commence a tender offer to acquire all of the issued and outstanding common shares of NXP for $110 per share in cash, for estimated total cash consideration of $38 billion. The company raised its offer in January 2018 to take the value of the deal from $38 billion to $44 billion which corresponds to the value of $121 per share (Qualcomm Newsroom, 2016).

The slowdown of the smartphone market as well as the legal battles, made the acquisition necessary to increase Qualcomm's growth in the automotive and IoT space.

2.3.2 NXP

NXP is a Dutch semiconductor manufacturer. The company is headquartered in Eindhoven, the Netherlands. The company was founded in 1953 as part of the electronics firm Philips, and was sold in 2006 to a consortium of private equity investors, at which the name was changed to NXP (NXP Website/About).

NXP is the leader in high-performance, mixed-signal semiconductor electronics in automotive, broad-based microcontrollers, secure identification, network processing and radio frequency (RF) power products. Its product solutions are used in a range of application areas, including automotive, identification, wireless infrastructure, lighting, industrial, consumer, computing, and software solutions for mobile phones. The company is the largest vendor of automotive semiconductors with the 14% market share and is also the major player in chips for security cards and the IoT. As of 2016, the company had 31,000 employees in more than 33 countries and posted a revenue of 9.5 billion (NXP Annual Report, 2016).

2.3.3 Nvidia

Nvidia is a semiconductor manufacturer and the leader in systems for visual computing. The company is headquartered in Santa Clara in the United States. It was founded in 1993. The company started making graphic chips for the gaming industry and has slowly carved out a name for itself with the production of its shield tablet, shield portable and shield android TV. In 2016 Nvidia had a revenue of 5.01 billion and assets worth 9.84 billion with approximately 10,000 employees (Nvidia Annual Report, 2016).

From 2014 on, Nvidia shifted its focus to concentrate on four key area: data centers, gaming, auto and professional visualization with its latest focus coming in the form of artificial intelligence. Nvidia leverages its years of experience to gain a foothold in automotive and quickly reach a high degree of scale and maturity. The company is already at the forefront, working with more than 80 automakers, tier 1 suppliers, and start-ups on their autonomous car projects, some of them including Mercedes, Tesla, Audi, and Conti. (Nvidia Website/About).

2.4 Intel

2.4.1 Company overview

Intel is an American multinational corporation and technology company and among the world's largest manufacturers for the computing and communications end markets. The company is headquartered in Santa Clara, California, and since 1974 the central European head office has been in Munich. It was founded on July 18, 1968, as Integrated Electronics Corporation by semiconductor pioneers Robert Noyce and Gordon Moore, also known by the Moor´s law[2].

The company is the creator of the x86 series processors, found in most personal computers. Besides that, Intel also makes chipsets, network interface controllers and integrated circuits, flash memory, embedded processors, wireless and wired connectivity products and other devices related to communication, networking and computing (Intel Website/Timeline). In 2016 Intel was a world leader with 80% market share in its two largest product segments, PC and server processors.

Intel's initial products were memory chips, including the world's first metal oxide semiconductor, the 1101, which did not sell well. The company's first big success was

[2] Moore's Law states that the transistor count in integrated circuit chips doubles every one to two years

the 4004 microprocessor that came in 1971. This is also the year when the company went public at $23.50 per share, raising $6.8 million. In 1974 Intel launched its 8080 microprocessor, considered as the first true general-purpose microprocessor which featured 4,500 transistors and had about ten times the performance of its predecessors (Intel Website/Timeline).

Intel invested heavily in new microprocessor designs in the 1990s fostering the rapid growth of the computer industry (Intel Website/Timeline). During this period Intel became the dominant supplier of microprocessors for PCs and its chips were found in almost every PC except Apple Inc.'s Macintosh, which had used CPUs from Motorola since 1984. This changed under the leadership of Craig Barett and in 2005 Apple CEO Steve Jobs shocked the industry when he announced future Apple PCs would use Intel CPUs (Apple Newsroom, 2005).

Intel is a company known for aggressive and anti-competitive tactics in defense of its market dominance, particularly when threatened by competition. In the period 2009-2010, Intel saw the end to several high-profile antitrust cases that it had been tangled up in for years. (Tang & Brown, 2011). One of them includes "The Intel antitrust case", where the European Commission found Intel guilty for abusing its dominant market position. The decision imposed a record fine of EUR 1.06 billion and obliged Intel to break off the identified illegal practices. (EU Commission, 2009).

Intel challenges were reflected in recent year's figures. Macroeconomics trends like fast-progressing technology, change in consumers' behavior and the increasing consolidation in the industry as well as the slow growth of Intel's PC business gets the company new challenges. Not responding to it could lead to fewer customers, partners or suppliers, any of which could ultimately negatively affect Intel's financial results.

The company is now evolving from a PC-Centric to a Data-Centric company, delivering products that play critical roles in processing, storing, analyzing, and sharing data to enable competitive advantages. In other words, Intel is building the foundation for technology's data-driven future. Thus, the company is expanding and hopes to lead the industry in the fast growing Internet of Things (IoT) memory and artificial intelligence (AI) 5G products (Intel Newsroom/Krzanich, 2016). But transitioning could cost Intel´s lead position in the semiconductors industry.

2.4.2 Business overview

Intel has the following operating segments (Intel Annual Report, 2016):

- Client Computing Group (CCG) - Includes platforms designed for notebooks and desktops (including 2-in-1, thin-and-light, high-end desktop, and all-in-one PCs) and wireless and wired connectivity products and mobile communication components.
- Data Center Group (DCG) - Includes workload-optimized platforms and related products designed for enterprise, cloud, and communication infrastructure market segments.
- Internet of Things (IoT) - Includes platforms designed for Internet of Things market segments, including retail, transportation, industrial, video, buildings and smart cities, along with a broad range of other market segments.
- Non-Volatile Memory Solutions Group (NSG) - Includes NAND flash memory products primarily used in solid-state drives.
- Intel Security Group (ISecG) - Includes security software products designed to deliver innovative solutions that secure computers, mobile devices, and networks around the world (will be divested).
- Programmable Solutions Group (PSG) - Includes programmable semiconductors (primarily FPGAs) and related products for a broad range of market segments, including communications, data center, industrial, military, and automotive.

Intel's total revenues for the years ending with December 31, 2016, 2015 and 2014 were $59,397M, $55,355M $55,870M, respectively. The net income in accordance with U.S. GAAP was $10,316M, $11,002M and $15,347M for 2016, 2015 and 2014, respectively. The Client Computing Group and the Data Center Group are Intel's largest business units and account for 55% and 29% of revenue, respectively, while the fastest growing unit was the IoT with a 15% YoY growth compared to 2015. The Programmable Solutions Group unit was created during Q1 2016 subsequent to the acquisition of Altera. (Intel Annual Report, 2016).

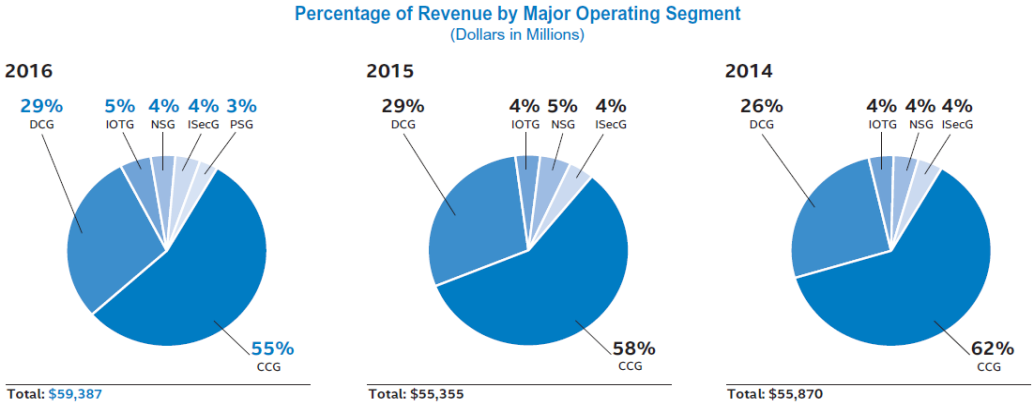

Figure 11 Percentage of revenue by major operating segments in 2016. Source: Intel annual report 2016

2.4.3 Operations overview

Intel has manufacturing facilities in the U.S. (Oregon, Arizona, New Mexico), Europe (Ireland) and Asia (China, Vietnam, Malaysia and Israel). The majority of Intel's wafer manufacturing was conducted within the U.S., while most of Intel's revenue was generated in the Middle East. As of December 31, 2016, Intel had 106,000 employees worldwide, with approximately 50% of those employees located in the U.S. (Intel Annual Report, 2016).

2.4.4 Customers

Intel's main customers are original equipment manufacturers (OEMs) and original design manufacturers (ODMs). In addition, their customers include other manufacturers and service providers, such as industrial and communication equipment manufacturers and cloud service providers, who buy the products through distributor, reseller, and retail channels around the world. Some of their customers include: Dell, Lenovo, HP Inc. and Apple. For 2016, their three largest customers accounted for 38% of our net revenue, with Dell accounting for 15%, Lenovo accounting for 13%, and HP accounting for 10%. These three customers accounted for 31% of the accounts receivable as of December 31, 2016 (Intel Annual Report, 2016).

2.4.5 Management structure

Andy D. Bryant has been the Chairman of the Board of Directors since May 2012. He joined Intel as a controller for the Commercial Memory Systems Operation in 1981 and became the Systems Group Controller in 1983. He was promoted to the director of Finance for the corporation in 1987, and was appointed as the vice president and the director of Finance of the Intel Products Group in 1990. Bryant became CFO in February

1994, and was promoted to the senior vice president in January 1999. Bryant expanded his role to the Chief Financial and Enterprise Services Officer in December 1999. In October 2007, Bryant was named the Chief Administrative Officer. In 2009 Bryant's responsibilities expanded to include the Technology and Manufacturing Group. Prior to joining Intel, he held positions in finance at Ford Motor Company and Chrysler Corporation. Bryant holds a bachelor's degree in economics from the University of Missouri and a master's degree in business administration with a concentration in finance from the University of Kansas (Intel Annual Report, 2016).

Brian M. Krzanich has been the Chief Executive Officer and a member of Intel's Board of Directors since May 2013, replacing Paul Otellini. Krzanich held a series of senior technical and leadership roles at Intel. He was named the Chief Operating Officer (COO) in January 2012. His responsibilities included leading an organization of more than 50,000 employees spanning Intel's Technology and Manufacturing Group, Intel Custom Foundry, supply chain operations, the NAND Solutions group, human resources, information technology and Intel's China strategy (Intel Newsroom, 2013).

Krzanich listens to customer's needs and has an open-minded approach to problem solving which led to extending the company's product and technology leadership and creating billions of dollars in value for the company. In 2006, he drove a wide change of Intel's production lines and store network, enhancing factory velocity by 60 percent. Krzanich is also associated with propelling the business' progress with bringing down the 450mm wafer producing cost through the Global 450 Consortium (Gasior, 2013).

Krzanich began his career at Intel in 1982 in New Mexico as a process engineer. He holds a bachelor's degree in chemistry from San Jose State University and has one patent for semiconductor processing. He is also a member of Deere & Company's board of directors, and the chairman of the board of directors of the Semiconductor Industry Association (Intel Newsroom/Biographies, 2018).

2.5 Mobileye

2.5.1 Company overview

Mobileye N.V. is one of the leading companies in the development of computer vision and machine learning, data analysis, localization and mapping for Advanced Driver Assistance Systems and autonomous driving. The company was founded in 1999 by Amnon Shashua, when he evolved his academic research into a technical solution for a

vision system which could detect vehicles using only a camera and software algorithms on a processor. After receiving a license to use the technology which was owned by Yissum, it was possible to incorporate the company. Together with Ziv Aviram, he set up the company in Jerusalem, Israel. Shashua is the Chief Technology Officer, while Aviram is the Chief Executive Officer (Mobileye Website /Timeline).

At the beginning Mobileye developed algorithms, and a custom accelerator processor chip called the EyeQ chip. All of the company's processing algorithms run on the EyeQ chip. After several years of testing, the chip and software algorithms began to be sold as commercial products to original equipment manufacturer (OEM) customers. Mobileye's first clients were automotive manufacturers such as General Motors, BMW, and Volvo. At first, Mobileye's technology was sold as an optional accessory when buying a new car, and later it was a standard in new cars (Mobileye Website/Timeline).

The company went public on August 6, 2014. Out of the 35.6 million shares being offered, the company was selling 8.33 million while the rest was sold by shareholders. The shares were priced at $25 for a total net value of $890 million, a biggest Israeli IPO in the US. (Coppola, Picker, 2014; Thomson One).

On March, 20, 2015, Mobileye closed their secondary public offering of 19,696 thousand ordinary shares sold at a price of $41.75 per share by shareholders who had acquired their shares prior to the IPO. The company listed their shares on the NYSE, and traded under the symbol "MBLY" until August 2017- the official ending of Intel`s tender offer (Thomson One).

Tesla Motors announced in August 2015 that it was using Mobileye's technology to enable its self-drive solution, which would be incorporated into Model S. However, after the first deadly crash on May 7, 2016 involving the Model S with active Autopilot in June 2016, Mobileye announced the end of its partnership with Tesla (Hull, 2016).

The company is the global leader in the development of monocular vision based advanced collision avoidance systems, providing system on chip and computer vision algorithms to run Driver Assistance Systems (DAS) functions. The company's proprietary software algorithms and EyeQ chips perform detailed interpretations of the visual field in order to anticipate possible collisions with other vehicles, pedestrians, cyclists, animals, debris and other obstacles (Mobileye Annual Report, 2016).

In addition, Mobileye has an aftermarket department which offers aftermarket Advanced Driver Assistance System that leverages the algorithms and EyeQ chips used in new vehicles. This aftermarket system can be installed in any vehicle and it is sold to an international network of distributors on all continents who sell the products to fleets of trucks and buses, to car dealerships, and to car accessory shops (Mobileye Annual Report, 2016).

Mobileye's trusted solutions continue to be integrated into new vehicle models, with planned implementation into for more than 250 models from 21 world's major automakers including BMW, Ford, General Motors, Nissan, Volvo, Audi and Hyundai. It is estimated that by the end of 2016, Mobileye's technology was used in over 15 million vehicles worldwide (Mobileye Annual Report, 2016).

The company won the International Fleet Industry Award in 2011 and 2013 and has been picked as a Top100 Innovator by U.S. Red Herring magazine. The company holds 41 U.S. patents, 6 European patents, 53 U.S. patent applications, 29 European and other non-US patent applications, and provisional patent filings (Mobileye Annual Report, 2016).

2.5.2 Business overview

Mobileye's-based Advanced Driver Assistance System technology that covers all major safety and convenience-related functions includes (Mobileye Annual Report, 2016):

Safety Functions

- Lane functions - Lane Departure Warning (LDW) and Lane Keeping and Support (LKS); Vehicle detection functions - Forward Collision Warning (FCW), Headway Monitoring and Warning (HMW), Adaptive Cruise Control (ACC), Traffic Jam Assist and Automatic Emergency Braking (AEB)
- Pedestrian detection functions - Pedestrian Collision Warning (PDW) and Pedestrian Automatic Emergency Braking
- Animal detection functions
- General objects detection features
- Convenience and Driving Enhancement Functions - Adaptive High Beam Control (AHC) and Traffic Sign Recognition (TSR)

Driving Enhancement Functions

- Intelligent High Beam Control (IHC), Traffic Sign

Autonomous Driving Technologies

Car programs for Level 3 autonomy and beyond, fall within the following key areas:

- Sensing capabilities which, in addition to ADAS safety and convenience functions, contain drivable path delimiter capabilities, including detection of barriers, construction zone obstructions, general obstacles, road bumps and debris as well as other technologies which help to interpret the driving scene for autonomous driving
- Mapping to support fully autonomous driving
- Driving policy to enable autonomous cars to drive in a complex environment by taking into consideration the response of other road users to our own actions which enables the navigation in difficult scenarios

Mobileye has two business segments:

- OEM segment - supplies the proprietary software algorithms and EyeQ chip that are the core technology of the complete ADAS to the Tier 1 companies that are the system integrators for the automotive industry
- AM (Aftermarket) segment - includes complete systems, which include Mobileye's proprietary software algorithms and EyeQ chip as well as the camera and other necessary components

For the years ending with December 31, 2016, 2015 and 2014, Mobileye's total revenues were $358.2 million, $240.9 million and $143.6 million, respectively, representing year-over-year total revenue growth of 49% and 68% for the two most recent fiscal years. The most revenue is comes from sales to OEM (77% of revenue) with a growth of 36%, from 2015 to 2016. However, the aftermarket sales increased more, by 113% from 2015 to 2016. The net income (loss) in accordance with U.S. GAAP was $108.4 million, $68.5 million, and $(30.1) million for 2016, 2015 and 2014, respectively (Mobileye Annual Report, 2016).

2.5.3 Operations overview

Mobileye operates its machine vision R&D headquarters from Jerusalem and additionally has offices in the U.S., Germany, Japan, and China and over 100 distributors in over 48 countries. As of December 31, 2016, the company had 663 full-time-equivalent employees, including 473 full-time-equivalent employees engaged in research and development, primarily in Israel, 71 full time-equivalent employees in general

management, administration and finance, 90 full time-equivalent employees in sales and marketing and 29 full time-equivalent employees in operations, manufacturing and quality assurance. The company also has approximately 1.000 full time-equivalent personnel in quality assurance employed by an exclusive subcontractor in Sri Lanka (Mobileye Annual Report, 2016).

2.5.4 Customers

Mobileye has strong direct relationships with OEMs. The company's products are or will be available in production vehicles from most of the global OEMs, including: BMW, Ford, GM, Honda, Hyundai, Opel, Audi, Chevrolet, Volkswagen, Volvo and others (Mobileye Annual Report, 2016).

Mobileye's technology is being supplied to OEMs through automotive system integrators, known as Tier 1 suppliers, which are direct suppliers to vehicle manufacturers. Sales to OEMs represented approximately 77% and 84% of the total revenues in the years ended December 31, 2016 and 2015, respectively. Some of Mobileye's Tier 1 customers include Autoliv, Inc., Delphi Automotive Plc, Gentex Corporation, HiRain, Key Safety Systems, Sony Corporation and others (Mobileye Annual Report, 2016).

Aftermarket customers include commercial and governmental fleets, vehicle importers and dealers, insurance companies and end users. Aftermarket sales represented approximately 23% and 16% of the total revenues in the years ended December 31, 2016 and 2015, respectively (Mobileye Annual Report, 2016).

2.5.5 Management structure

Professor Amnon Shashua is the co-Founder, Chief Technology Officer, Chairman and an executive director, and former Chairman of the supervisory board. Professor Shashua holds the Sachs Chair in computer science at the Hebrew University of Jerusalem. His field of expertise is computer vision and machine learning with emphasis on theoretical studies of deep networks. He received the MARR Prize Honorable Mention in 2001, the Kaye Innovation Award in 2004 and the Landau Award in Exact Sciences in 2005. He has published more than 120 scientific papers, and continues to be an active academic researcher. He is also the co-founder in 2010, the Chief Technology Officer and the Chairman of OrCam, an Israeli company that has recently launched an assistive product

for the visually impaired based on advanced computerized visual interpretation capabilities (Mobileye Annual Report, 2016).

Ziv Aviram is a co-Founder, President, Chief Executive Officer and an executive director. Mr. Aviram is also a co-founder in 2010, President and Chief Executive Officer of OrCam. Prior to founding Mobileye, he was the chief executive officer of three private Israeli companies, all leaders in their fields (Keter — Retail Chain, Gali — Retail Chain, Attrakzia). In all three cases, Mr. Aviram led the companies from loss to profit by restructuring the organization appropriately. He earned a B.A. in Industrial Engineering and Management from Ben-Gurion University in 1984. Intel and Mobileye announced Aviram's retirement in August 2017 as Intel completed its tender offer for Mobileye (Mobileye Annual Report, 2016).

3 Strategy analysis

In the following section the strategy of Intel and Mobileye, as well as the strategic fit of both companies will be analyzed.

3.1 Intel's strategy

Intel has defined the following "Strategic imperatives" (Intel Website/Support):

- Defend and extend the core PC and server businesses
- Expand into profitable, related adjacencies
- Selectively disrupt markets and adapt Intel formula
- Continue to develop Go Big opportunities

Intel's leading position in the PC business has left not much room for growth and the company has to figure new ways of growing and maintaining competitive. Intel already missed the smartphone revolution before they even realized it had started. The company had an inconsistent strategy called "XScale" and their chips were never able to match the competitor ones in terms of performance, efficiency, or price (Dilger, 2015). Now, the company doesn´t want to miss the next opportunity and big computing revolution: autonomous cars. The CEO of the company, Brian Krzanich, calls the new company focus "the big bets".

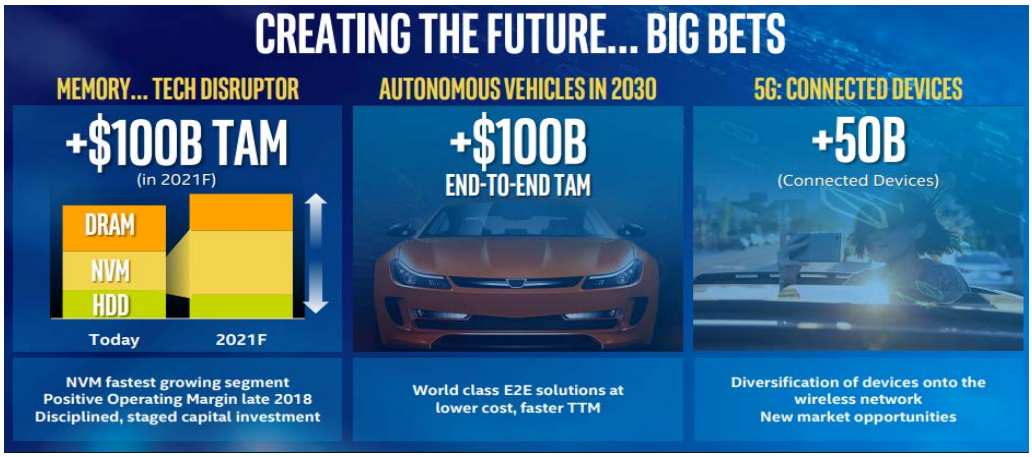

Figure 12 "Intel's Big Bets 2017". Source: Intel's presentation at Global Technology Conference 2017

Intel's plan is to invest in order to grow their existing capabilities. In their "transformation" Intel plans to shift their R&D focus to become a more data-centric company. The capital investment silicon wafer manufacturing should remain flat, but on the other side Intel wants to increase their capital investment in memory business and in companies of artificial intelligence, startups and market leaders in the emerging technology space (Intel Annual Report 2017). Some of the examples are the investment of 15 percent stake in HERE, a global provider of digital maps and location-based services for automotive and the Internet of Things as well as $250 million worth investments in start-ups working on driverless car technologies (Thomson One). Moreover, the company created a partnership in 2016 with Mobileye and BMW with a goal to put a fully autonomous vehicle into serial production in 2021 (Intel Newsroom, 2016).

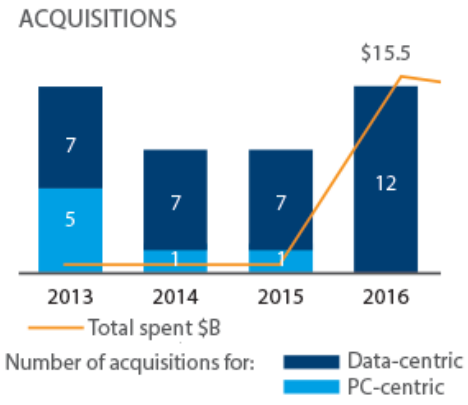

Figure 13 Number of Intel's acquisitions 2013 – 2016. Source: Intel annual report 2017

The acquisitions and partnerships complement Intel's strategic objectives and stimulate growth of the data-centric opportunities. Other important strategic announcements from Intel at Consumer Electronics Show (CES) 2017 included a new 5G modem, an

automated driving platform called “Intel GO” and the expectation of having 40 autonomous test vehicles on the road by the end of 2017.

3.2 Mobileye’s strategy

Since its inception, Mobileye’s goal has been to develop vision-based-systems to improve on road safety and reduce collisions. Furthering this goal, Mobileye developed systems which offer multiple lifesaving features in a single bundle, empowering drivers to mitigate and avoid collisions while improving driving behavior. What began as a mission to reduce vehicle injuries and fatalities has quickly become the most advanced collision avoidance system on the market (Mobileye Website/About Mobileye).

ADAS technologies like Automatic Emergency Braking can make a meaningful impact, but the adoption rates for those system grows. Carmakers around the world are accelerating their development to higher levels of autonomous vehicles (Mobileye Website/Future of Mobility).

In line with this, Mobileye is putting their effort into developing a technology which will revolutionize the driving experience by enabling autonomous driving. The company already has plans to start the production of EyeQ4 and EyeQ5 chips for Level 3/4 autonomous driving programs in 2018 and 2020 respectively (Mobileye Website/Evolution EyeQ). Moreover, Mobileye is now developing its multi-camera-based HD map enhancing Road Experience Management (REM^{TM}), an end-to-end mapping and localization engine for full autonomy system, which is expected to be launched in 2018 (Mobileye Website/REM^{TM}).

3.3 Analysis of the strategic fit between Mobileye and Intel

Given the company’s complementary capabilities, Intel-Mobileye combination makes sense from both technology and strategic perspective.

Several years ago, dimensions which cars were compared by, were performance metrics like speed or acceleration. Today, advanced characteristics like entertainment system, navigation, parking assistance are gaining increasingly in importance (PwC Research, 2017).

The future for cars moves towards autonomous. Making an autonomous car is a collaborative effort because it contains several components such as digital maps, sensors

and autonomous algorithms. What makes it interesting is the amount of data an average autonomous car can collect in a day. This kind of data demands real-time processing and transfer of data from the car to the data center (cloud). Therefore, an immense computing power, including the latest microchips, is necessary in order to enable processing of large volumes of data in seconds to keep the cars safe on the road (Tanner, 2017).

Mobileye has a great independent business and is a leader in advanced driver assistance systems. The company has excellent growth, great earnings and strong partnership with 27 carmakers around the world. Using an artificial vision sensor, strategically installed in the vehicle, and the proprietary chip EyeQ, Mobileye Systems act like a driver's third eye. Mobileye helps a car to "see" and understand the situation on the road with its industry leading technology for the vision engine. Its technology includes various elements such as cameras, radar, sonar, LiDAR (light detection and ranging), sensor chips, in-car networking and roadway mapping (Mobileye Annual Report 2016).

Higher levels of driverless systems will require a lot of processing power and this is why the market is attractive to Intel. Intel connects a car with other vehicles and data centers through high-speed wireless technology. Its processors in data centers help a car interpret objects and make real-time decisions through artificial intelligence and machine learning (Tanner, 2017).

Intel has already developed a scalable platform which is capable of processing high amounts of data as well as driver policy and path planning logic. It is one of the pioneers in the development of 5G technology which should provide high performance and low latency connectivity between the car and the data center.

This transaction is in alignment with Intel's strategy to invest in data-intensive market opportunities that build on the company's strength in computing and connectivity. Moreover, Intel does not have the relationships with the OEMs and it is losing out to the competition (Nvidia, Qualcomm/NXP). Therefore, Mobileye's OEM relationships can be a valuable asset to Intel.

By pooling together Intel and Mobileye infrastructure and resources, the combined know-how in the areas of mapping, virtual driving, simulators, hardware, data centers and high-performance computing platforms can be enhanced and accelerated.

The combination of the two companies can provide a compelling value proposition for the automotive industry and it can position Intel as a leader in delivering technology for fully autonomous driving.

3.3.1 Strategic risks

Although there are numerous reasons why this acquisition is a good strategic step for Intel, there are some possible threats, which are important to mention as they could make the $15.3 billion acquisition a waste of money.

The first risk Intel faces with this acquisition is that Mobileye could fail to create an autonomous driving solution before commercially available cars adopt competitors' solutions. If this happens, Mobileye's current ADAS systems would become obsolete and would only sell in the low-end market with limited growth opportunities.

Furthermore, Intel has a history of reacting incorrectly to new and emerging platforms. One recent example of this is the fact that the company didn't enter the smartphone market until it was too late. Another example is the story of Intel's cyber security division, also known as McAfee, where Intel sold the division for $4.2 billion, five years after having bought McAfee for $7.7 billion (Intel Annual Reports, Intel Website).

Some potential risks are also government regulations, as the auto industry is highly regulated with significant government oversight. Autonomous driving is an opportunity for the company, but it is still not clear what the legal framework and government regulation (across the globe) for self-driving cars will be. For example, a delay in implementing regulations for active safety could allow the competition to catch up. Increasing competition in ADAS and autonomous driving could have a negative impact on pricing or shares of the company.

Considering the above-mentioned risks, a conservative approach in the stand-alone as well as combined-entity valuations was applied. Furthermore, a sensitivity analysis was performed in order to capture the possible influence on the value caused by changes in some core assumptions.

4 Financial analysis

To complement the strategic analysis, a financial analysis is carried out. A quality analysis of financial statements is a good basis for adequately evaluating acquisition strategies. A

profitable operation is an indication of economic strength, and is an important topic of corporate finance in order to maintain relationships with customers, debt- and shareholders as well as other stakeholders (Drake & Fabozzi, 2012).

The objective of the financial analysis is to examine different dimensions of a company's financial condition and performance. The trend and level of profitability, liquidity, activity, financial leverage as well as specific industry ratios for both Intel and Mobileye will be determined. In order to achieve this, several sub-questions need to be answered:

- **Liquidity**: Are the companies able to satisfy their immediate obligations?
- **Activity:** Are the companies getting the most use out of their asset deployment?
- **Profitability:** Are the companies efficient in managing their expenses?
- **Financial leverage:** How much do the companies rely on debt financing? Are they able to satisfy their long-term obligations?
- **Specific industry ratios:** Do the companies meet the specific requirements of industry?

As most ratios cannot be judged in isolation, they will be considered simultaneously with other dimensions of the company's performance, the trend over time and industry benchmarks. Equations (1) – (7), (9) – (12) from Section 4.1-4.4 will be based on calculation presented by Drake & Fabozzi (2012, Pg. 110-125).

4.1 Liquidity analysis

Liquidity is a very important feature of the company. Liquidity refers to a company's ability to satisfy its short-term obligations using assets that are quickly converted into cash. As the liquidity of the company is higher before maturity, it is more likely that it will not face the problem of insolvency in events of an increase in costs and outflows. Liquidity mostly refers to the current and quick ratio (Drake & Fabozzi, 2012).

The current ratio demonstrates a company's ability to satisfy its current liabilities with its current assets.

$$Current\ ratio: \frac{Current\ assets}{Current\ liabilities} \quad (1)$$

The quick ratio (also known as acid test ratio) is the ratio which indicates a company's ability to satisfy current liabilities with its most liquid assets (current assets less inventory).

$$Quick\ ratio: \frac{Current\ assets - Inventory}{Current\ liabilities} \quad (2)$$

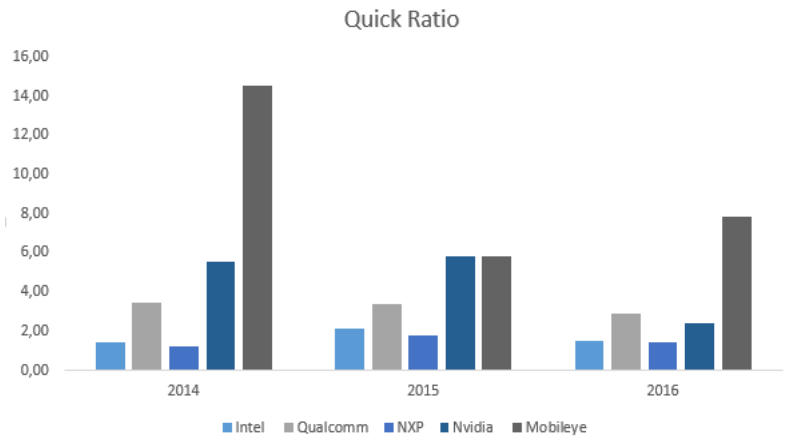

Figure 14 Liquidity analysis: Quick ratio. Source: Annual reports, own contribution

The result of the liquidity analysis are presented in Figure 14. In general, the higher the ratio, the better is the ability of the company to meet its immediate obligations. According to the so-called "Banker's rule" (also called two-to-one rule), the current ratio should be at least 2. (Kruschwitz, Decker & Röhrs, 2002, Pg. 283.). The rule of thumb for the acid test is that it should be equal or higher than one. If this is not the case, it means that some of the short-term liabilities are not covered by short-term assets which could lead to a liquidity shortage. While Intel keeps both ratios according to the rule of thumb, and within industry average, Mobileye seems to have excess cash, as cash represented approximately 36% of the balance sheet in 2016. This isn't always good, as this cash can lower the return on assets and the overall risk by destroying business value. Holding excessive cash is often just as bad as holding excessive debt (Passov, 2003). Anyway, considering that Mobileye is a young firm with high growth and investing opportunities, this cash represents a good source of internal financing.

4.2 Activity analysis

Activity ratios measure how well company's assets are used. Activity ratios can be used to evaluate the benefits produced by specific assets, such as inventory accounts receivable by all company's assets collectively. The most common turnover ratios are the inventory turnover and total asset turnover (Drake & Fabozzi, 2012).

Inventory turnover determines how many times inventory is created or purchased and sold during the period.

$$Inventory\ turnover = \frac{Cost\ of\ goods\ sold}{Inventory} \quad (3)$$

Intel is, with a 4.3 average inventory turnover rate, slightly above the average of the peer group, which implies strong and fast sales, while Mobileye's average inventory turnover rate is slightly under the average.

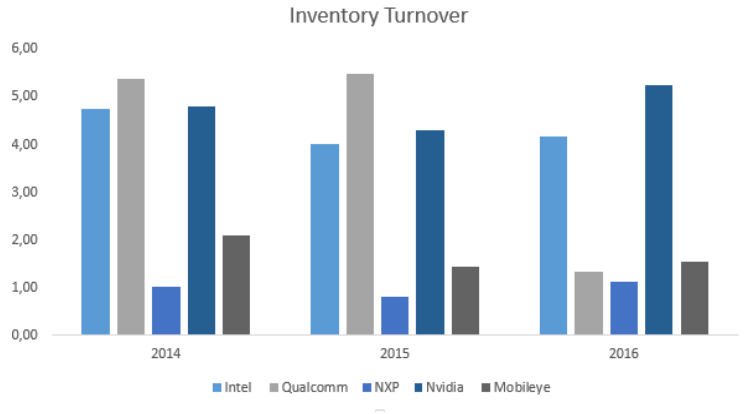

Figure 15 Activity analysis: Inventory turnover. Source: Annual reports, own contribution

Total asset turnover is the ratio of revenues to total assets and it indicates how much of investment in total assets results in revenues. The number can also be interpreted as a multiple of the revenues generated from investments in total assets.

$$Total\ asset\ turnover = \frac{Revenues}{Total\ assets} \quad (4)$$

For every dollar in assets, Intel generated $0.56 in sales on average for the last three years, while Mobileye generated $3.27. Intel low total asset turnover corresponds to the industry average and high capital intensive nature of the business, while Mobileye's higher ratio indicates that it is efficiently employing its assets.

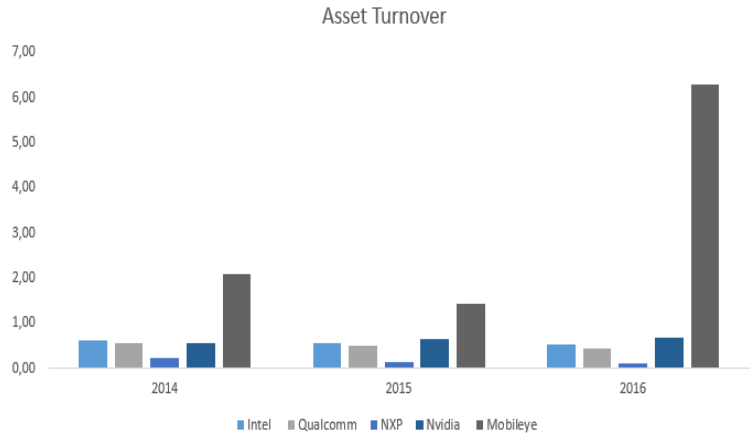

Figure 16 Activity analysis: Asset turnover. Source: Annual reports, own contribution

4.3 Profitability analysis

Profitability ratios compare components of income with revenues (Drake and Fabozzi, 2012). In the following section the gross margin, operating margin and profit margin will be presented.

The gross profit margin is the ratio of gross income or profit to revenues and measures how much of every dollar of revenues is left after the deduction of costs of goods sold:

$$Gross\ profit\ margin = \frac{Gross\ income}{Revenues} \quad (5)$$

The operating profit margin is the ratio of operating profit (earnings before interest and taxes, EBIT) to revenues and indicates how much of each dollar of revenues is left over after the deduction of operating expenses:

$$Operating\ profit\ margin = \frac{Operating\ income}{Revenues} \quad (6)$$

The net profit margin is the ratio of net income to revenues. This ratio measures how much of each dollar of revenues is left over after all expenses:

$$Net\ profit\ margin = \frac{Net\ income}{Revenues} \quad (7)$$

EBITDA has become a common measure of performance that is supposed to overcome the problem of accounting differences (Suozzo, et al., 2001). EBITDA excludes interest, depreciation, amortization and taxes, and therefore provides the investor a clear view of a company's operating profitability (Krause. & Arora, 2010, Pg.89).

$$EBITDA\ margin = \frac{EBIT+Depreciation+Amortization}{Revenues} \quad (8)$$

The findings of the profitability analysis, presented in Figure 17, indicate that both Intel and Mobileye are amongst the most effective producers in the peer group. However while Intel's profitability decreased over the last three years, Mobileye's profitability saw a significant increase. Its business model seems to produce extraordinary high profitability. Some of the reasons for Intel's recent profitability decrease are explained in Section 2.4. Mobileye had the best results in almost all categories in the last two years. The only exception is the gross margin in 2016, which was outperformed by Qualcomm. NXP's low profitability ratios in 2016 are one-time event and can be explained by higher operation costs due to amortization of intangible assets (through the acquisition of Freescale).

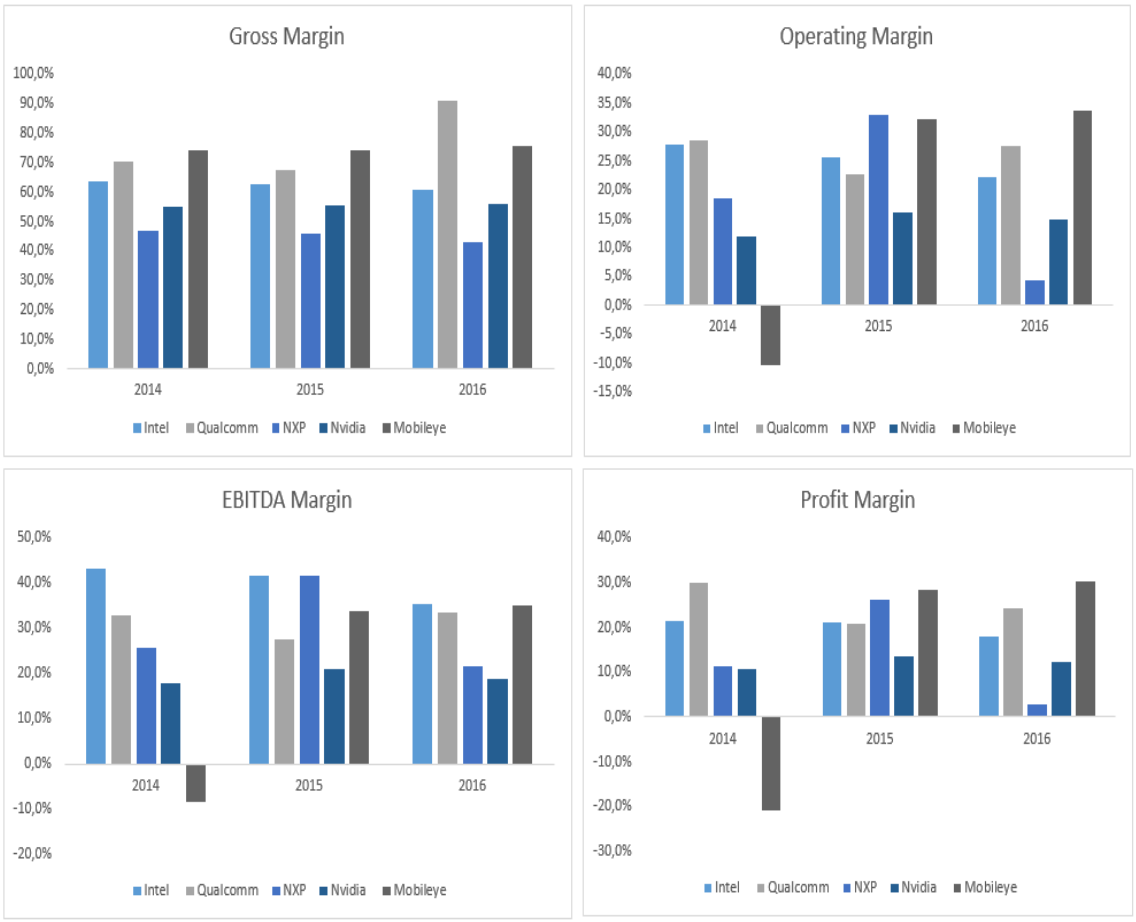

Figure 17 Profitability analysis. Source: Annual reports, own contribution

The operating return on assets is the ratio of company's net profit to assets and indicates the net income generated per dollar invested in total assets.

$$Return\ on\ assets = \frac{Net\ income}{Total\ assets} \tag{9}$$

This ratio measures what the company receives, as a whole, from the investment it has made in assets. This is also reflected in the market value of the company, as companies that can generate a relatively high income from its assets will typically possess a market value that is far higher than its book value. Mobileye outperformed the peer group in the last two years with an ROA of 13.9%.

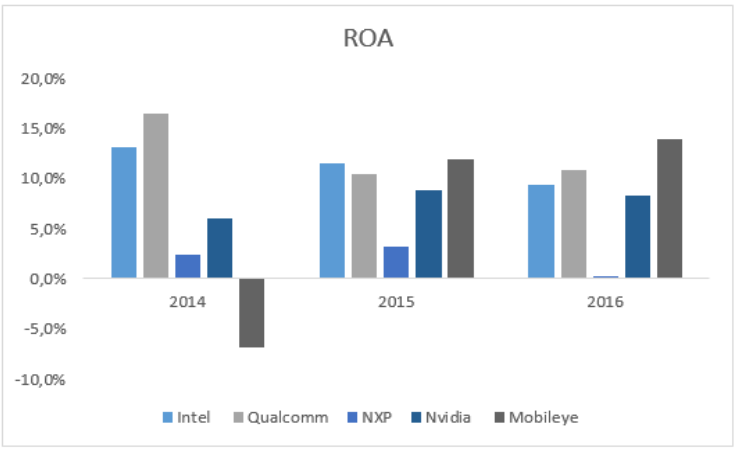

Figure 18 Profitability analysis: ROA. Source: Annual reports, own contribution

The return on equity is the ratio of net income to shareholders' equity and measures the profit generated per dollar of shareholders' investment. The ROE ratio is a measurement of the return attributable to equity holders, after costs of debt are serviced.

$$Return\ on\ equity = \frac{Net\ income}{Shareholders' equity} \tag{10}$$

As presented in Figure 19, Intel's ROE decreased in the last three years to being outperformed by Qualcomm in 2016. Mobileye's return of equity increased from a negative ROE in 2016 to 15.5 % being right in the middle of the peer group performance.

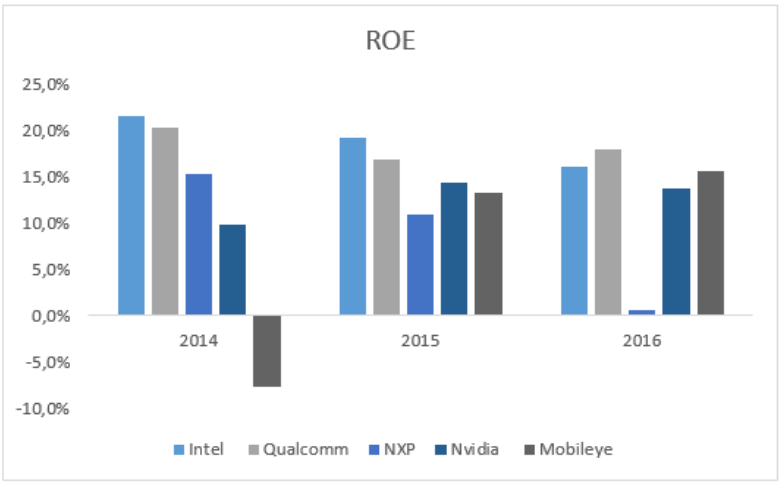

Figure 19 Profitability analysis: ROE. Source: Annual reports, own contribution

4.4 Financial leverage

Company's assets can be financed either with equity or with debt. How a company chooses to finance its operations may add financial risk on top of business risk (Drake and Fabozzi, 2012).

The debt-to-equity ratio is calculated by dividing a company's total liabilities by its stockholders' equity.

$$Debt - to - equity\ ratio = \frac{Debt}{Total\ shareholders' equity} \tag{11}$$

Financial leverage provides information on the long-term liquidity risk of the firm. The higher the leverage, the higher the long-term liquidity risk, as the firm has a larger debt to cover.

While NXP has a higher share of debt in comparison to the peer group, the current level of financial leverage is not critical for any of the peers, and does not imply any dramatic long term liquidity risk. Mobileye liabilities represent only a small fraction of total assets, but it is not clear whether the company will use more debt in the future. Results can be found in Figure 20.

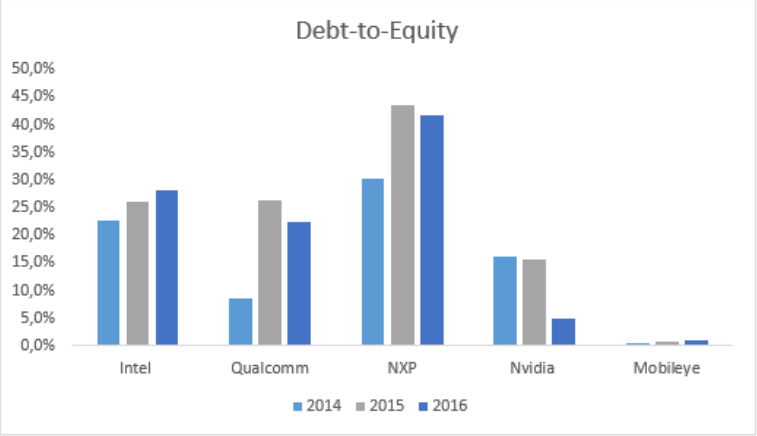

Figure 20 Financial leverage: Debt-to-equity. Source: Annual reports, own contribution

In addition to financial leverage ratios, which express the information about how debt is related to assets or equity, there are also coverage ratios, which capture the ability of the company to satisfy its debt or fixed financing obligations. The interest coverage ratio compares the earnings available to meet the interest obligation with the interest obligation.

$$Interest\ coverage\ ratio: \frac{Earnings\ before\ interest\ and\ taxes}{Interest} \tag{12}$$

The higher the ratio, the lower the liquidity risk, as it is realistic that the firms will meet their liabilities. Mobileye has no interest bearing debt and was excluded out of the analysis. All other firms in the peer group seem to be able to meet their interest obligation. Interest coverage ratios for the peer group can be found in Figure 21.

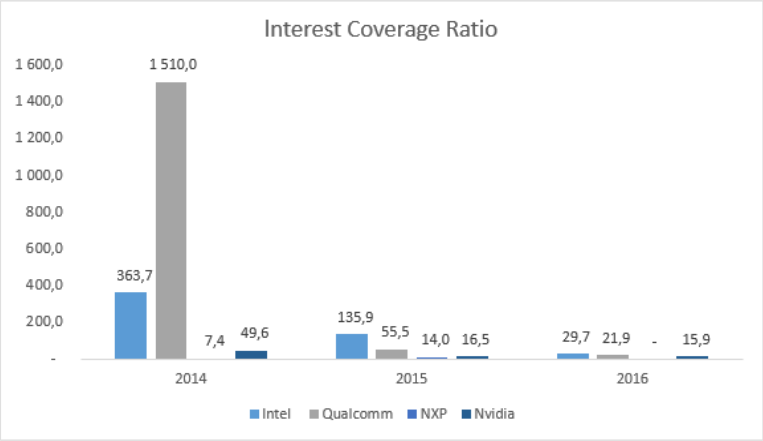

Figure 21 Financial leverage: Interest coverage ratio. Source: Annual reports, own contribution

4.5 Specific industry ratio

Besides standardized ratios used to try to overall financial condition, there are also industry specific ratios. These ratios are useful only in a specific industry and hence calculated for analyzing entities in that industry only.

Research and development (R&D) and capital expenditure (CAPEX) are two numbers that are the cornerstone of the company's commitment to the future. The very fast-progress of technological innovation requires from company in the semiconductors industry to develop more complex technology and to keep pace with industry wide investment rates of approximately 30% of sales (SIA, 2017).

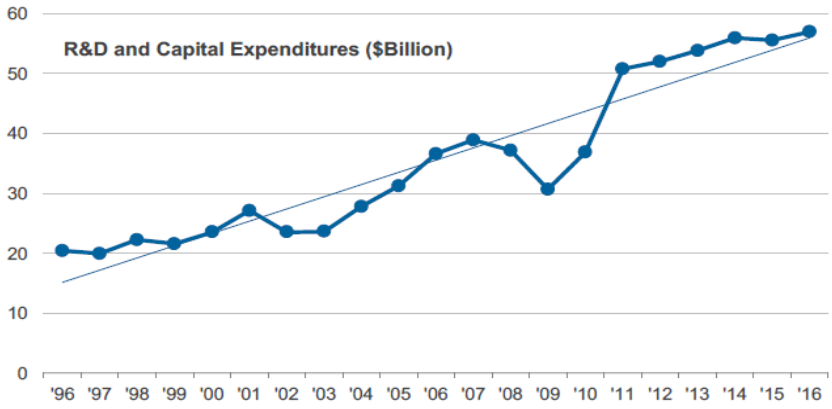

Figure 22 R&D and CAPEX in the semiconductors industry. Source: SIA, 2017

The total R&D and capital expenditures in the US in 2016 were $56.9 billion with a compound annual growth of 5.3 % in the period between 1996 and 2016 (SIA, 2017).

The R&D rate represents R&D expense as a percentage of revenues.

$$R\&D\ rate\ = \frac{R\&D}{Revenues} \tag{13}$$

Intel's R&D expenses for years ending 2014, 2015 and 2016 were $11.5 billion, $12.1 billion and $12.7 billion respectively, which corresponds to an average R&D rate of 21.3% and a growth rate of 5% p.a. Intel's R&D efforts are focused on advanced computing technologies, developing new microarchitectures, advancing silicon manufacturing process technology, delivering the next generation of platforms, developing new solutions in emerging technologies (including memory and the Internet of Things), and developing software solutions and tools (Intel Annual Report, 2016).

Mobileye had $36.9 thousand, $43.3 thousand, $65.3 thousand R&D costs for years 2014, 2015, 2016 respectively. The R&D rate decreased from 21% in 2014 to 15% in 2016. Mobileye's R&D in 2016 included the extension of monocular visual processing capabilities, development of autonomous driving functionality, continuous EyeQ3 production and EyeQ4 and EyeQ5 design and production. Mobileye expects to increase the absolute amount of the R&D in the future, but the percentage of revenue should reduce, due to the growth of the business (Mobileye Annual Report, 2016).

In comparison to the industry, Intel is on average, while Mobileye R&D rate is underperforming the industry trend. Mobileye's low R&D rate is not a good sign, as R&D rate remains as important as ever, especially as the space becomes more competitive.

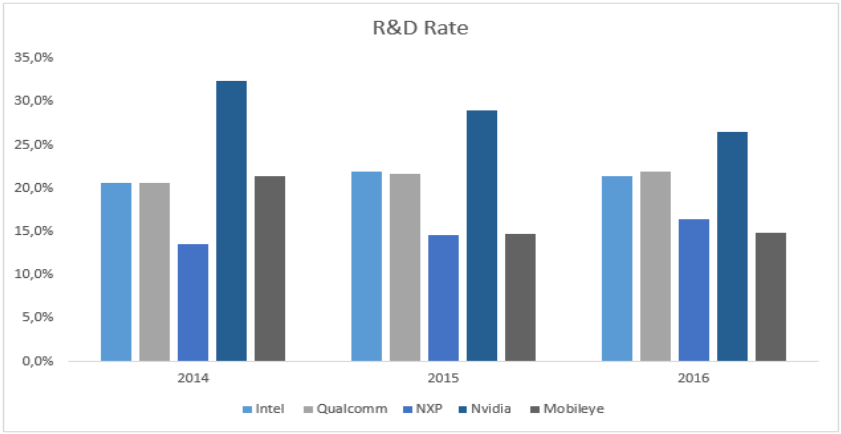

Figure 23 Industry specific ratios: R&D rate. . Source: Annual reports, own contribution

Capital expenditure rate represents the percentage of revenues used for capital expenditure.

$$CAPEX\ rate\ = \frac{Capex}{Revenues} \tag{14}$$

Intel capital expenditures were $9.6 billion in 2016, $7.3 billion in 2015 and $10.1 billion in 2014. This corresponds to an average rate of 15.8% of sales (Intel Annual Report, 2016). Mobileye's average capital expenditure rate of 2.6% is significantly lower. Mobileye's capital expenditures for years 2016, 2015 and 2014 were 11.0 million, $5.6 million and $5.6 million, respectively (Mobileye's Annual Report, 2016). Intel's capital expenditure is related to additions to property, plant and equipment while Mobileye mainly invests in data storage and computer equipment to support the growth as well as expenditures related to the acquisition of land and buildings to serve as the company's R&D and innovation center in Jerusalem (Intel/Mobileye Annual Report, 2016).

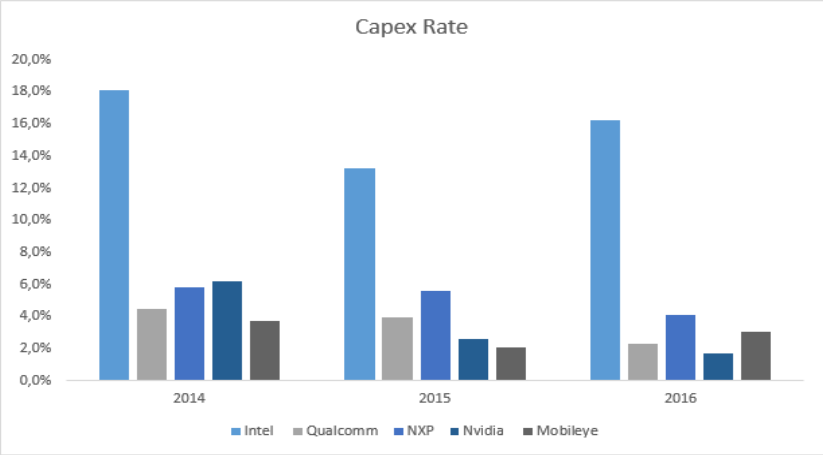

Figure 24 Industry specific ratios: Capex rate. . Source: Annual reports, own contribution

While Mobileye remains on average within the peer group, Intel's capital expenditures seem to be significantly above the average.

4.6 Findings from financial analysis

The performed financial analysis of the companies showed a decreasing efficiency of Intel's assets in the last couple years. Mobileye on the other side, seem to be an attractive target based on its financial indicators and performance. The company is efficient in the use of its assets, highly profitable and financial healthy. This all indicates that Mobileye is capable of maintaining a sustainable business in the future.

5 The acquisition

In the following chapter details about the acquisition, like the classification, pricing and timing of the acquisition as well as the market response in terms of stock prices and analyst ratings will be presented.

The acquisition was announced on March 13, 2017 by both Intel and Mobileye. Formal talks began on January 27 to discuss the acquisition price, and by January 31 all board members knew about the potential transaction. In the process, Mobileye was advised by Goldman Sachs and Raymond James & Associates Inc., while Intel's advisors included Citi and Rothschild & Co (Thomson One)

The terms of the agreement included a tender offer by a subsidiary of Intel, Cyclops Holdings. The subsidiary commenced a tender offer to acquire all of the issued and outstanding ordinary shares of Mobileye for $63.54 per share in cash. This represents a fully diluted equity value of approximately $15.3 billion ($14.9 billion net of cash acquired). The tender offer (including the subsequent offering period) expired on August 21, 2017, by which time Intel had acquired approximately 97.3% of the outstanding ordinary shares of Mobileye. The final judgment was rendered by the Enterprise Chamber (Ondernemingskamer) of the Amsterdam Court of Appeals (Gerechtshof Amsterdam) on March 27, 2018, in a statutory compulsory acquisition proceeding (uitkoopprocedure) initiated by Cyclops Holdings for all remaining outstanding Mobileye shares (Intel Website/Transaction Announcement).

Intel decided to give Mobileye an unusual autonomy, integrating its own automated driving group with Mobileye's operations under Mobileye Chairman Amnon Shashua, who will lead the unit from Israel report directly to Intel's CEO, Brian Krzanich.

According to the relative nature of the company´s core business involved in merging and acquisition transactions, M&A can be classified as related or unrelated (Salter and Weinhold, 1981). Moreover, we can classify acquisitions as friendly or hostile, depending on the position or recommendation of the management of the target company (Damodoran, 2006). The acquisition between Intel and Mobileye can be considered as a related and complementary acquisition as it involves adding functional skills and resources to the company's existing distinctive competence while leaving its product-market commitment relatively unchanged. This type of acquisition is mostly valuable to companies in attractive industries whose competitive or strategic position could be

strengthened by changing their value-added position (Salter and Weinhold, 1981), which is exactly happening to Intel. Furthermore, the acquisition can be classified as friendly as Mobileye's board supported the acquisition.

The timing of the acquisition was not unusual, taking into consideration the transformation phase happening across the industry and the current merger boom[3].

In order to incorporate market reaction in the acquisition analysis, the behavior of both company's stock price in the last years and the behavior of the stocks around the announcement of the acquisition will be analyzed.

Mobileye's stock price development can be found in Figure 25. Since its blockbuster IPO, Mobileye´s stock has ridden the wave of autonomous car enthusiasm. The IPO gave Mobileye an initial valuation of $7.6 billion. On the first day of trading its stocks jumped 48% from the initial $25 price.

Ever since, the stock has fluctuated and become a favorite among short sellers betting against the stock. It reached its peak in 2015 with as much as quarter of outstanding shares being short. A major stock fell down was in 2016 when Mobileye´s partnership with Tesla collapsed (Hull, 2016). Some analysts, one of them prominent short seller firm Citron Research, called Mobileye the "most outrageously overpriced, overpaid semiconductor stock ever" (Citron Research, 2016).

Even though the competition has intensified, investor remain optimistic about the future of self-driving cars. Shares of Mobileye rose 38% in the last twelve month. The company had a market capitalization of $10.5 billion short before the deal was announced and a price to earnings ratio of 80.

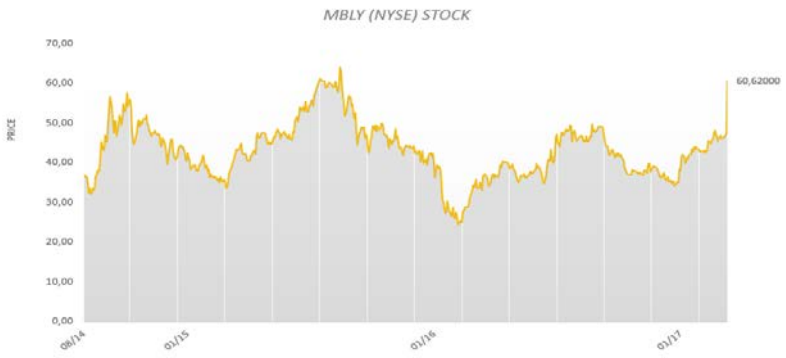

Figure 25 Mobileye´s stock 2014-2017. Source: Yahoo Finance, own contribution

[3] See Chapter Industry Analysis

When an acquisition of a publicly traded company is announced, the attention is generally drawn to the target firm and its stock price, but the market's reaction to the event is better captured in what happens to the acquiring firm's stock price.

Intel's stock price, depicted in Figure 26, indicates that the company's stock price was fluctuating over the last five years being in a range $33-$50, with a peak of $57.17 in February 2015. However, Intel is currently suffering from slow growth. The company has already got most of the market share in its leading segments, and is experiencing increasing competition, which is also reflected in its latest stock price. The stock has risen only 13.3% in the period 2016-2017. On the other side, Nvidia's stock has risen 227.0% in the same period.

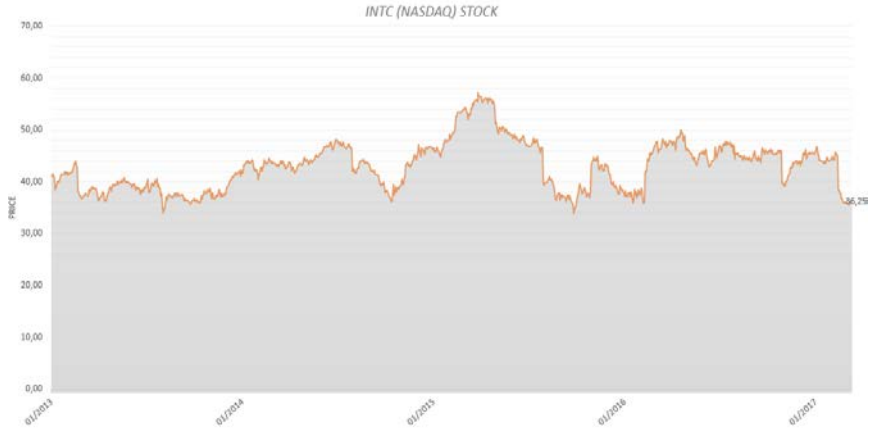

Figure 26 Intel's stock 2013-2017. Source: Yahoo Finance, own contribution

Figure 27 shows Intel and Mobileye's stock behavior twenty days before and after the acquisition announcement.

Intel paid $63.54 per share in cash, which represents a 34.4% premium over Friday´s closing price of $47.27 but it is still below Mobileye´s all-time high closing price of $64.4 in August 2015. Shares of Mobileye surged 30% to a $61.51 in morning trading, and closed at $60.62, while shares of Intel slid 2% to $36.59 in the morning and to $36.25 closing price.

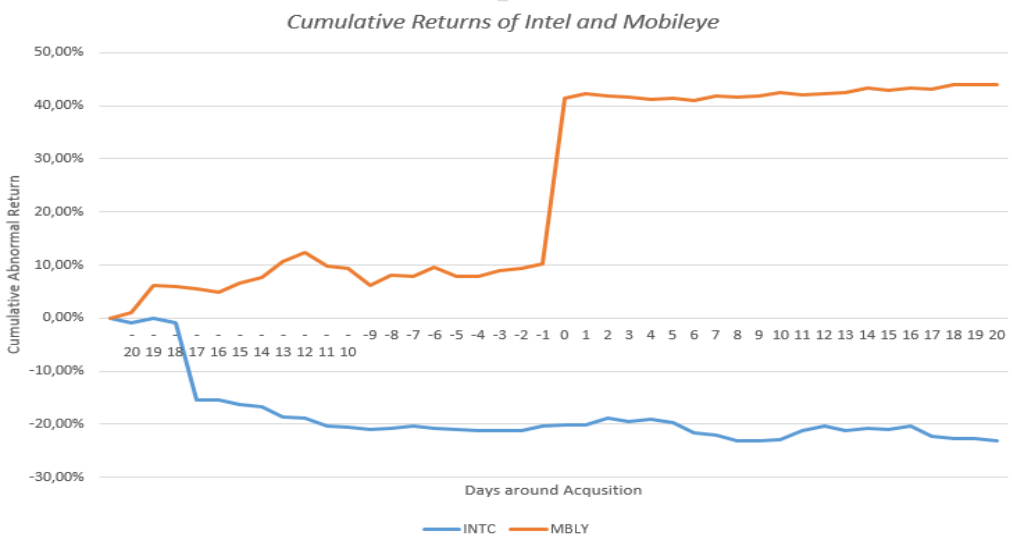

Figure 27 Cumulative returns of Intel and Mobileye 20-days announcement. Source: Yahoo Finance, own contribution

By taking the cumulative market value of Intel and Mobileye just before the acquisition announcement and just after the following effect, the following can be noticed: even though the market believes that there is a value added from synergy, it also believes that Intel overestimated the value of synergy and paid too much.

While most of the investment analysts considered the strategic reason for the acquisition justified, most of them remained skeptic about the high price.

Christopher Rolland, a chip analyst with Susquehanna Financial Group thinks that Intel CEO Brian Krzanich does not want to make the same mistake as his predecessor Paul Otellini regarding mobile chips. Otellini has often been criticized for letting ARM dominate the market. As a result, ARM chips are powering 95% of smartphones in use today. Rolland added that Krzanich "is trying to prevent the same" in the auto market (La Monica, 2017).

Hans Mosesmann, Rosenblatt Securities analyst, believes that Nvidia's technology has a competitive advantage over Intel's in both AI (artificial intelligence) and autonomous cars, and considers Nvidia to be Intel's biggest rival (La Monica, 2017).

Mark Lipacis, equity analyst at Jefferies was concerned that Intel's use of cash for M&A and decreasing DCG growth to single-digit growth rates makes Intel drifting away from its strength in x86 processing (Lipacis, 2017).

Stephen Chin, analysts with UBS finds the deal attractive from strategic perspective, but addresses the high P/E valuation as well as monetization of data and services given Intel's mixed M&A track record (Chin, 2017).

6 Valuation of the stand-alone entities

Valuation is the process of determining the present value (PV) of an asset, project or company. From the point of view of the buying corporation, acquisitions can be treated as another aspect of capital budgeting.

There are several methods which can be used to value companies. In this thesis the Discounted Cash Flow (DCF) Framework will be used, as this represents the common valuation technique in mergers and acquisitions. Additionally, in order to stress test the output from the DCF method, a relative valuation by selected multiples will be performed.

6.1 Discounted cash flow

The discounted cash flow method uses the concept of time value of money to value a company. When applying the DCF-model, the current value of a company is calculated according to its forecasts of free cash flow to the firm (FCFF). Forecasted free cash flows are then discounted to the present value using the company's weighted average costs of capital (WACC). Finally, a terminal value of the company in the steady state is calculated, and together with the FCF incorporated in the two-stage model to forecast the enterprise value (Berk and DeMarzo 2014, p. 285):

$$PV_0 = \sum_{t=1}^{n} \frac{FCFF_t}{(1+WACC)^t} + \frac{TV_n}{(1+WACC)^n} \quad (15)$$

6.1.1 Forecasting free cash flow

DCF represents an unbiased estimate as long as the assumptions are unbiased. The estimation of the free cash flows requires a high level of understanding related to industry value drivers, as well as the companies' strategic situation influencing the future cash flows (Damodoran, 2006). All forecasts of cash flows of Intel and Mobileye are based on findings from the financial and strategic analysis. Free cash flows can be calculate as follows (Berk and DeMarzo 2014, p.284):

$$FCFF = EBIT\,(1 - tax\ rate) + depreciation/amortization - capital\ expenditures - change\ in\ working\ capital \quad (16)$$

To project future cash flows of Intel and Mobileye on a stand-alone basis, the following assumptions have been made:

I. Intel is valued using a medium-term cash flow valuation, a 5-year DCF. Revenue is expected to be roughly flat and to grow in the low single digit range of 2.5%, while the gross margin is expected to be around 62%. Depreciation, CAPEX and NWC projections are based on the average historical percentage of sales.

II. Mobileye is valued using a long-term cash flow based valuation - in this case a 15-year DCF with high (2016-2020), moderate (2020-2030) and ultimately perpetuity growth stage (2030-).

In the high growth stage it is assumed that the growth potential is slowly sinking from approximately 50% in 2016 to 30%. The high growth rates are driven by:

- The competitive advantage and leadership in the area of computer vision
- Increasing content per vehicle and penetration gains
- Improving prospect of widespread proliferation of driverless cars suggested by developments in the past few years
- Capability to emerge as a pioneer in localization and real time map updates via REM

The medium growth stage assumes mid-range growth rates decreasing from 15% to 5%, according to projections from the industry analysis. The increasing competition in the autonomous driving space from alternate sensing technologies and new entrants will eventually reduce and normalize Mobileye's growth opportunities over time.

The last stage refers to the terminal value and mature state of the company, and will be explained in Section 6.1.3.

Depreciation, CAPEX and NWC projections are based on the average historical percentage of sales which were used as an indicator of company's behavior for the future.

Mobileye's financial statements were adjusted for share-based-compensation, which was added back in the discounted free cash flow, as this item was also excluded in Mobileye's Non-Gaap calculation (Mobileye Annual Report 2016). This was due to the fact that share-based compensation doesn't represents a cash outflow from the company and may vary for reasons unrelated to the company's overall operating performance.

Intel as well as Mobileye's forecasted cash flows can be found in Appendix III and IV, respectively.

6.1.2 Estimating the cost of capital

The weighted average cost of capital (WACC) is firm's required rate of return, which the firm expects to pay on average to all its security holders. The WACC is calculated by equation 17 (Berk and DeMarzo 2014, p.422)

$$WACC = \frac{E}{E+D} * Cost\ of\ Equity + \frac{D}{E+D} * Cost\ of\ Debt * (1 - Tax\ Rate) \quad (17)$$

In order to determine the WACC, each component must be considered and calculated.

6.1.2.1 Capital Structure

When computing the WACC-calculations, the capital structure determines the respective weights of each component. Neither Intel nor Mobileye disclose their capital structure policy and therefore applying a target capital structure is not possible. As a proxy for the target capital structure, a historic two–year average was used.

While market values were used for equity ratio, the debt ratio was calculated with book values. This is due to the fact that debt is typically difficult to calculate and that the book value of debt mostly equals its market value.

Mobileye's liabilities represent a very small fraction of its balance sheet. Young firms are often equity funded. As they become larger, increasing earnings and cash flow usually allows for more borrowing (Damodoran, 2006). Higher debt would lead to tax savings and a lower cost of capital. However, as there is no future target capital structure disclosed, a more conservative approach, considering Mobileye as equity funded, will be used. Intel capital structure is in the industry range.

Table 1 Intel and Mobileye's capital structure

	INTC	MBLY
D/(E+D)	0.2	0.00
E/(E+D)	0.8	1.0

Source: Annual reports, own contribution

6.1.2.2 Estimating the cost of equity (r_e)

There are several different ways to estimate the cost of equity. In this thesis the Capital Asset Pricing Model (CAPM), as the most popular method will be used. In this model the cost of equity is decided by three main factors; the risk-free rate, the systematic risk and the market risk premium.

The cost of equity can be calculated as follows (Berk and DeMarzo 2014, p.381):

$$Cost\ of\ Equity\ =\ Risk-Free\ Rate\ +\ Beta\ of\ Asset\ *\ Risk\ Premium \quad (18)$$

Each of the parameter for both of the firms was determined on the following way:

- For the risk free rate, long-term US government bonds were used. Even though the 30-year governmental bond might be a better match, a 10-year bond was used as it has less liquidity premium, and is the preferred proxy for the risk-free rate. The risk-free rate for 2017 proposed by Damodoran (2017) lies at 2.8%.
- Beta is the sensitivity of the expected excess asset returns to the expected excess market returns. Beta can be estimated using different approaches. The traditional beta estimation is carried out through a regression between returns on the relevant share and an appropriate index. While using this method, it is important to consider what market index is to regress against the return interval as well as the length of the estimation period (Damodoran, 2006). Considering the market index benchmark, both stocks were regressed against MSCI (MSCI World Index), which represents a market capitalization-weighted benchmark index made up of equities from 23 countries. This stock is often used by investors as a common benchmark for 'world' or 'global' stock funds as it represent a broad cross-section of global markets. Daily stock returns in the period 01/01/2015 – 31/12/2016 were used as both stocks were trading in this period and no extraordinary events happened in the market. The output of the performed regression analysis output was beta of 1.1 for Intel and 1.2 for Mobileye, respectively. Both betas are considered to be medium high, and imply a significant portion of systematic risk attached to the stocks.

- The risk premium refers to the spread between the risk-free rate and the expected market return. The implied equity risk premium, proposed by Damodoran (2017) was 5.1 % in 2017.

6.1.2.3 Estimating the cost of debt (r_d)

The cost of debt should reflect the required rate of return for creditors to finance the firm with debt capital and this may fluctuate according to company's performance. As Mobileye has no interest bearing debt, only the cost of debt for Intel was calculated. Intel discloses interest rates on all its loans and credit facilitates. The average of the interest rates was used as a proxy for the cost of debt.

6.1.2.4 Effective Tax Rate (t)

The historical average tax rate was used to calculate the effective tax rate.

The results of the previous calculations, and the corresponding WACCs are presented in Table 2.

Table 2 WACC calculations for Intel and Mobileye

	INTC	MBLY
r_e	8.4%	8.9%
rd	3.3%	-
t	22.6%	13.9%
WACC	**7.2%**	**8.9%**

Source: Own calculation

6.1.3 Terminal value

Determining the terminal value represents the next phase of the modelling. The concept of the terminal period is to capture the future value creation that lies beyond the forecasting period, and occurs as the firm enters the "steady state". It is also referred to as Gordon's growth model, where *g* represents the constant growth rate in FCFF forever. The formula for calculating the terminal value can be calculated as follows (Berk and DeMarzo 2014, p.285):

$$TV = \frac{FCFF_{n+1}}{(WACC - g)} \tag{19}$$

The applied terminal growth rates of Intel and Mobileye were 2% and 2.5%, respectively. The terminal growth rate assumptions were based on industry average growth rate

assumptions, company maturity stage and market attractiveness. The terminal values were $140.4 and $5.7 billion for Intel and Mobileye, respectively.

6.1.4 Stand-alone values

The presented value approach yields an enterprise value of approximately $179.6 billion for Intel and $10.6 billion for Mobileye. This represents a respective share price of $37.99 for Intel (Table 2) and $47.82 for Mobileye (Table 3).

Table 3 Intel stand-alone value

DCF value	$	39,173
Terminal value	$	140,421
Total	**$**	**179,594**
# Shares		4,728
per Share	**$**	**37.99**

Source: Own calculations

Table 4 Mobileye stand-alone value

DCF value	$	4,888
Terminal value	$	5,715
Total	**$**	**10,603**
# Shares		222
per Share	**$**	**47.82**

Source: Own calculations

Before the acquisition was announced, Intel was trading at $35.71 while Mobileye was trading at $47.27 (Yahoo Finance). These results imply that shortly before the acquisition was announced, Intel was slightly undervalued by 6%, while Mobileye was fairly valued by the market.

6.1.5 Sensitivity analysis

One of the main disadvantages of the discounted cash flow method is that minor changes in input variables can have large impacts on the output. Hence, a sensitivity analysis is performed, in order to see how the share price changes if the underlying assumptions from the model change.

Figure 28 and Figure 29 present sensitivity-matrices for both Intel and Mobileye with respect to changes in the WACC and the terminal growth rate.

The terminal growth rate of Intel is set at 2%. As presented in Figure 26, a 0.25% change in this growth rate will not change the output drastically. The terminal growth rate of Mobileye is set at 2.5%. As presented in Figure 27, a 0.5% change in this growth rate will also not change the output significantly.

The second measure, whose impact will be examined is the WACC. The WACC could change due to a higher risk of the stock (beta), more expensive debt or change in capital structure. For Intel, the lower bound was set to equal 6.7% while the upper bound is set to 7.7%. Mobileye's WACC was estimated to vary between 8.4% and 9.4%.

		WACC				
	38.0	6.7%	6.9%	7.2%	7.4%	7.7%
	1.5%	38.4	37.0	35.2	34.0	32.4
	1.8%	40.3	38.8	36.7	35.5	33.7
Growth Rate	2.0%	41.8	40.1	37.9	36.5	34.7
	2.3%	44.1	42.3	39.8	38.3	36.2
	2.5%	45.9	43.9	41.2	39.6	37.4

Figure 28 Sensitivity analysis Intel's stock price. Source: Own contribution

		WACC				
	47.8	8.4%	8.6%	8.9%	9.1%	9.4%
	2.0%	50.4	48.0	45.8	43.8	41.9
	2.3%	51.6	49.1	46.8	44.6	42.7
Growth Rate	2.5%	52.9	50.3	47.8	45.6	43.5
	2.8%	54.3	51.5	48.9	46.6	44.4
	3.0%	55.8	52.9	50.1	47.6	45.4

Figure 29 Sensitivity analysis Mobileye's stock price. Source: Own contribution

It can be concluded that the change in the WACC has a higher effect on the share price than the change in the terminal growth rate.

However, the findings from the sensitivity analysis confirm the high degree of uncertainty when valuing Intel and Mobileye, as the estimated share price fluctuates widely due to small changes in the parameters.

6.2 Relative valuation

An alternative approach to valuing companies is by relative valuation. In this approach the objective is to value an asset based on how similar assets are currently priced by the market. Multiples can be equity based such as P/E or P/B, or enterprise value based such as EV/Sales and EV/EBITDA (Damodoran, 2006).

The use of relative valuation is widespread. The advantage of using this approach over the discounted cash flow method is that it is far less complexed and also much faster. Furthermore, the relative valuation is much more likely to reflect the current mood of the market (growth and risk expectations of the market participants) better than other valuation approaches. (Damodoran, 2006).

However, market sometimes tends to reflect irrational growth perspectives so the valuation should never be relied only on comparable companies (Rosenbaum & Pearl, 2009). Therefore, the multiple valuation will be used only as a stress test of the DCF valuation.

6.2.1 Peer multiples

One way of using relative valuation is by looking at the value of companies similar to the target company. The peer group in the analysis will be the group used for the comparison of financial performance in Chapter 4. Forward-looking multiples were obtained from Thomson One Platform. The results are presented in Table 5.

Table 5 Valuation multiples

	Qualcomm	NXP	Nvidia	Peer Average	Industry
P/E	18.4	15.2	36.6	23.4	18.9
EV/Sales	3.3	4.1	11.9	6.4	4.3
EV/EBITDA	11.2	11.7	30.2	17.7	12.8

Source: Thomson One, own contribution

The first results of the analysis confirmed the DCF valuation, and indicated that Intel was undervalued by the market. The performed relative valuation implied a price range of $42.35-$74.45 per share for Intel. Table 6 summarizes the results.

Table 6 Value range for Intel

	Intel	
	Low	High
P/E	$ 42.35	$ 52.46
EV/Sales	$ 50.34	$ 76.59
EV/EBITDA	$ 52.74	$ 74.45

Source: Own calculation

On the other side, Mobileye results were inconsistent with the DCF valuation. The extreme low multiple valuation price might refer to a lack of a truthful comparable in terms of business model, growth rates and profitability. To support this statement, we refer to Morgan Stanley Report (2017, p.5). The company`s analysts compiled a list of 40 competitors in the industry consisting of auto suppliers, semiconductors, and internet/tech stock and found that none of the companies comes close to the revenue CAGR and margins of Mobileye. The obtained multiples will therefore be only applied to Intel.

6.2.2 Transaction multiples

The valuation of acquisition can also be performed with the use of transaction multiples. In this method the target deal is compared to a group of comparable deals (Lütolf-Carroll and Pirnes, 2009).

The multiples used to value the transaction between Intel and Mobileye will be derived from comparable transactions in the industry. Semiconductor makers are currently very interested in the automotive industry as they hope that the increasing use of electronics in cars will offset the PC's decline and the slowdown in the smartphones market. Most of them try to grow by performing a record number of M&A transactions as shown in Section 2.1.4.

Two recent major M&A transaction involving semiconductor companies investing in autonomous driving include Qualcomm/NXP $44billion deal and the Samsung/Harman acquisition of $8 billion. Transaction multiples are obtained from Thomson One Platform and presented in Table 7.

Table 7 Transaction Multiples

	Annoucement Date	Equity Value	Enterprise Value	Type	Multiples		
					P/E	EV/Sales	EV/EBITDA
Qualcomm/NXP	Oct-16	45.1	52.8	Cash	36.4	13.0	25.2
Samsung/Harmann	Nov-16	8.0	8.6	Cash	21.3	1.2	10.7
Intel/Mobileye	**Mar.17**	**15.3**	**14.9**	**Cash**	**135.3**	**39.8**	**114.0**

Source: Thomson One, own contribution

The transaction multiples valuation yields a slightly higher valuation for Mobileye than the peer multiple valuation. For a multiple comparison the Intel/Mobileye transaction multiples are also shown in Table 7. It is obvious that Intel/Mobileye multiples are higher than the average transaction multiples.

Due to high valuation output differences between the DCF and relative valuation method in the case of Mobileye's valuation, the relative valuation method for Mobileye was completely dismissed. The stand-alone valuation for Mobileye will therefore rely solely on the DCF method.

With the calculated stand-alone valuations, the first step of Damodoran's framework is completed. The next step is to calculate the enterprise value without synergies by simply adding the stand-alone values of the two companies. The calculated value for the merged entity is estimated to be $190.1 billion.

The valuation has not considered any synergies so far. Therefore, the next step will be to identify and quantify synergies, and ultimately assess whether synergies justify the high acquisition price.

7 Synergy analysis

In order to analyze the potential synergies between the two companies a literature study will be carried out to fully understand the concept of mergers and acquisitions and how synergies arise.

7.1 Value creation in M&A

Mergers and acquisitions represent one of the main features of today's economic trends. It represents a general term that refers to the consolidation of companies or assets.

It is unequivocal that there are good and bad takeovers, but economists find it hard to agree whether they are generally useful. Given that M&A's are complex phenomena, both in their reasons and results, they have been studied from various perspectives. The results of financial research are not decisive on this issue and they show that this strategy has rather mixed performance for the involved stakeholders.

Most of the studies, the older (Eckbo, 1983) as well as the newer one (Arik and Kutan, 2015), agree that M&A's generate positive abnormal returns in the selling company while buyers mostly remain on average. However, some studies, like Zaremba and Płotnicki (2016) or Bradley, Desai, and Kim's (1988) study, found strong evidence that announcement of a takeover creates value for both bidders and acquirers in the short run.

7.2 Incentives in M&A operations

The theory as well as practice suggest several motives which encourage M&A. Taking into account that the results are to a large extent ambiguous, researchers have focused on explaining them from two perspectives. The first perspective is related to rational motivations to conduct the transaction, and the second is related to irrational or behavioral motivations.

Regarding rational motivations, the determinants of M&A's may be analyzed based on the neoclassical hypothesis, which suggests that the purpose of mergers between companies is to increase their efficiency in the face of changes, such as regulations, costs, and technological innovations that affect the structure of the industry or cause industrial shocks (Mitchell and Mulherin, 1996).

Meanwhile, irrational or behavioral motivations relate the appearance of M&A's to distortions in the market value of companies or to the personal motivations of managers that are not in line with the interests of shareholders. One of the studies related to this perspective is from Jensen and Meckling (1976). Their study found that agency conflicts between managers and shareholders may distort managerial incentives and eventually lead to value-destroying investments, such as acquisitions.

When considering the two alternatives noted and taking into account that the fundamental purpose of an M&A is to generate synergies, empirical studies have found that rational motivations, corresponding to the neoclassical hypothesis, are those that may, to the greatest degree, provide shareholder value. Meanwhile, for shareholders, irrational or behavioral motivations may be a response to value destruction. Further we will focus

more on rational motivations and value creation, as well as different source of value which can be obtained through M&As.

7.3 Synergies

As already explained, the primary motive for entering into M&A's is to exploit potential sources of value creation. The concept of value creation is synonymous with that of synergy (Anju Seht 1990). There have been numerous definitions of synergies defined by various authors. The term synergy itself comes from the Greek word *synergos*, συνεργός, meaning "working together, cooperation"[4] In a business context it was first applied by Ansoff (1965) in his book Corporate Strategy. He proposed a meaningful framework for the evaluation of merger and acquisition synergy. He describes synergy as a type of reaction, where two factors combine to give a greater joint effect than the sum of their individual effects or, in other words, "2+2=5" Ansoff (1965).

7.3.1 Origins of synergies

In this section, the potential sources of synergy will be analyzed. Damodoran (2006) categorizes sources of synergies into two groups: operating and financial synergies.

7.3.1.1 Operating synergy

Operating synergies arise from value creation associated to a change in operating decisions. The underlying economic motivation for the change could be cost of economies arising from economies of scope (Panzar and Willig, 1981), economies of scale, or improved management techniques (Chandler, 1962; Williamson, 1981). Alternatively, operating synergies could arise from increased market power in input or output markets. In all these cases the underlying economic source makes synergy available to the pair of firms upon combination; exploitation of this synergy involves a change in the operating decision subsequent to the acquisition.

Damodoran (2006, Pg.542) categorizes operating synergies into four sub-categories:

- **Economies of scale/scope** allow the combined firm to share fixed costs and become more cost-efficient and profitable. Economies of scale are especially relevant to capital-intensive manufacturing firms. Such economies can only serve as an origin of synergy in product-centric mergers as well as in horizontal

[4] Dictionary, O. E. (2007). Oxford English dictionary online. Retrieved from: https://en.oxforddictionaries.com/definition/synergy

integration, where an entity moves from a low level of output to a higher level of output (Copeland, Weston & Shastri 1983).

- **Increased pricing power** from reduced competition and higher market share. De la Mano (2002) defined market power as the ability to maintain prices above competitive levels for a significant period of time. According to Chatterjee (1986), market power may lead to collusive synergy which should result in higher margins and operating income. Combining two firms from the same business might lead to creation of an oligopoly.
- **Combination of different functional strengths**, which can apply to wide variety of mergers since functional strengths can be transferable across businesses.
- **Higher growth in new or existing markets,** which also includes a very wide range of situations. One very common situation would be a case when a company wants to expand and acquires a company in an emerging market that already has an established distribution network, brand name or similar valuable assets.

Operating synergies show up as higher expected cash flows and can affect margins, returns, and growth, and through these the value of the firms involved in the merger or acquisition. Some authors (Ansoff, 1965; Chatterjee, 1986) connect cost synergies with efficiencies, and revenue synergies with the effects of collusion and market power (Chatterjee, 1986).

7.3.1.2 Financial synergy

Financial synergies can increase firms' cash flows, reduce the cost of capital or both. Damodoran (2006, Pg.542) categorizes financial synergies as follows:

- **Cash slack** represents a combination of a cash rich mature firm (and limited project opportunities) and cash starved firm with high-return projects (and limited cash). The synergy comes from the projects that can be undertaken with the excess cash that otherwise would not have been undertaken. This synergy is likely to show up most often when mature firms acquire startups firms, or when publicly traded firms acquire private businesses.
- **Financial leverage** results in an increase of value due to the increase in leverage after the acquisition. This happens when the cash flows of the combining firms are less than perfectly correlated, which increases the optimal amount of debt after

the acquisition. This allows the combined firm to borrow more, which creates tax benefits, usually represented in a form of a lower cost of capital.

- **Tax benefits** usually arise with taking on tax loss carry forwards of acquired firms, or by taking the advantage of tax laws to write up the target company´s assets.
- Synergies may also be created by the mere fact of combination with no change in strategic decisions, as a result of **financial diversification**. Combining two firms in the presence of capital market imperfections such as costly information (Lintner, 1971) can reduce the required return without affecting expected cash flows, if the returns of the merging firms are imperfectly correlated. However, as markets should be perfect, the investors in most publicly traded firms, can diversify themselves at a far lower cost and with more ease than the firm. For private businesses there can be potential benefits from diversification.

Chatterjee (1986) draws the following links of types of synergies:

- Related, horizontal or vertical mergers - Operational synergies
- Unrelated or conglomerate mergers - Financial synergies

He explained that these equivalencies imply that there is no difference between the type of mergers and the type of synergy, but that in reality mergers are unlikely to fit into such a classification (Chatterjee, 1986).

7.3.2 Valuation of synergies

Clearly, there is potential for synergy in many mergers. Firms are willing to pay huge premiums in M&A under the justification of synergy. The more important issues relate to valuing this synergy and determining how much to pay for the synergy.

Adequately evaluating synergetic effects requires a good knowledge of the strengths and weaknesses of the two companies that integrate and thus create a post-acquisition company.

By examining the literature on synergies valuation, disagreements can be found to whether synergy should and how it should be valued. Some authors find that valuing synergies isn´t possible at all, as it requires making a lot of assumptions which in the end makes the analysis pointless. Others, however, find valuing synergies as an important task, which must be taken before engaging into acquisitions (Damodoran, 2006).

Damodoran (2006) introduces a general and overall approach in valuing synergies. He argues that there are two important questions which need to be answered in order to value synergy (Damodoran, 2006, Pg.543):

1. What form will the synergy take? For example, will the synergy generate higher cash flows from existing assets (cost savings and economies of scale), higher expected growth rates (market power, higher growth potential), longer growth periods (from increased competitive advantages), or lower costs of capital (higher debt capacity)?
2. At what time will it start to affect the cash flows? This can be explained by the time value of money, as the value of synergy is the present value of the cash flows created by it, the longer it takes for it to show up, the less its value is.

7.3.2.1 Valuing operating synergies in DCF Framework

As previously described, operating synergies can take different forms. In a discounted cash flow method, we have to consider which inputs tend to be the best to evaluate the synergy as different types of synergies require a change of different inputs.

7.3.2.1.1 Economies of scale and scope

Economies of scale arise when the average cost of production falls as the volume of its output increases (Samuelson, 1948). Economies of scale give rise to lower per-unit costs for several reasons. One way of achieving economies of scale is by reducing administrative costs as some positions or jobs become redundant. The removal of redundancies is mainly in areas like personnel, accounting and auditing service (Copeland, Weston & Shastri 1983). Calculating the benefits resulting from the removal of redundancies is relatively straightforward (De Graf & Pieenar, 2013).

Economies of scope occur when it is more efficient and less expensive to produce a number of different products together than separately (Samuelson, 1948). Due to the production of similar complementary goods and services, the long-run average and marginal cost of a company decreases. Economies of scope can come from sharing centralized functions like, for example, finance or marketing or from interrelationships like, for example, cross-selling of products, or the use of outputs of one business as the inputs for the other. There is no specific practice for calculating economies of scope. However, one thing which should be considered are the costs of vertical integration, such as higher legal fees connected to merger control regulations (De Graf & Pieenar, 2013)

7.3.2.1.2 Increased purchasing power

The literature doesn't demonstrate a lot of data on practice regarding valuation of M&A synergy from market power. This is understandable to some degree, as the authorities are trying to limit increases in market power and pricing manipulations.

The US Department of Justice uses a very common measure to calculate the market concentration, the Herfindahl- Hirschman Index (HHI). This index applies a formula which considers both the number of firms in a market and market shares. HHI is calculated by taking the market share of each firm in the industry, squaring and then summing them, which gives proportionately greater weight to the larger and concentrated market shares. When using the HHI, both the post-merger level of the HHI and the increase in the HHI resulting from the merger are considered. Based on their experience, the US Department of justice classified markets into three types (US Department of Justice):

1. Unconcentrated Markets: HHI <1500
2. Moderately Concentrated Markets: 1500≤HHI ≤2500
3. Highly Concentrated Markets: HHI >2500

The increasing purchase power was not considered as a potential synergy in the acquisition of Mobileye, due to ever increasing and intense competition in the industry as described in the Chapter 2. The HHI calculation was therefore dismissed.

7.3.2.1.3 Combination of different functional strengths

The synergy benefit can arise out of the combination of two firms with different capacities, resources and strengths. Combining companies also means sharing each other's' technology knowledge and technical know-how. One example of this synergy is in the literature referred to as *economies of technological innovation.*

Schuh, Klapper and Haag (2008) emphasize the increasing importance of technological innovation, while De la Mano (2002) states that this kind of synergies could be substantial, especially when the competition is in the field of innovation, as in the case of Intel and Mobileye.

Regarding the valuation, this kind of synergy requires a proper understanding of the environment as it includes a high degree of uncertainty. The result of the valuation will depend on the quality of inputs. Camesasca (2000) implies that economies in an

innovative activity relate to the removal of redundancies in R&D. This relates to spreading the costs of R&D over a greater level of output. In this way the average cost per unit is reduced. Based on their literature study, De Graf and Pieenar (2013, Pg. 64) identified three origins of synergy in the scope of economies in innovative activity:

1. Gaining access to external technology, which may in turn speed up a project, interact with an existing research and development portfolio or accelerate the commercialization of a technology
2. The absorption of technology "free-riders" as not sufficient protection of intellectual property might cause shifting the knowledge to competitors
3. Gaining access to core technology-enabling patents, allowing the lifting of licensing fees, or legal action against violators

There are some difficulties while trying to valuate firms which are dedicated to technological development. One successful method would be the real options framework. This framework for decision making under uncertainty allows enhancing and improving the calculation of a companies' worth by the flexibility of future options. The real option valuation applies the techniques developed to value financial options, to actual assets (Steffens & Douglas, 2007). Real options might be based on binomial option pricing models or the popular Black-Scholes formula (Black & Scholes, 1973).

The real options valuation is outside the scope of this thesis. However, R&D redundancies are obtained in the DCF Framework as cost synergies.

7.3.2.1.4 Higher growth in new or existing markets

Growth synergies can manifest in several ways. The companies might have a higher competitive position than the individual companies due to a wider market reach, better performance and enhanced efficiencies. The payoff/valuation will be that the combined firm will be able to maintain excess returns and growth for a longer time period (Damodoran, 2006).

7.3.2.2 Valuing financial synergies in DCF Framework

Some writings (Gaughan, 2010) find financial synergies as an arguable motive for M&A. Modigliani-Miller-Theory (1958) states that in a world without taxes, bankruptcy costs, informational asymmetries, or agency costs, financial synergies cannot exists, and that

the capital structure is irrelevant to the value of a firm. However, a perfect market is rather a theoretical framework than reality, which implies that capital structure does matter.

7.3.2.2.1 Cash slack

Sometimes managers have to reject profitable investments due to a limited access to capital markets and the resulting capital rationing constraint. This happens often to small firms and private business as they are unable to raise capital at a reasonable price (Damodoran, 2006).

Another reason was outlined by Myers and Majluf (1984), who argued that managers know more than investors about future projects and have to issue new stock at less than the true value to finance these projects, leading to the good projects being rejected.

Therefore, it seems logic that cash rich firms with no investments opportunities take over cash-poor firms with huge investments opportunities. This mostly includes publicly trading firms with easy capital market access which acquire small private business with capital constraints. The value of cash slack is in its simplest, the net present value of the projects, the cash-poor firm would be forced to reject, due to its cash constraints (Damodoran, 2006).

Mobileye and Intel are both cash rich firms as shown in Chapter 4 Financial Analysis and therefore the acquisition is not considered to be a source of cash slack synergy.

7.3.2.2.2 Tax benefits

Firms use possible tax benefits which can arise to increase value. However, Eccles et al. (1999) states that this should not be the main reason for a merger.

Tax benefits might accrue when a company with high loses and tax deductions that it cannot use, combines with a company with high income, by offsetting the taxable income of one firm against the assessed loss of the other. Such gains result in an improved net present value of the cash flow of the combined firm. Anyway, tax authorities often prevent the utilization of such benefits (Camesasca, 2000).

The other reason for tax benefits represents the increase in the tax value of target assets. This comes from the possibility to write up the depreciable assets of a target firm in an acquisition. It results in higher tax savings from depreciation in the future. At this point, we have to take into consideration goodwill, which is not tax deductible. (Damodoran, 2006).

7.3.2.2.3 Debt capacity

According to Lewellen (1971) a combination of imperfectly correlated non-synergistic activities, has a coinsurance effect. He argues that mergers reduce the default risk, since the combined entity has less variable cash flows and thereby increase debt capacity. Because of higher debt capacity we can have a greater optimal leverage and tax savings, which ultimately leads to a greater value of the merged firm.

Stapleton (1982) agrees that mergers have a positive effect on a total firm value as a result of an increase in the debt capacity and hence the value of the firm. Here it is very important to notice that both the acquiring firm and the target firms should be at their optimal debt capacities prior to the merger. It is also important to notice that the increase in value, needs to be weighed against the immediate transfer of the wealth from the stockholders to the existing bondholders as the bondholders are lending to a safer firm after the merger. Unless the coupon rates are renegotiated, they will be receiving a higher coupon rate, as the premerger firm had a higher risk. This will cause an immediate wealth transfer to bondholders at the expense of the stockholders.

Theoretically, the combination of Intel and Mobileye would have the capacity to increase the leverage. However, as none of the firms reveals its target capital structure this kind of synergy is also dismissed.

7.3.2.2.4 Diversification

Diversification should not be the main motivation for a takeover as investors of publicly traded companies can diversify on their own. It seems that market also recognizes the lack of success contributed to diversifying acquisitions. Doukas, Holmen and Travlos (2001) find that markets react negatively to the announcements of such acquisitions.

As both Intel and Mobileye were publicly traded before the acquisition, this topic is not discussed any further.

7.3.2.3 Steps in valuating synergies

In this thesis, the value of synergy will be derived by using the broader technique of discounting cash flows, proposed by Damodoran (2006). He suggests that the only way to value synergy in an unbiased matter is to first evaluate the companies involved in the acquisition independently of each other, by discounting the expected cash flows for each company at the weighted average cost of the capital of that company. Secondly, we calculate the value of the combined firm without synergies by simply adding the values

calculated in the first step. The stand-alone valuations for both Intel and Mobileye were already calculated in Chapter 6. The next step is to assess the impact of the transaction on both income statement items and balance sheet items and incorporate the effects of synergies into the cash flows.

Incorporating the effects of operating synergy includes:

- higher growth rate in revenues,
- higher margins, because of scale economies,
- lower taxes, because of tax benefits,

while incorporating financial synergies includes:

- adjusting the cost of capital of the combined entity.

Finally, after the assessment of the value of the combined entity with synergies, the value of the combined firm without synergies is subtracted in order to get the value of synergies.

7.3.2.4 Common pitfalls

In the previous sections we introduced a concept of value creation through realizing of synergies. Managers pay huge premiums under the justification of synergies, but how valid is this?

As already mentioned, the most mergers do create value on average. But, what happens when the synergies fails to deliver value? Sirower (1997) takes in his study a detailed look at promises and failures of synergies and explains how companies often pay too much and predictably never realize the promises of increased performance and competitiveness. Through an empirical study we identified some common pitfalls and sources of value leakage.

One of the reason often introduced in the literature is the payment of excessive premium (Hitt et al). Roll (1986) explained internal motivations of growth and synergies by the hubris hypothesis. According to this hypothesis, managers pay too much in acquiring companies because they assume they can create more value with an acquisition target than other potential acquirers and the management of the target. Managers suffering from “hubris” tend to be overly optimistic and overconfident in their own abilities and what can be achieved after the merger.

Bazerman and Samuelson (1983) describe a phenomena called the "winners' curse" which occurs in competitive situations when a successful buyer finds that he or she has paid too much for an item of an uncertain value, or in our case the acquisition target. In their study they provide an experimental demonstration of the winners' curse, and identify factors that affect the existence and magnitude of this bidding abnormality. They found that "winners' course" is directly proportional to the degree of uncertainty concerning the value of the target and the number of competing bidders. Increasing one or both of the factors increases the range of value estimates and bids, which makes it more likely that the winner will overestimate the intrinsic value of the item and thus overbid.

The hubris hypothesis and "winners' curse" imply that managers' overconfidence is one possible reason behind excessive premiums and M&A failure.

Ficery, Herd, and Pursche, B (2007) find that a common problem which causes synergies to fail is that companies define synergies too broadly. This would be the case when managers set up higher growth rates as they do not want to achieve revenue growth rates that are equal to growth rates of the stand-alone company. It is possible for the combined firm to achieve higher sales growth than either company could on its own. However, revenue synergies are notoriously hard to estimate, because they involve external variables which are beyond managements' control.

To overcome this issue, Ficery, Herd, and Pursche, B (2007) propose to precisely match the value and type of synergies and clearly define what is included versus what is excluded in the cash flows of the stand-alone companies. When done correctly, pre-deal synergy estimates should determine the total valuation and premium.

Another reason causing mergers failure is that acquirers often assume prices and market share which are not consistent with the overall market or use benchmarks from non-comparable situations. (Christofferson, McNish, & Sias, 2004)

The theory expresses the importance of cautiousness and the need for a conservative approach while valuating synergies and growth opportunities. All of the mentioned pitfalls, is something that was taken into consideration while identifying and valuating synergies between Intel and Mobileye.

7.3.3 Identification and value of synergies in Intel's Acquisition of Mobileye

In Chapter 3 Strategy Analysis the strategic fit between Intel and Mobileye was described. These two companies are expected to bring a very powerful combination on the market.

Intel has assets in mapping and infrastructure, data centers, artificial intelligence, and machine learning complement to Mobileye' assets in that area, and additionally has assets in hardware and simulators. All of this together creates a strong platform for offering complete end-to-end autonomous driving solutions, from the car to the data center.

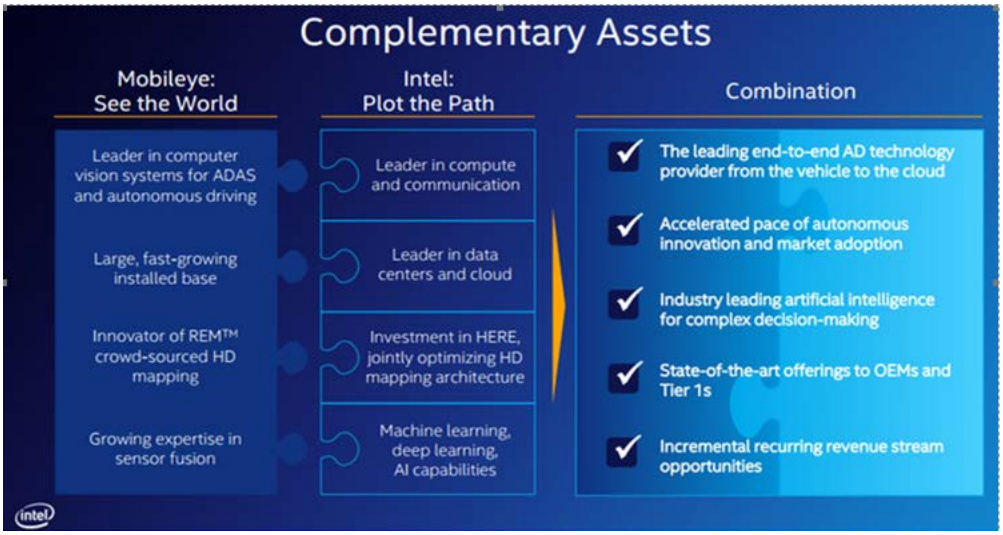

Figure 30 Intel and Mobileye's complementary assets. Source: Intel's acquisition presentation 2017

Intel sees the significant sources of value for both Mobileye's and Intel's shareholders. In this section the main value drivers of Intel/Mobileye acquisition will be identified and quantified. As proposed by Damodoran (2006), the synergies identified in the analysis will be categorized into operational and financial synergies.

7.3.3.1 Operational synergy

Operational synergies can manifest themselves in several ways, as shown in Section 7.3. We will differentiate between cost and revenue synergies when discussing operational synergies. This will lay the foundation when explicitly analyzing Intel and Mobileye for operational synergies.

7.3.3.1.1 Revenue synergies

Revenue synergies are more difficult to realize and quantify, as they depend on the behavior of the third parties, such as customers. Typical examples are synergies arising from entering into new markets, expanding to new geographies, cross-selling one company's product or service into the other company's established customer base, accessing new distribution channels or by leveraging an expanded sales force to reach new customers. Other synergies could result from a product innovation by combining

each company’s research and development efforts and using the existing production platforms to deliver new products or services.

- Revenue growth rate

Intel’s revenue growth in its core markets is currently stagnating as the company has most of the market share in a segment which is slowly losing on importance. Now Intel wants to shift its business in a market with huge growth opportunities. Through Mobileye’s broad customer base, strong relationships with both automotive OEMs and Tier 1 suppliers and significant current sales related to autonomous driving, Intel gets the possibility to obtain a larger footprint in the market and gain more market share. Furthermore, Mobileye's installed base of vehicles (millions of vehicles equipped with the company's camera sensors) provides an attractive platform for the combined effort.

Therefore, we will apply a higher growth rate for Intel’s revenues in the combined entity. The growth rate for Intel’s IoT and PSG Business Group will equal the forecasted middle range growth rate of 15% p.a. perceived in the industry analysis. The growth rate will be applied for the period 2017-2022. Other business segments will remain flat. The perceived present value of synergies is calculated to be 10.9 billion.

7.3.3.1.2 Cost synergies

Operating synergies which relate to cost savings are considered the easiest to model. Based on the impact that they have on the cash flow, we can divide them into one-time cost savings and ongoing cost savings. Both cost savings increase the firm value by the present value of the savings. The later one, due to a continuing impact on the cash flow, will have also a much higher impact on the value by affecting operating margins.

Typically, opportunities for cost reduction may involve reducing costs in back-office-functional areas like i.e. human resources, consolidating two facilities within the same city, or increased productivity from consolidated operations (e.g. economies of scale, better use of technology).

7.3.3.1.2.1 Operating expense (economies of scale)

While the transaction Intel-Mobileye is primarily growth driven, the company also sees cost-related synergies driven by some overlap in the product development roadmaps and on the margin some lower SG&A-related expenses (Intel’s presentation, 2017).

Intel's management indicated that the combination of the two companies would produce cost-savings on silicon. Sales, marketing and distribution and other overlapping activities are natural sources of synergy as economies of scale allows the merged entity to gain more efficient access to markets. The market for autonomous driving is global, with an emergence of Asian markets. Both Intel and Mobileye are present in the same regions and markets. By default, it should be possible to realize cost synergies by combining sales and distribution from to the global market.

Intel believes it can derive annualized cost synergies of $90M for 2018 and $175M for 2019 avoiding the duplicate product development and SG&A expense (Intel's presentation 2017). After discounting with the new WACC, the value of expense related savings is estimated to be $ 235M.

7.3.3.1.2.2 R&D costs (economies in innovative activities)

Both Mobileye and Intel are making similar investments in autonomous driving, which could be streamlined by combining the companies. The increase in efficiency of R&D expense could lead to a huge cost saving for Intel. If Intel invested in R&D over the next 5 years to create a position in the automotive market rather than acquiring Mobileye, the company would still have to pay billions of dollars. Although the company will continue to invest in R&D, these heavy upfront expenditures represent money Intel will now save.

The financial analysis showed that Intel had been expanding their R&D expenditures approximately 5% annually in the last 2 years. It is assumed that by completing this acquisition Intel will save this money so the present value of this savings was added to the combined entity valuation. A time horizon of 5 years for the R&D expense savings was used, as investments in the automobile industry represent a complicated and time-consuming process usually lasting 5-10 years. The calculations results in a present value of R&D synergies of approximately $ 4.4 billion.

7.3.3.2 Financial synergies

Most of the financial synergies were already dismissed in the Section 7.3.2.2. As tax benefits are addressed in Intel's Presentation, they will be discussed further.

7.3.3.2.1 Tax benefits

Tax-related motivation is not considered to be the primary motive for this merger because both Intel and Mobileye are currently operating with net positive results. Nonetheless, potential tax benefits can be identified.

The synergy refers to the amortization of the deal valuation premium and to a lesser degree lower blended tax rate. The valuation premium is estimated to be $4.8 billion and subject to asset valuation true-up. It is estimated that 75% of this premium of $3.6 billion is allocated to goodwill and amortization period of 10 years, leading to a post-tax benefit of $185 M based on Intel's 22% blended tax rate.

7.3.4 The value of the merged entity with synergies

When estimating the fair value of the merged entity, the identified operational and financial are added to the stand-alone valuation of Mobileye. This is done in order to identify the total change in enterprise value following the merger and synergies. By adjusting the growth rate, the cost of capital and by adding each of the identified and calculated synergies, we get a value of $205.9 billion for the combined entity. The value of synergies represents the difference between the value of the merged entity and the stand-alone valuations. The presented findings imply that the value of all synergies is estimated to be $15.7 billion based on Damodaran's framework. The calculated synergies justify the high price Intel paid for Mobileye. The synergy break-down can be found in Appendix V.

8 Post-merger performance

Empirical studies suggest that synergies are not realized in many acquisitions (Sirower & Sahni, 2006). The previous analysis and valuation of Intel and Mobileye's acquisition support the strategic reasoning behind the acquisition but question the high acquisition price. The performed synergy valuation seems to justify the price. To test whether Intel's $15.3 billion gamble in purchasing Mobileye had a positive influence on Intel, the post-deal performance will be analyzed.

The success of Intel's purchase of Mobileye can be measured by looking at the post-deal performance of the firm after acquisition. The value of the firm will be represented by the returns on its stock after the official completion of the purchase. The impact of the acquisition is reflected in Intel's stock performance which is depicted in Figure 31.

Figure 31 Intel's stock return August, 2017 – May, 2018. Source: Yahoo Finance, own contribution

In August 2017, when the acquisition of Mobileye was completed, the price for Intel's shares traded for $34.28 per share, which indicates that by the end of the acquisition process the market still believed that Intel overestimated the value of synergy and paid too much for Mobileye. At the time, the acquisition represented a typical example of a merger transaction which destroyed value for the bidder.

The analysis of the post-merger performance turned the story completely upside-down. Continuously rising, in less than a year, the value of Intel stock increased to $55.32 per share at the end of May 2018 which represents a 62% increase compared to the stock price 9 months ago.

One of the main successes in the previous year can be attributed to Mobileye's recent contract to supply autonomous vehicle technology to 8 million cars. Even though the name of the buyer was not disclosed, the purchase target delivery date was set to 2021, when Intel's EyeQ5 chip, designed for fully autonomous driving, is launched as an upgrade to the EyeQ4 that will be rolled out till the middle of 2018, according to Erez Dagan, the senior vice president for advanced development and strategy at Mobileye (Scheer, 2018).

Although not much time passed since the acquisition, Intel's stock price rose, and it seems that Intel's acquisition has paid off. However, as the industry of autonomous cars is still in its earliest phase, it is not much clear how the future for Intel will look.

9 Conclusion

The term synergy is often used by managers to justify deal rationales and premiums. This thesis studied synergies and their valuation in mergers and acquisitions with a specific focus on the acquisition of Mobileye by Intel in March 2017.

Recently, Intel was threatened to be outperformed by its competitors as its dominance in the PC market was losing on importance due to a decline in the market. Moreover, the semiconductor industry is a subject to rapid changes in technology and is currently experiencing a transformational change. A growth outside the core business is not an unusual step, but a risky one, especially due to Intel's unsuccessful acquisitions' history. However, taking the market projections for autonomous cars into consideration, the acquisition makes complete sense.

The combination of Intel's processing capabilities and Mobileye's software and vision competencies is supposed to create an effective and powerful combination in the world of autonomous driving. The acquisition should make Intel one of the largest vendors offering end-to-end autonomous-driving solution from car to the data center. Based on the strategic and financial analysis of both firms, Mobileye was recognized as a good acquisition target.

The valuation done by the discounted cash flow showed that, shortly before the acquisition was announced, Intel's stock was slightly undervalued, while Mobileye's stock was fairly valued by the market. Nevertheless, Intel paid a high 34% acquisition premium for Mobileye. In order to calculate if the paid price was justified, potential synergies had to be considered. A literature study was carried out in order to understand how to identify and value synergies. The performed synergy valuation, showed that plenty of benefits can be achieved in the merger of the two companies. Both quantitative and qualitative analysis proved that Intel and Mobileye were a very good fit.

The post-performance analysis showed that, despite the initial market lack of confidence, the acquisition seem to have a positive impact on Intel's market capitalization. The stock has risen 62% in the past 3 quarters. Having said that, the research question is answered. The future for Intel looks bright. However, as the market of autonomous driving is still in its early phase, it will be interesting to observe the future actions of the two companies.

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Appendix I: Abstract

This thesis represents a study of synergy valuation in mergers and acquisitions, with a detailed analysis of the acquisition between Intel, a leader in the microchip market and Mobileye, one of the pioneers in the development of computer vision, machine learning, localization and mapping for Advanced Driver Assistance Systems. This acquisition is one of the largest in the fast-growing market for autonomous vehicle technology. In the first part the industry was described including a description of the main rivals and both companies. A strategic and financial analysis proved that Mobileye's assets would be a good fit for Intel strategy. The DCF valuation for the stand-alone entities found that Mobileye was fairly valued by the market shortly before the acquisition, which indicated that Intel made an overpayment. However, in order to fully capture all the benefits of the acquisition, a synergy valuation was performed. The result implied Intel paid a fair price for Mobileye. The recent development of Intel indicates that the acquisition was indeed a good decision.

Appendix II: Kurzfassung

Diese Masterarbeit behandelt die Thematik der Synergiebewertung bei Fusionen und Übernahmen anhand einer Erwerbsanalyse des Mobileyes, Pioniers für Technologien im Bereich der Unfallpräventions- und autonomen Fahrtechnologien seitens Intel, dem Weltmarktführer im Microchipmarkt. Diese Akquisition ist eine der größten auf dem schnell wachsenden Markt für autonome Fahrzeuge. Im ersten Teil der Arbeit, wird die Industrie, inklusive einer Beschreibung der Hauptkonkurrenten und beider Unternehmen, dargestellt. Die strategische und finanzielle Analyse ergab, dass die Vermögenswerte von Mobileye für die Strategie von Intel gut geeignet sind. Das Discounted Cash Flow (DCF) Verfahren für die Einzelgesellschaften ergab das Mobileye, kurz vor dem Erwerb, von dem Markt fair bewertet wurde, was auf eine Überzahlung seitens Intel hindeutet. Um jedoch alle Vorteile der Akquisition vollständig zu decken, wurde eine Synergiebewertung durchgeführt. Das Ergebnis implizierte das Intel einen fairen Preis für Mobileye bezahlte. Die jüngste Entwicklung von Intel zeigt, dass die Übernahme tatsächlich eine gute Entscheidung war.

Appendix III: DCF Valuation Intel

Intel	2016	2017E	2018E	2019E	2020E	2020T
			in millions ($)			
Revenues	59,387	60,570	61,776	63,006	64,260	
YoY %		*2.0%*	*2.0%*	*2.0%*	*2.0%*	
COGS	23,196	23,104	23,564	24,033	24,512	
as % of Revenues		*38.1%*	*38.1%*	*38.1%*	*38.1%*	
Gross profit	**36,191**	**37,466**	**38,212**	**38,972**	**39,748**	
Gross margin, %	*60.9%*	*61.9%*	*61.9%*	*61.9%*	*61.9%*	
R&D expenses	12,740	13,388	14,068	14,784	15,535	
as % of Revenues	*21%*	*22%*	*23%*	*23%*	*24%*	
SG&A	8,397	8,901	9,078	9,259	9,443	
as % of Revenues	*14%*	*15%*	*15%*	*15%*	*15%*	
Other	2,180	-	-	-	-	
as % of Revenues	*2%*					
EBIT	**12,874**	**15,177**	**15,065**	**14,930**	**14,770**	
EBIT margin, %	*21.7%*	*25.1%*	*24.4%*	*23.7%*	*23.0%*	
Taxes	2,620	3,436	3,411	3,380	3,344	
EAT	**10,254**	**11,741**	**11,654**	**11,549**	**11,426**	
NWC	4,303	3,421	3,489	3,559	3,629	
Δ NWC	*1,268*	*- 882*	*68*	*69*	*71*	
Depreciation	8,084	8,903	9,081	9,261	9,446	
CAPEX	9,625	10,724	10,937	11,155	11,377	
FCF	**7,445**	**10,802**	**9,729**	**9,586**	**9,424**	**185,347**
WACC	1.0719	1.1489	1.2314	1.2314	1.3199	1.3199
DCF	**6,946**	**9,402**	**7,901**	**7,785**	**7,139**	**140,421**

Appendix IV: DCF Valuation Mobileye

in millions ($)

Mobileye	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2030T
Revenues	358.16	537.24	752.14	977.78	1,124.45	1,293.12	1,461.22	1,651.18	1,832.81	2,034.42	2,217.52	2,417.09	2,586.29	2,767.33	2,905.70	
YoY %	*49%*	*50%*	*40%*	*30%*	*15%*	*15%*	*13%*	*13%*	*11%*	*11%*	*9%*	*9%*	*7%*	*7%*	*5%*	
COGS	87.26	134.31	188.04	244.45	281.11	323.28	365.31	412.80	458.20	508.61	554.38	604.27	646.57	691.83	726.42	
as % of Revenues	*25%*	*25%*	*25%*	*25%*	*25%*	*25%*	*25%*	*25%*	*25%*	*25%*	*25%*	*25%*	*25%*	*25%*	*25%*	
Gross profit	**271**	**403**	**564**	**733**	**843**	**970**	**1,096**	**1,238**	**1,375**	**1,526**	**1,663**	**1,813**	**1,940**	**2,075**	**2,179**	
Gross margin, %		*75%*	*75%*	*75%*	*75%*	*75%*	*75%*	*75%*	*75%*	*75%*	*75%*	*75%*	*75%*	*75%*	*75%*	
Research and Development, net	53.04	80.59	112.82	146.67	168.67	193.97	219.18	247.68	274.92	305.16	332.63	362.56	387.94	415.10	435.85	
as % of Revenues	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	
Sales and Marketing	16.71	25.40	35.55	46.22	53.15	38.79	43.84	49.54	54.98	61.03	66.53	72.51	77.59	83.02	87.17	
as % of Revenues	*5%*	*5%*	*5%*	*5%*	*5%*	*3%*	*3%*	*3%*	*3%*	*3%*	*3%*	*3%*	*3%*	*3%*	*3%*	
General and Administrative	14.61	21.95	30.73	39.95	45.94	52.83	59.70	67.46	74.88	83.12	90.60	98.75	105.67	113.06	118.72	
as % of Revenues	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	*4%*	
EBIT	**187**	**275**	**385**	**501**	**576**	**684**	**773**	**874**	**970**	**1,076**	**1,173**	**1,279**	**1,369**	**1,464**	**1,538**	
EBIT margin, %	*52%*	*51%*	*51%*	*51%*	*51%*	*53%*	*53%*	*53%*	*53%*	*53%*	*53%*	*53%*	*53%*	*53%*	*53%*	
Taxes	(17.07)	38.13	53.39	69.41	79.82	94.89	107.22	121.16	134.49	149.28	162.72	177.36	189.77	203.06	213.21	
EAT	**203.61**	**236.87**	**331.61**	**431.10**	**495.76**	**589.36**	**665.98**	**752.55**	**835.33**	**927.22**	**1,010.67**	**1,101.63**	**1,178.74**	**1,261.26**	**1,324.32**	
NWC	10.74	20.03	28.05	36.46	41.93	48.22	54.49	61.57	68.35	75.86	82.69	90.14	96.44	103.20	108.36	
Δ NWC	-	9.29	8.01	8.41	5.47	6.29	6.27	7.08	6.77	7.52	6.83	7.44	6.31	6.75	5.16	
Depreciation	4.09	6.76	9.46	12.30	14.15	16.27	18.39	20.78	23.06	25.60	27.90	30.42	32.54	34.82	36.56	
CAPEX	11.02	13.91	19.48	25.32	29.12	33.48	37.84	42.76	47.46	52.68	57.42	62.59	66.97	71.66	75.24	
FCF	196.68	220.42	313.59	409.67	475.32	565.86	640.26	723.49	804.16	892.62	974.33	1,062.01	1,138.01	1,217.67	1,280.48	20,520.56
WACC	1.0890	1.1858	1.2913	1.4062	1.5313	1.6675	1.8159	1.9774	2.1533	2.3449	2.5535	2.7806	3.0280	3.2974	3.5907	3.5907
DCF	**180.62**	**185.88**	**242.84**	**291.33**	**310.41**	**339.34**	**352.59**	**365.88**	**373.45**	**380.67**	**381.57**	**381.93**	**375.83**	**369.29**	**356.61**	**5,714.92**

Appendix V: Synergy Break-Down

Growth synergies		2016	2017	2018	2019	2020	2021	2022
	IoT w synergies	2,638	3,034	3,489	4,012	4,614	5,306	5,306
	PSG w synergies	1,669	1,919	2,207	2,538	2,919	3,357	3,860
	IoT w/o synergies		2,691	2,745	2,799	2,855	2,913	2,971
	PSG w/o synergies		1,702	1,736	1,771	1,807	1,843	1,880
Benefits			560	1,215	1,980	2,871	3,908	4,316
WACC			1.0744	1.1543	1.2401	1.3324	1.4315	1.5380
DCF			521	1,053	1,596	2,155	2,730	2,806
Present Value		**10,861**						

Cost-synergies (Economies of scale)	2016	2017	2018
C-S Savigs		90	175
WACC		1.0744	1.1543
DCF		84	152
Present Value	**235**		

R&D		2016	2017	2018	2019	2020	2021
	R&D expense w/o synergies	12,740	13,388	14,068	14,784	15,535	16,325
	R&D expense w synergies		13,132	13,394	13,660	13,932	14,211
R&D Savigs			256	675	1,123	1,603	2,114
WACC			1.0744	1.1543	1.2401	1.3324	1.4315
DCF			238	585	906	1,203	1,477
Present Value		**4,409**					

Tax benefits			2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
	Amortization of intangible assets		120	120	120	120	120	120	120	120	120	120
Tax Savings			27	27	27	27	27	27	27	27	27	26.86
WACC			1.0744	1.1543	1.2401	1.3324	1.4315	1.5380	1.6524	1.7753	1.9073	2.0492
DCF			**25**	**23**	**22**	**20**	**19**	**17**	**16**	**15**	**14**	**13**
Present Value		**185**										