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EQUITY RESEARCH REPORT: VALUATION OF U-BLOX

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Abstract

This equity report aims at analyzing the Switzerland based company U-Blox, and the latest development in the Internet of Things landscape. By thoroughly analyzing the company and its industry, we conceived a valuation model that encompasses all the drivers which will underpin the growth of the company and the industry. Throughout the report, we present drivers as well as the methodology used to arrive at our underlying model assumptions. Having analyzed the current and the potential future environment for U-Blox, our results suggest that the company is trading at a premium and recommend investors to sell the stock.

Keywords
U-Blox, Internet of Things, positioning, connectivity, high-growth

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NOVA SCHOOL OF BUSINESS & ECONOMICS

MASTER IN FINANCE

U-BLOX

COMPANY REPORT

TECHNOLOGY - SEMICONDUCTORS

22/05/2020

STUDENTS: DAVID COPPINI, GABRIELE GATTI

FROM KING to FOOT SOLDIER

- We issue a **SELL** recommendation for U-Blox. Our target price of **CHF 39.99** has been derived on a Discounted Cash Flow method weighted 50% and a multiple valuation (EV/Sales) weighted 50% and represents a **40.48% downside.**

- History of missing guidance and setback on top-line growth are not a temporary phenomenon, but a result of more important structural changes in the industry that are going to put U-Blox under pressure in the years to come. While management foresee 2024 revenue to be between CHF 700M and CHF 800M, we are expecting only CHF 556M.

- The R&D process is drying up all the free cash flow. The markets where U-Blox is competing experience a 10% selling price decline p.a. on existing products, therefore companies must innovate constantly. Moreover, with the recent swift from GNSS to Cellular and Short-range markets, U-Blox will be obliged to intensify its R&D process, spending CHF 600M over the next 5 years.

- U-Blox missed its own guidance 5 years in a row and the management is betting on risky products that do not have any market yet, such as all autonomous driving chips and modules.

- Competition is going to be fierce, especially in the connectivity market, coming from low cost and well capitalized Chinese competitors along with giants such as Qualcomm and Broadcom moving from the smartphone segment.

Company description

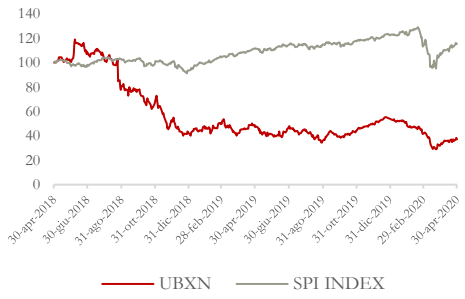
U Blox is a Switzerland-based semiconductor provider engaged in the development and marketing of Global Positioning System (GPS) products. It offers a wide range of GPS solutions, including GPS receiver chipsets, modules and GPS smart antennas which are used for: navigation, automatic vehicle location, security, traffic control, location-based services and timing.

Recommendation:	**SELL**
Price Target FY2020:	**39.99 CHF**
Price (as of 22-May-20)	**67.20 CHF**

Reuters: 22/05/2020

52-week range (CHF)	49.52-101.20
Market Cap (CHF m)	495.549
Outstanding Shares (m)	6.861

Source: Reuters as of 22/05/2020



Source: Thomson Reuters

(Values in CHF millions)	2018	2019A	2020E
Revenues	393.3	385.1	387.3
EBITDA	71.7	52.6	58.0
EBIT	48.3	22.1	27.0
Net Profit	38.5	12.9	19.1
EPS	5.6	1.9	2.8
P/E	79.0	35.4	24.2
DPS	2.3	1.6	0.8
Dividend Yield	2.8%	2.4%	1.2%

Source: Thomson Reuters

THIS REPORT WAS PREPARED EXCLUSIVELY FOR ACADEMIC PURPOSES BY DAVID COPPINI AND GABRIELE GATTI, MASTER IN FINANCE STUDENTS OF THE NOVA SCHOOL OF BUSINESS AND ECONOMICS. THE REPORT WAS SUPERVISED BY A NOVA SBE FACULTY MEMBER, ACTING IN A MERE ACADEMIC CAPACITY, WHO REVIEWED THE VALUATION METHODOLOGY AND THE FINANCIAL MODEL. (PLEASE REFER TO THE DISCLOSURES AND DISCLAIMERS AT END OF THE DOCUMENT)

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Executive summary

U-Blox is now at an inflection point, required to move from its leadership position in GNSS to the connectivity space to capture higher growth rates. In fact, the former is unlikely to experience much growth since U-Blox already has a consistent market share. On the other hand, the latter seems to be very appealing with the notion of Internet of Things (IoT) and the billions of connected devices worldwide.

Difficult to diversify U-Blox's portfolio.

However, we strongly believe that it will be very hard for U-Blox to replicate its success in the GNSS market, since the connectivity one is very different. The promise of billions of connected devices is not sufficient for capturing new (and higher) revenues. In fact, the IoT word comprises many verticals that require very different features, and experience very different dynamics. Success in any given segment does not guarantee a good result in another segment. As an example, smart meters require very low power solutions but no normal latency while indutrial IoT requires extremely low latency and ultra high reliability. Moreover, we expect major semiconductors players such as Broadcom and Qualcomm to start moving from the smartphone segment which is now experiencing mid-single digits growth versus 30+% growth rates in the past.

An history of missing guidance.

U-Blox missed its own guidance 4 years in a row suggesting that the management is not able to forecast the evolution of the addressed markets and they are investing in products that do not have a tangible market yet. We strongly believe that the 2023 revised guidance will not be achieved, based on:

1. Much stronger competition in connectivity rather than in positioning
2. No more room for market share gain in positioning due to U-Blox already leadership position
3. R&D intensity unlikely to slow down, because of the first two points
4. Substantially lower gross margins in the connectivity segments
5. Covid-19 impact especially on the automotive sector

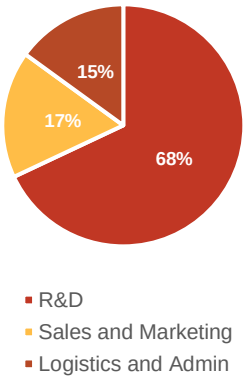
Valuation: 50% DCF and 50% EV/Sales

Considering all these factors we conducted a valuation based on a 50% weight DCF and a 50% weight relative valuation. With this methodology we arrived at a twelve-month **target price of CHF 39.99**, which implies a **SELL** recommendation at the current share price of CHF 67.20. While we share the management's view on the positive long-term outlook, the low-cost competition is hitting hard. Therefore, we do not see any upside potential in the short-term to medium term.

Company overview

Funding and IPO

Figure 1: U-Blox's workforce

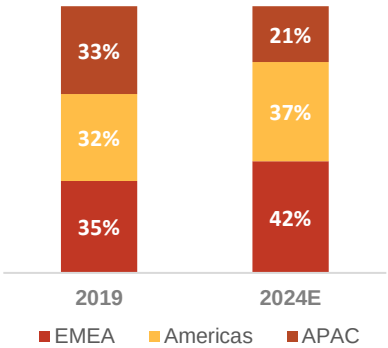


Source: Company data

Based in Thalwil, Switzerland, U-Blox was founded in 1997 by three Ph.D. students of the Swiss Federal Institute of Technology (ETH) of Zurich and their professor. In 2007, after developing their first commercial products and opening offices in both USA and Asia, the company successfully made an IPO on the Swiss stock exchange. U-Blox acts as a "fabless semiconductor provider of embedded wireless and positioning communications solutions"[1], and actively operates in more than 28 locations, including 16 R&D centres across the world. The company currently employs 1088 people worldwide, with most of its workforce employed in R&D (68%), followed by Sales and Marketing (17%) and finally Logistics and Administration (15%), (**Fig. 1**). For the fiscal year ended 2019, U-Blox reported revenues of CHF 385.1 million.

Presence on Global Markets

Figure 2: Regional split 2019-2024



Source: Company and own calculations

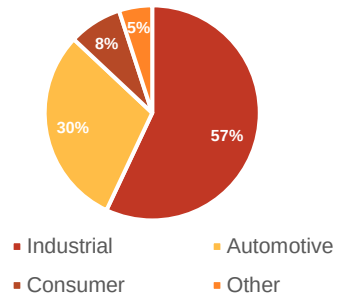
According to the company's 2019 Report, they are present in the three major geographic areas, namely Asia-Pacific (APAC), Americas and Europe and Middle East (EMEA), accounting for 33%, 32% and 35% of total revenues respectively. In 2019 the company experienced adverse market conditions, especially in EMEA and in the Americas. This is primarily caused by the trade war between the US and China, which created a negative sentiment with a deep impact in EMEA. In the Americas the creation of the LTE Cat-M[2] network was once more delayed, postponing marketable opportunity for U-Blox's Internet of Things products. In APAC the activity suffered a major blow due to the elimination of a large client in Taiwan who was not able to meet U-Blox's standards of compliance. However, the sales in the region have been keep afloat thanks to the growth of investment in infrastructure, IoT and automotive, in China. Based on the current state of the activities we project to see U-Blox regional segmentation in revenues to change by 2024 to 37% Americas, 42% EMEA and 21% APAC (**Fig. 2**).

APAC market share is under stake and will probably decrease significantly because of the fierce competition caused by Chinese companies entering their domestic market.

The sharp decline in APAC, from the actual 35%, is caused by fading opportunities in the market mainly caused by an increasing number of Chinese competitors offering efficient and low-cost products.

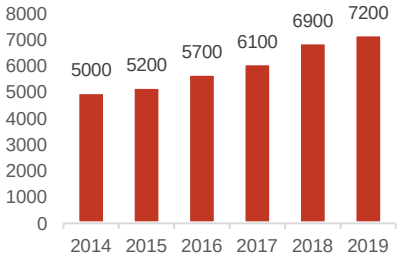
[1] "U-Blox 2019 Half Year Report"
[2] Long Term Evolution (4G), category M is a new protocols for cellular communication designed to provide low power and low cost cellular connectivity for industrial Internet of Things (IoT) applications.

Figure 3: Revenue by segment



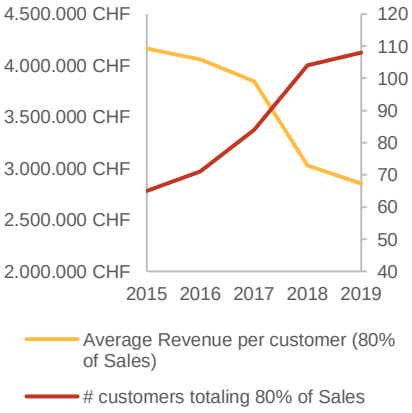
Source: Company data

Figure 4: Customer base evolution



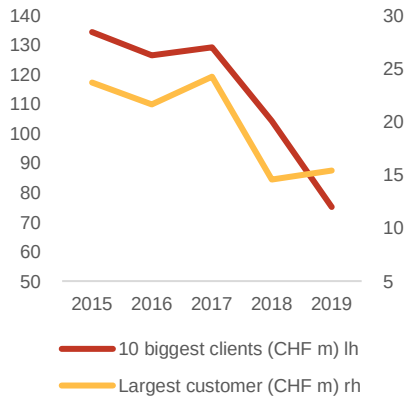
Source: Company data

Figure 5: 80% of Total Sales



Source: Company data

Figure 6: 20% of Total Sales



Source: Company data

Diversified product range

U-Blox is mainly focused on the industrial market sector, accounting for 57% of total revenues, covering many use cases from fleet tracking, cargo monitoring, smart street lighting and medical devices, through to the use of timing solutions for 4G and 5G cellular systems. U-Blox also addresses the Automotive market, accounting for 30% of total sales, where the ever-increasing focus on autonomous vehicles is translated on rising demand for both cm-level high precision positioning and secure vehicle-to-everything (V2X) communication. Finally, U-Blox serves the Consumer market with an 8% contribution to total revenues, focusing on the proliferation of smart technology, notably sport and fitness equipment, people and pet trackers, action cameras and more futuristic kit, such as robots and drones (**Fig. 3**).

Customer base composition

In the last years U-Blox experienced a significant customer base growth passing from 5000 in 2014 to 7200 in 2019 (**Fig. 4**). Among their customers there are companies such as Bosch, Schindler, Leica and Siemens, all leaders in their specific markets. This led the management to claim that with such a large number of clients the company enjoy a very diversified customer base, dodging the risk to rely on one single customer. However, only 104 customers account for 80% of total revenue and their contribution to sales steady decreased from CHF 4.2M per client in 2015 to CHF 2.8M per client in 2019 (**Fig. 5**). The same pattern can be seen analyzing the share of revenue for the 10 biggest customers that amounted to CHF 134M in 2015 and steadily decreased to CHF 75M in 2019 along with the largest client that counted for CHF 23.7M in 2015 and currently amounts to only CHF 15.7M (**Fig. 6**). We can conclude that despite claiming such important diversification on customer base U-Blox still highly rely on very few clients. In fact, 104 customers are 1.5% of all clients, and its strategy is just leading to a contraction of the average expenditure of those most important clients. Isolating the 98.5% of the clients which only generate 20% of total sales, we find that the average value per client of this group is only CHF 10,860. This massive number of low-value clients reveals a blow of resources impacting on efficiency. G&A expenses have been increasing following the number of customers, whereas peer analysis shows an opposite trend. Indeed, G&A expenses do not represent a critical factor for U-Blox, however decreasing them will provide an important benefit to EBIT margin. Since management did not provide any indication of their future reduction, we expected G&A expenses to Sales ratio to stay constant.

Strategy

U-Blox outlines a four-pillar strategy as base for the future.

1. ***Operational excellence***, focusing on supply chain and logistical performance, as demanded by its large number of units shipped per year.
2. ***Strategic partnership and acquisitions***, consistent with its M&A history dating back to 2009.
3. ***Market position***, by focusing on the long-term most growing markets, which the management believes will be autonomous driving, mobility and unmanned vehicles and industrials, where communication and positioning technologies are becoming more and more crucial.
4. ***Technology and innovation***, focusing on expanding their existing products and services portfolio supported by strong investments in R&D.

We believe that the key points of this strategy, Market position and Technology and innovation, have been disappointed so far. U-Blox is failing to position itself successfully in other markets where the management is trying to expand, such as autonomous driving. This one, for example, is an immature market far from being ready for mass production and their leadership position in GNSS market will not be replicated in others market niches they are exploring right now. The huge investments in Research and Development are not producing any concrete return, in fact, while the R&D to sales ratio is remaining constant, revenues are decreasing, meaning R&D investments are not paying off.

Massive number of low-value clients impacting on efficiency.

Supply Chain

U-Blox pursues a fabless manufacturing corporate strategy by fully outsourcing the hardware production of its chips and modules. This allows U-Blox to focus on its core activities which are the research, development and marketing of positioning and communication products. The production process goes through Chip Wafer processing, where leading semiconductor manufacturers such as **TSMC** (Taiwan) and **Global Foundries** (Singapore) are U-Blox's primary suppliers. Then, **AMKOR** (Philippines) is the chip packager. Finally, finished chips are sent to **Flextronics** (Austria) for being assembled into modules (**Fig. 7**). Flextronics provides full-service inventory management and order fulfilment to U-Blox. This business model allows the company to eliminate fixed costs, maintaining an easiness in scalability and focusing on product innovation.

Figure 7: *Suppliers*

Chip wafer processing: first step of the manufacturing process and the most important.

Chip packaging: last stage of the semiconductor production process. The package is an encasement designed to protect the wafer and to promote the electrical contacts.

U-Blox fully outsource the semiconductor fabrication to specialized manufacturers to focus on design and sales.

This allows them to benefit from lower capital costs while concentrating their research and development resources on the end market.

We noticed that this model does not allow the company to effectively improve COGS that are roughly 55% of revenue which in a market leading to enduring price competition is a key aspect.

***Figure 8**: Supply chain composition*

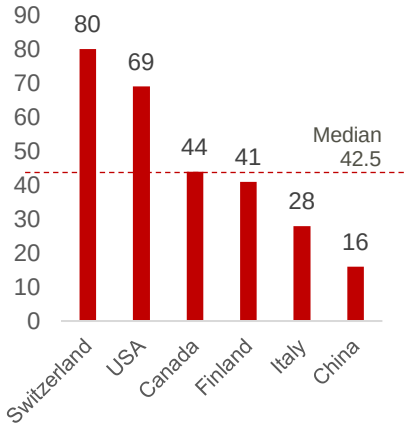
	Firm Infrastructure	Design & Engineering	Procurement	Chip Wafer Processing	Chip Packaging	Assembly & Distribution	Sales & Marketing
Owners	U-Blox	U-Blox	U-Blox Flextronics	TSMC Global Foundries	AMKOR	Flextronics	U-Blox
Costs	CHF 23m	CHF 106m	CHF 51m	CHF 59m	CHF 15m	CHF 81m	CHF 37m
% of costs	6%	29%	14%	16%	4%	22%	10%
Importance	Low	High	Medium	High	Medium	High	Medium
Cost control	Full	Full	Moderate	Low	Low	Low	Full
Cost drivers	Compensation, amenities	Frequency of new models, R&D locations	Order size, supplier location, avg order	Chip complexity, wafer yield	Chip complexity, order size	Order size, destination, module complexity	Account no., value, reputation

Source: Company data, Team analysis

The ending steps of the Supply Chain have been the most troubled one for U-Blox. **Distribution and Sales** have been neglected so far: the actual structure of the sales network is centred around the main quarters in Switzerland with small local offices abroad. This led to an inefficiency of sales that the company has started to tackle recently: firstly, with the appointment of **Markus Schaefer** as head of global sales and then **Carl Bellanca** as head of sales in America, in order to set up a deeper network together with new distribution agreements. We believe that this deep restructuring of the sales structure was greatly needed but it will take a consistent amount of time before giving back any tangible result.

Research & Development and intangible assets

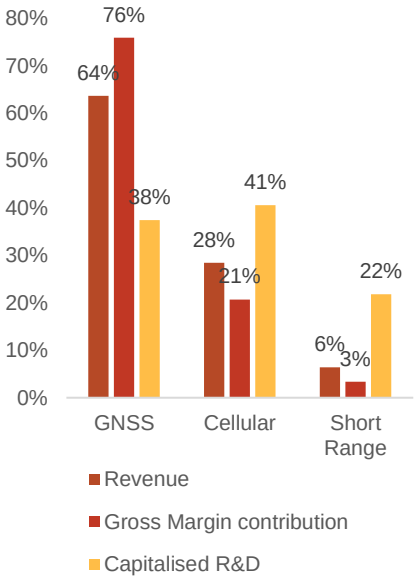
***Figure 9:** Junior Engineer Salary ($th per year)*



Source: Universum

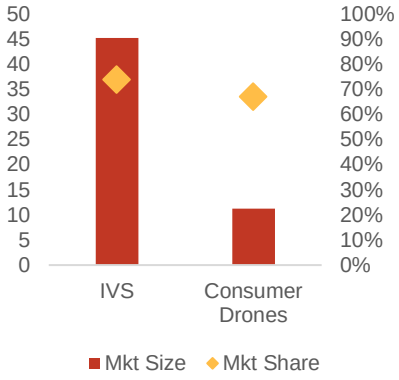
U-Blox has an R&D team of 740 engineers, who are dedicated to improving existing products and to launch new chips and modules for both positioning and cellular markets. It must be considered that roughly 50% of the R&D activities (~350 engineers) are conducted in Switzerland (Thalwil). The second most important R&D centre is in Finland, where a significant part of cellular R&D is conducted. Switzerland represent a strong talent pool for engineers, this is enhanced by world renowned engineering universities, such as ETH of Zurich and EPFL of Lausanne, and by the presence of many high-tech companies such as Google and IBM having their European HQs in Zurich. This situation on the other side means a more competitive and expensive market, which elevate Switzerland to top of most expensive labour market for engineers (**FIG. 9**). We believe that this higher personnel cost compared to U-Blox competitors, if it was the key to U-Blox success so far, now can become a big disadvantage in a "semiconductors" market where the dire competition of Chinese producers is pushing the price to an historic low. On this

Figure 10: Revenue, Gross Margin, Capitalized R&D by technology



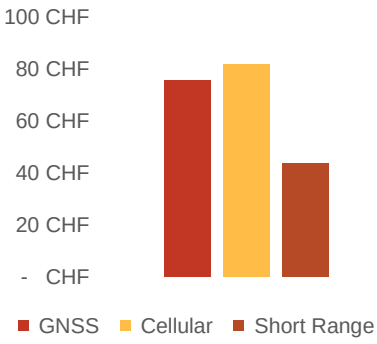
Source: Company data, team analysis

Figure 11: Mkt Size and Mkt Share leadership 2019



Source: Company data, team analysis

Figure 12: Capitalized R&D (Mln)



Source: Company data

regard, U-Blox's CFO, Roland Jud, stated the contrariety of U-Blox in decreasing its R&D workforce, believing that when business will ramp up again, they need to be prepared and if they let engineers go it would be very hard to get them back.

Intangible Assets are a crucial concern to U-Blox shareholders since they amount to 60% of non-cash total assets. A deep analysis of intangibles reveals that 62.5% of U-Blox R&D capitalized comes from Cellular and Short-Range segments (40.63% and 21.87% respectively) which together only bring 34% of sales and 24% of Gross Margin (**Fig. 10**). Moreover, it must be noted that U-Blox relies more on constant innovation rather than on patents for protecting its products. In our opinion this approach seems to be very hazardous since design IP is reasonably valuable for no more than 3 years before the products become obsolete. Moreover, we believe that U-Blox is burning a significant amount of cash trying to develop market segments that are not yet in place, such as Autonomous Driving which its development is far from being fully implemented in the market due to an early stage which still focuses on a conditional automation[3].

The Sector

Global Navigation Satellite System (GNSS) is the infrastructure that allows users with a compatible device to determine their position, velocity and time by processing signals from a variety of satellite positioning systems. This high technology market greatly increased in the past decades reaching 6.4 billion of global installed base of GNSS devices in 2019, with a forecast of 9.4 billion by 2029.

For more than 10 years, U-Blox has served the positioning industry developing and selling chips and modules that support global navigation satellite systems (GNSS). The company succeeded in building a strong market position, with almost a monopoly, in Drones and a superior market share in several Automotive applications (**Fig. 11**). Despite the positive sector forecast the GNSS market is close to saturation and U-Blox, due to its strict dependence with 76% of the revenues generated from this market, started to seek for opportunities to expand and diversify its business in other markets such as Cellular and Short-range connectivity. The strategy is well highlighted in **Fig. 12** with the majority of R&D resources invested in those two segments rather than in positioning (126 CHF, 63% of the total).

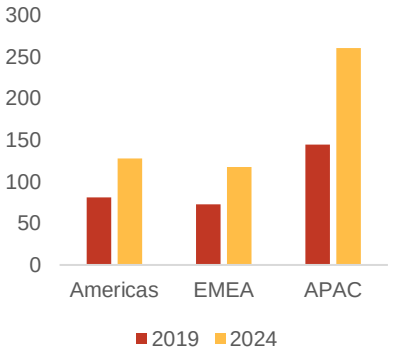
[3] In Autonomous Driving there are 5 stages of automation: 1) Driver Assistance 2) Partial Automation 3) Conditional Automation 4) High Automation 5) Full Automation. To advance between these levels, an increasing amount of sensory data is necessary to enable the vehicle, from 3rd stage on the usage of sensor start to be intense.

We do not believe that U-Blox will be able to replicate its success in GNSS in the connectivity market since the cellular market is much more crowded than the positioning one with bigger and stronger competitors (**Appendix 10**).

U-Blox's Blue Ocean

When US President Bill Clinton made the US GPS system available for global use in 1996, U-Blox rapidly took the opportunity. It must be considered that the GPS infrastructure was already in place and operational. Moreover, when the company started its operations in 1997, it already had a customer waiting for its products: the Swiss Government. Starting from this point, U-Blox provided customers with chips and modules with core positioning functionalities while being relatively cheap and easy to implement. Furthermore, U-Blox pushed its revenues by selling modules, with an ASP of CHF 9.7, to companies and individuals that do not have the engineering capabilities to integrate the much cheaper chips (ASP of CHF 1.65) for their applications. This is reflected in the very high number of clients (7200 in 2019), meaning that the company sells low volume products.

Figure 13: Market Size (Mln units)



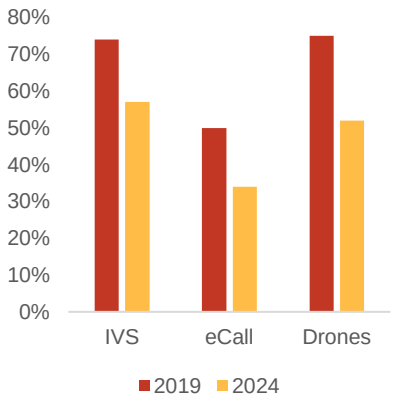
Source: GSA GNSS Market Report 2019

Competitors

"No competitor is like us" but many are very similar.

As Roland Jud (U-Blox's CFO) always remember during corporate presentations, no competitor is perfectly comparable to U-Blox. However, by analysing the market, it can be seen that many companies directly compete with at least one of U-Blox's products. Moreover, the company is much more unique in the GNSS segment rather than in the connectivity space. In fact, it must be noted that the cellular segments where U-Blox has been successful are those which require both GNSS and connectivity features.

Figure 14: U-Blox Crucial Market Shares evolution



Source: Company data

Unlike US competitors like Trimble who turns a $9 module into instruments worth thousands of dollars[4], U-Blox decided to expand its operations to the connectivity industry. This could be seen as a natural shift; however, the company entered a field with strong and established players such as Sierra Wireless, Telit and Quectel. U-Blox found its niche in applications that both required GNSS and connectivity features by leveraging its dominant leadership in positioning. Overall, the growth from the entering on the connectivity market has been quite strong, mostly driven by IVS devices, eCall systems and drones. In fact, those markets have increased from 12.5M (IVS), 1.4M (eCall) and 0.045M (drones) devices in 2009 to 45M (IVS), 15.3M (eCall) and 13M (drones) in 2019, and are expected to reach 61M (IVS), 16M (eCall) and 21M (drones) in 2024. In these particular segments that require both positioning and connectivity features, U-Blox has

[4] www.trimble.com

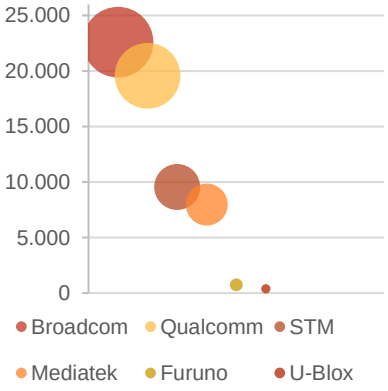
market shares of 74% (IVS), 50% (eCall) and 75% (drones) in 2019. We believe that these market shares are going to decrease to 57% (IVS), 34% (eCall) and 52% (drones) (**Fig. 13**), due to the increasing competition from Chinese companies given the relative simplicity and low cost of devices needed in these applications.

Main semiconductors players

After saturating the GNSS' niches in 2009-10, U-Blox started expanding in dangerous waters.

We believe that U-Blox has been very smart in the past to move towards niches markets that require both GNSS and connectivity features but that are not so complex to need huge R&D budgets, like the one of giants such as Qualcomm or Broadcom ($5.4 Bln, $4.7 Bln, respectively[5]). These markets are not large enough, for the moment, to attract big players which mostly compete in the smartphone segment. Cellular market in unit terms, still account for the vast majority of the overall GNSS market with 1.5 billion units out of 1.7 billion, representing 83% of overall installed base[6].

Figure 15: *Size by Revenue ($ mln)*



Source: Thomson Reuters

U-Blox does not serve the smartphone market because their edge in positioning would be lost, since smartphones only require simple positioning chips. However, U-Blox's strategy of portfolio diversification towards appealing markets such as Automotive and Industrial could be ineffective once entered in competition with such giants. To make a comparison, U-Blox R&D budget is roughly 2% of Qualcomm's one. The size advantage also means that those big players could easily enter in U-Blox's niches if the market size will be attractive enough. As we can better see from the **Fig.15** U-Blox size is very limited compared to the main players. The most dangerous for U-Blox expansions are:

- **Broadcom** is known for a very aggressive M&A strategy, buying companies that have the best-in-class technology franchises, divest any resulting underperforming assets and optimize those franchises. They rapidly became the biggest player in the sector with $107 Bln of market cap and $20.85 Bln of Revenues. Its market focus is mainly on Wireless and Industrial Semiconductor Solutions.
- **Qualcomm** is an American semiconductor company best known for its efforts in the realm of smartphone connectivity. The company plays a significant role in many other areas: a great example of this is its $6.5 billion automotive business out of $24.3 Bln Revenues and $88 Bln market cap.
- **STMicroelectronics** is the result of the merger of former French and Italian government-owned companies. With a market cap of $20.01 Bln,

[5] R&D expenditure from Thomson Reuters
[6] GSA GNSS Market Report 2019

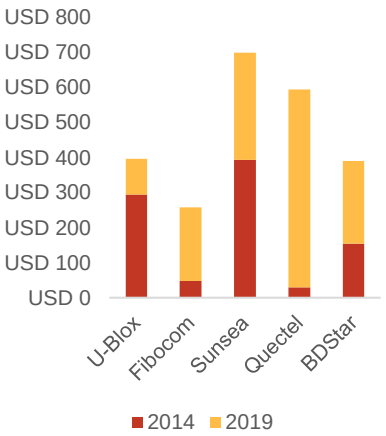
$9.56 Bln of Revenues and $2.29 Bln of R&D expenditure, STM is the Europe's largest semiconductor chip maker, having Apple as their biggest client, generating 17.6% of the revenues with them. The company's main markets are: Personal Electronics, Communications, Automotive and Industrial.[7]

- **Nordic Semiconductor** has strong leadership in low-power Short-Range chips, being a formidable competitor for U-Blox. This young company promptly hired large teams of navigated experts coming from Nokia and Ericsson.[8]

New Chinese competitors are duplicating U-Blox's portfolio

The National Government of China started investing in "National Champions" thanks to the China Integrated Circuity Industry Investment Fund (CICIIF). In the first round, the fund raised more than $20B that invested in 23 Chinese semiconductor companies. In 2019, the CICIIF raised an additional $29B and started to invest some months ago. This large fund, invested in successful companies such as BDStar Navigation, which is competing with U-Blox in the GNSS sector and saw revenue growing from $243.5M in 2016 to $461.3M in 2018. Moreover, Chinese President Xi Jinping with the "Made in China 2025" initiative targeted the semiconductor industry's auto-sufficiency as crucial. For all these reasons, we strongly believe that national and state-influenced Chinese clients would likely choose to work with such companies rather than U-Blox, especially for lower sophisticated products. Finally, given the low certification requirements in China, the Chinese market is particularly unattractive for premium quality manufacturers such as U-Blox.

Figure 16: *U-Blox vs Chinese competitors - Revenue evolution*



Source: Thomson Reuters

Figure 17: *Chinese presence in U-Blox markets*

	P	C	S-R
Quectel	◎	◎	◎
BDStar	◎		
SunSea AIoT		◎	◎
Fibocom		◎	

Source: Team analysis

U-Blox started to feel the pressure coming from well capitalized and strong Chinese peers such as Sunsea, BdStar, Fibocom and Quectel. In fact, these companies experienced very high growth rates during the last 5 years and are expected to continue growing faster than U-Blox. Moreover, all these companies have a much lower gross margin, meaning that they sell products at a lower price. It must be noted that all these competitors started to grow considerably starting from 2015 following the "Made in China 2025" program (**Fig. 16**). By analysing these companies' product portfolio, we noticed that they are all replicating U-Blox's products in a particular niche (**Fig. 17**):

- Fibocom is replicating the cellular segment.
- Sunsea is replicating both the cellular and the short-range segments.

[7] www.stm.com, Company Presentation April 2020
[8] Vontobel, U-Blox Company Report / 08.02.2019: Michael Foeth, PhD, CFA and Panagiotis Spiliopoulos, CEFA

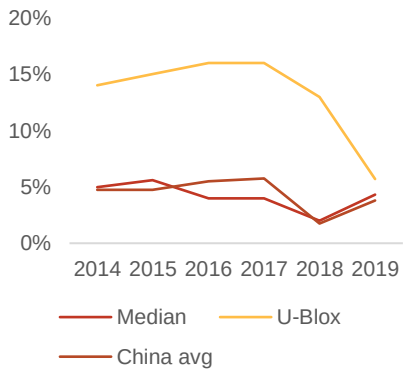
- BDStar is replicating the GNSS segment.
- Quectel is replicating the entire product portfolio.

Even if these companies offer lower quality solutions, they seem to be sufficient and much cheaper.

Ratio analysis vs peers constantly deteriorated from 2014

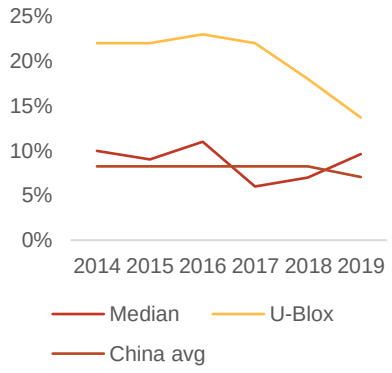
A large comparison of financial ratios between U-Blox and its competitors highlighted that in 2014 the company was better than everybody else in: Revenue growth, gross margin, EBITDA and EBIT margins (**Fig. 18 and 19**), ROE, ROA and current ratio. In the following years all these ratios started deteriorating and we expect this trend to continue in the future. The most visible effect was in EBITDA margin and EBIT margin, where U-Blox literally collapsed in the last 2 years, while competitors remained more or less stable.

Figure 18: *Peers comparison EBIT Margin*



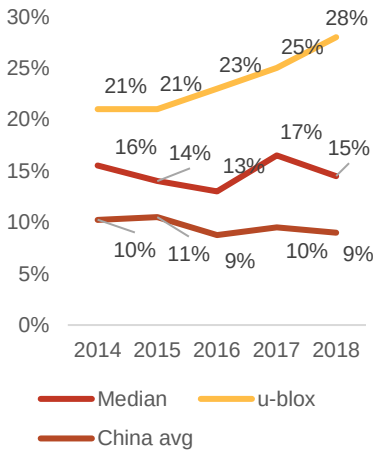
Source: Thomson Reuters

Figure 19: *Peers comparison EBITDA Margin*



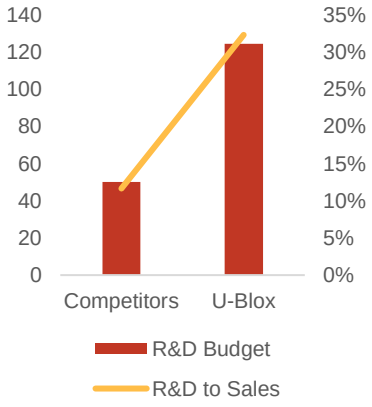
Source: Thomson Reuters

Figure 20: *R&D to Revenue Growth*



Source: Thomson Reuters

Figure 21: *R&D to Sales trend*



Source: Thomson Reuters

Margins and R&D efficiency as key value drivers

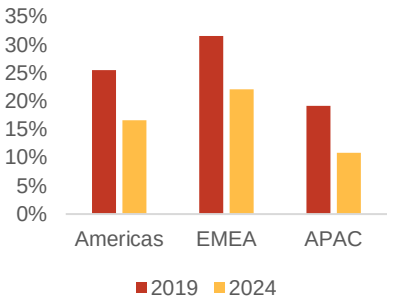
In the semiconductor industry, the key value driver is how much a business can generate for each dollar invested to develop a new chipset (or module), multiplied by the margin on that chipset (or module). Running a regression analysis shows a quite strong correlation between Revenue and Gross Margin, (R2 = 0.49). High margins are the result of having developed a technology that competitors do not have; therefore, it is obvious that companies must massively spend on R&D. It must be noted that Chinese companies that entered this sector are focused on low innovation, low margins and high-volume products, meaning that Chinese firms have the lowest R&D to Sales ratio (10% vs 18% median and 28% of U-Blox), (**Fig. 20 and 21**). Moreover, as Roland Jud (U-Blox's CFO) admitted, U-Blox has no process patents but it is only competing on design. This lack of process technology means that the company has no real structural advantage over its peers, but only a temporary design benefit that only lasts in the short-term. This confirms our view

that U-Blox cannot stop its innovation pipeline, otherwise it is going to be easily replaced.

Growth opportunities concentrated in APAC

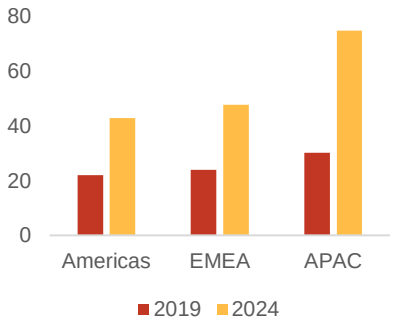
The European GNSS Agency (GSA) expects the positioning market across all applications to increase from 329M to 677M units over 5 years (16% CAGR). However, most of this growth is expected from APAC. Due to the previously highlighted dynamics, it is our opinion that U-Blox will not fully benefit from this growth. The gradual market share decline in APAC, especially in China, is expected to offset market growth, resulting in a slight decrease in revenue from CHF 117M in 2019 to CHF 113M in 2024 (**Fig. 22 and 23**)

Figure 22: *Market Shares*



Source: GSA GNSS Market Report 2019

Figure 23: *Cellular Market Size (mn units)*



Source: GSA GNSS Market Report 2019

IoT deployment not as easy as announced

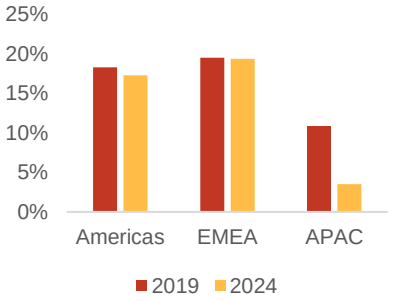
The extensive adoption of IoT as expected by U-Blox's management is taking place at a much slower rate. In fact, many technical and economic aspects need to be analyzed: collecting, processing and interpreting data from millions of connected devices require massive computational power and quantum computers are only at an early-stage development[9]; telecommunication companies need to invest heavily in order to modernize the infrastructure required by the IoT ecosystem; cybersecurity, data security and privacy problems are not being fully investigated so far; regulation is not promptly responding on all these themes; the absence of standardization is slowing down the entire process.

COVID-19 is pushing the global economy into a recession

Covid-19 is having an unprecedented effect on our society and economic landscape. U-Blox is highly exposed to a recession risk since the company sells chips and modules to automotive players (CHF 116M in 2019), industrial players (CHF 123M in 2019), drones (CHF 115M in 2019) and consumer (CHF 31M in 2019).

Moreover, U-Blox's success is heavily dependent on infrastructural improvements which are critical for the IoT development and require billions of dollars in Capex. It must be also considered that 5G will not allow a massive increase in IoT use cases, instead we are waiting for the 6G development. Expecting that many

Figure 24: *Cellular Market Shares*

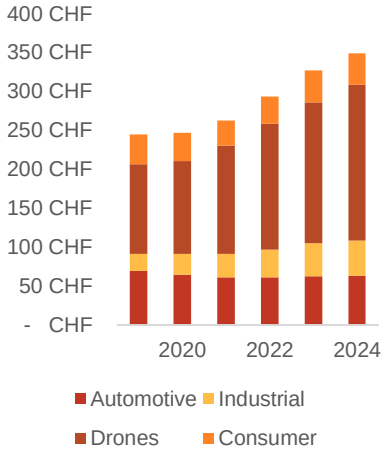


Source: GSA GNSS Market Report 2019

[9] Quantum computers: In traditional computing, capacity is measured by bits, information units that can have two possible outcomes: 0 and 1. In quantum computing, those outcomes, called qubits, can be 0,1 and both of them at the same time. Therefore, they can perform computations millions of times faster than traditional computers. Moreover, quantum computing will allow, if used properly, to create a virtually inviolable communication network. It should be noted that cybersecurity is crucial for the scalability of the IoT universe. Quantum computing is still in its development stage with industry giants such as IBM, Google and Microsoft investing massively in this sector.

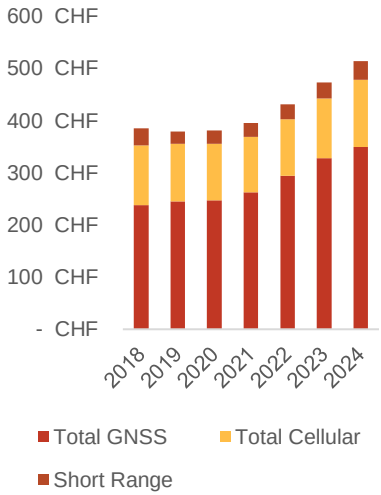
infrastructural investments will be postponed, we believe that the majority of the new products will not start selling in volume until 2022-23. Generally speaking, as demand for products and services dries up, the most important move for companies is to cut costs immediately. We understand that businesses will need to automate their processes more and more. However, this automation process, in the short term will only be concentrated in simple applications such as cleaning robots, where Chinese competitors are much more competitive than U-Blox. The only positive effect seems to be on Drones which have been used on a large scale by many corporations and governments in order to make medical deliveries, monitor public spaces, broadcasting messages and spread information and for agricultural tasks.

Figure 25: Revenue evolution per business



Source: Company data, GSA GNSS Market Report 2019

Figure 26: Revenue forecast per market segments



Source: Company and GSA GNSS Market Report 2019

Financial Analysis

Forecasting revenues

Given the complicated features of the industry previously explained, we relied on a bottom-up approach in order to forecast market data and consequently revenues. For this purpose, we used as a principal source the European GNSS Agency's 2019 GSA GNSS Market Report that provides detailed 10-year market units projections for all different GNSS applications. Because of the Covid-19 emergency we decided to apply a 25% discount on the growth rates estimated by the European GNSS Agency in 2019. Then, looking at the U-Blox's addressed market, we came up with 20 GNSS applications. From this point, the company's market share was estimated by investigating data disclosed by U-Blox, market report from several sources, clients and competitors. The subsequent step was to estimate the Average Selling Price (ASP) by application, considering both the adoption of new products and the industry average ASP decline of 8% per year. It must be noted that we applied a higher ASP decline rate of 12% in 2020 accounting for the Covid-19 emergency. This 2% change in ASP erosion in 2020 and 2021 is expected by many international IoT report that we analysed as reliable. Market shares for every application were suddenly adjusted in order to make our model reflect the company's Revenues in 2018 and 2019. With this approach, it was possible to estimate U-Blox's total sales by segment, product, application and geography. It is our opinion that the company will reach revenue of CHF 556M in 2024 (**Fig 25 and 26**), well below management guidance (CHF 700-800M).

GNSS: strong leadership but no more growth

We expect U-Blox GNSS unit sales to stay constant or to decrease slightly, accounting for a weaker demand in the automotive segment caused by the

Coronavirus emergency. Therefore, we modelled an overall GNSS market share decreasing from 23% in 2019 to 14% in 2024. We strongly believe that the company will experience significant pressure in the **Consumer** segment because of the simplicity and easy replicability of these products. In our view, this segment will become dominated by low-cost producers, mainly Chinese. Considering automotive **IVS,** we estimated a market share decline from 74% in 2019 to 57% in 2024. In fact, automotive customers in APAC will likely switch to local suppliers such as Mediatek, Quectel and BDStar. For the same reason we also expect **Consumer Drones** market share to decrease from 67% in 2019 to 47% in 2024. On the other hand, the **Professional Drones** segment is expected to be more resilient because of the much more sophisticated modules requested. All other use cases such as **Timing**, **Agriculture**, **Emergency Response** and **Geomatics** have a minimal impact on U-Blox revenues, and they are not expected to grow substantially in the next 5 years. Agriculture for example, is experiencing a decreasing farm income, extremely limited financial resources for new investments, rising costs, climate-change effects and the absence of young workers who could bring innovation faster in this industry. Moreover, rural areas across the world suffer from the lack of reliable connectivity. It must be noted that the European GNSS Agency expects the geospatial positioning industry to grow at a 14% CAGR in unit terms. Therefore, overall market share loss will be offset by market growth. In our view, U-Blox is going to benefit from the product mix effect as a higher percentage of sales will come from premium products. In fact, we forecasted a GNSS revenue CAGR of 7%.

Cellular and short-range: a dangerous battlefield

According to the Ericsson Report 2019 the connectivity market is expected to grow at a 27% CAGR between 2018 and 2024 (**Fig 27**). However, it is our opinion that U-Blox will not be able to fully capture this growth because of the severe competition in this market. In fact, we modelled the overall cellular market share decreasing from 17% to 13%. On one hand, we see an increase in market share in **Insurance Telematics** and **Fleet Management** from 6% in 2019 to 17% in 2024, coming from new partnerships in the Americas and EMEA. On the other hand, we expect to decrease market share in Asia-Pacific for important applications such as **eCall** and **Bike/Scooter sharing**, because of the low complexity of the modules needed. Accounting for all these aspects, revenues from the connectivity business will increase at a 3.2% CAGR. Thanks to the acquisition of Rigado's Bluetooth business in 2019, U-Blox expanded its short-range activity. According to Ericsson Report 2019, the short-range market is

***Figure 27**: Global IoT connections*

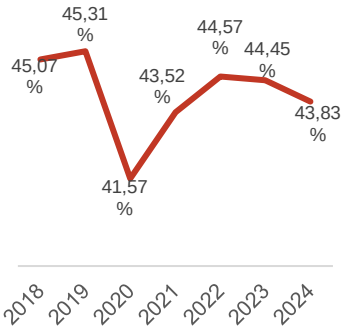
IoT Connections (bln)	2018	2024	CAGR
Wide-area IoT	1,1	4,4	27%
Cellular IoT	*1*	*4,1*	*27%*
Short-range IoT	7,5	17,8	15%
Total	**8,6**	**22,3**	**17%**

Source: GSA GNSS Market Report 2019

expected to grow at 15% CAGR for the next 5 years. However, for the same reason analyzed in the Cellular industry, it is our opinion that sales in this segment will only grow at an 8% CAGR through 2024.

Connectivity growth will not support positioning

Figure 28: Gross Margin



Source: Company data, GSA GNSS Market Report 2019

Looking at our model, the forecasted increase of the Cellular contribution to total sales will not take place. Contrary to the claim of the management, we expect U-Blox to become even more dependent on GNSS revenue contribution increasing from 64% in 2019 to 67% in 2024 with Cellular decreasing from 28% to 25% in the same period (**Fig 26**). This dynamic will be mainly caused by the greater level of competition in the cellular segment, especially in APAC and by the increasing price effect of premium products in the GNSS segment. At the same time, we expect Gross Margin to decrease from 45.3% in 2019 to 43.8% in 2024 with a low of 41.57% this year due to the Covid-19 emergency (**Fig. 28**). Accordingly, the GNSS Gross Margin contribution will increase from 76% in 2019 to 78% in 2024 while the Cellular one will decrease from 21% to 19% during the same period. In fact, we believe that while Cellular and Short-Range gross margin will remain roughly stable, the GNSS one will decrease from 54% in 2019 to 51% in 2024.

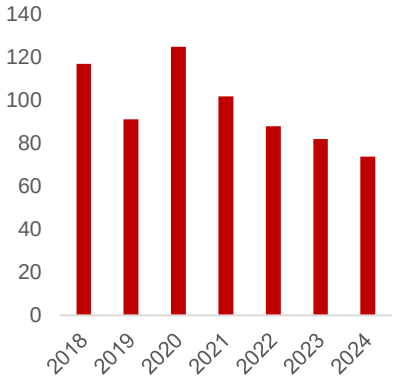
Future not as bright as anticipated

Decreasing margins and missing guidance once more.

To continue enjoying a higher gross margin than competitors, U-Blox must constantly launch new products. During 2019, they launched two critical new V2X NB-IoT products, such as F9 and M9. Moreover, according to the last company's presentation, U-Blox is actually capitalizing on 6 new devices. However, we must consider that the company is investing in futuristic products that are unlikely to generate incremental revenue in the short to medium term. The management consider R&D spending as a fixed cost, since it mainly consists of engineers' salaries and U-Blox is unwilling to decrease the workforce. Therefore, accordingly with management statements we estimate R&D spending to grow from CHF 96M in 2019 to CHF 117M in 2024. After the explicit forecast period, the R&D to Sales ratio is estimated to normalize to its historical average of 20%. Furthermore, management stated that they will continue to capitalize on between 40% and 45% of R&D expenses. With more and more capitalized R&D in the Balance Sheet, U-Blox will increase amortization as forecasted in our model (**Appendix 4)**. Currently, R&D assets account for 34% of Total Assets, while PP&E only 3%, because of the fabless business model of the company. With decreasing margins and increasing R&D we expect management to miss the 2023 already revised guidance of 20-25% EBITDA margin and 10-13% EBIT margin. In fact, our model forecasts these figures to be 16% and 8% respectively in 2024.

Working Capital

Figure 29: NWC in days



Source: Company data, team analysis

The main drivers in Net Working Capital consist of Accounts receivable, Inventory and Accounts payable. Receivables are expected to be driven by sales while inventory as well as payables by COGS. In 2018 the cash conversion cycle peaked at 117 days (**Fig. 29**) due to the trade war and some issues with a customer in the US and one in APAC. The situation normalized in 2019 with a cash cycle decreased to normal levels at 91 days. This was due to a decrease in account receivables days from 56 days in 2018 to 46 days in 2019 and a similar dynamic for inventory days decreasing from 97 days in 2018 to 89 days in 2019. Accounting for the Covid-19 impact we modelled an increase of receivable days reaching a value of 60 and inventory days of 100, that combined with account payable days of 35 mean a 125 days cash conversion cycle. This number would be the highest in U-Blox's history reflecting the extremely volatile period that the economy is facing. After this extraordinary period the collection period for receivables and the inventory days are expected to converge to industry median, translating in a 74 days cash conversion cycle in 2024.

U-Blox financial position

With an average **quick ratio** of 3.9 over the three last years and an average **current ratio** of 4.6 (vs 1.9 and 2.5 respectively for its competitors), U-Blox is not facing liquidity and solvency risk. The company is sitting on a large pile of cash raised with low-cost debt in 2015 and 2017 and maturing in 2021 and 2023. These bonds are expected to be rollover at maturity, implying constant nominal debt in the future. Cash currently amounts to 22% of Total Assets and equals 1 year of R&D spending, providing U-Blox with a safety buffer in case of hard times. Moreover, the **Altman's Z-Score** is still greater than the 2.99 threshold, meaning that the probability of bankruptcy is low. However, this value constantly decreased from 8.6 in 2015 to 3.1 in 2019. The cash conversion cycle reached a peak of 117 days in 2018 due to inventory build-up against trade-tensions worries and higher accounts receivables days deriving from a client in APAC who did not respect U-Blox terms. Due to the Covid-19 emergency and the impact on supply chain and weaker final customers, we expect a temporary increase of the cash conversion cycle in 2020, before decreasing to historical levels.

We performed a **Beneish's M-Score** (**Fig. 30**) test to assess whether U-Blox's financial statements had undergone any managerial **accounting manipulation**. According to this test the likelihood of accounting manipulation seems to be moderate with a value constantly greater than the -2.22 threshold. However, the

2Beneish's M-Score assesses the likelihood that the reported earnings of a company have been manipulated.

*If the M-Sscore is **higher than -2,22** the company is likely to be a manipulator.*

M-Score constantly decreased from -4.8 in 2014 to a low of -2.3 in 2018 before rebounding to -2.9 in 2019.

Figure 30: *Beneish's M-Score*

Input Variables (CHF m)	2014	2015	2016	2017	2018	2019
Revenue	270	338	360	404	393	385
Net Receivables	39	44	40	50	61	48
Gross Profit	122	155	167	184	177	174
Current Assets	153	220	240	283	277	260
PP&E	15	15	16	18	15	13
Total Assets	302	387	425	525	553	586
Depreciation	6	8	8	9	9	14
SG&A	35	41	47	55	58	-60
Current Liabilities	71	55	59	59	56	61
Long Term Debt	18	83	81	147	149	173
Net Income	34	37	46	51	39	13
Cash Flow from operations	54	75	94	61	36	77

Variables	Factor	2015	2016	2017	2018	2019
Days Sales in Receivables Index	0,9	0,9	0,9	1,1	1,3	0,8
Gross Margin Index	0,5	1,0	1,0	1,0	1,0	1,0
Asset Quality Index	0,4	0,4	0,8	0,6	1,0	1,0
Sales Growth Index	0,9	1,3	1,1	1,1	1,0	1,0
Depreciation Index	0,1	0,8	1,0	1,0	0,9	0,7
SG&A Expenses Index	-0,2	0,9	1,1	1,0	1,1	-1,1
Leverage Index	-0,3	1,2	0,9	1,2	0,9	1,1
Total Accruals to Total Assets	4,7	-0,1	-0,1	0,0	0,0	-0,1

M-SCORE	-4,8	-3,1	-3,2	-2,6	-2,3	-2,9

3Altman's Z-Score indicates the likelihood that the business will go bankrupt within the coming years.

Z-Score > 2,99*: The company is less likely to experience bankruptcy.*
Z-Score < 1,81*: The company is heading for bankruptcy.*

To verify the financial solidity of U-Blox we calculated the **Altman's Z-score** (**Fig. 31**), this indicator shows the **possibility of bankruptcy** for the company, the results highlighted its financial health obtaining results distant from the last acceptable value of 1,81.

From a closer look at those values, even if the results are more than positive we can identify a downtrend in the last years, signaling that U-Blox is struggling more in the business from its highs in 2015.

Figure 31: *Altman's Z-score*

Input Variables (CHF m)	2014	2015	2016	2017	2018	2019
Working Capital	82	164	181	224	221	199
Total Assets	302	387	425	525	553	586
Retained Earnings	122	169	219	280	322	275
EBIT	39	51	59	65	48	22
Market Cap	905	1.442	1.305	1.333	560	500
Total Liabilities	89	139	140	206	204	234
Sales	270	339	360	404	393	385

Z-Score Variables	2014	2015	2016	2017	2018	2019
Working Capital / Total Assets	0,3	0,4	0,4	0,4	0,4	0,3
Retained Earnings / Total Assets	0,4	0,4	0,5	0,5	0,6	0,5
EBIT / Total Assets	0,1	0,1	0,1	0,1	0,1	0,0
Market Cap / Total Liabilities	10,2	10,4	9,3	6,5	2,7	2,1
Sales / Total Assets	0,9	0,9	0,8	0,8	0,7	0,7

Z-Score	8,3	8,6	8,1	6,3	3,9	3,1

Valuation

Fundamental Valuation

The **standard WACC** was used to discount the **Unlevered Free Cash Flow** (or Free Cash Flow to the Firm), according to Mr. Roland Jud (CFO) statement that U-Blox will roll over its outstanding bonds and the amount of debt will stay constant. Revenues were forecasted using a two-stage model. For the first stage we performed a deep bottom-up revenue forecast, already explained in the previous section, with total sales expected to increase from CHF 385M (2019) to CHF 556M (2024). The second stage implies a stable growth rate of 3.7%. We only used a two-stage model since it would have been impossible to make an accurate forecast after 2024 and in any case most of the growth will come from the perpetuity. This approach leads our analysis to a one-year forward value of CHF 30.19/share.

WACC

We derived a **WACC of 10.4%**, where the cost of equity is obtained from a standard CAPM model with the following inputs:

- **Risk-free rate** of 0.5% even if the yield of a 10-year Swiss government bond is negative (-0.556%) as of 22nd May 2020.
- **Equity Beta** of 1.60, derived from the average competitors unlevered beta adjusted to U-Blox's Debt to Equity ratio. We regressed individual weekly stock performance on market returns, considering the relevant market index for each security, over 5 years, or the maximum available for competitors that recently became public. Then, we unlevered and adjusted for cash the betas for all competitors in order to compute an average asset beta. Finally, we re-levered this average beta with U-Blox's capital structure in order to obtain a Levered Beta of 1.48 for the company.
- **Equity risk premium** (ERP) of 6.20%, derived considering Damodaran's data weighted for regional revenues of the company.
- **Tax Rate** will decrease to 18.2% in 2023 because of a recent tax reform in Switzerland.
- The **pre-tax cost of debt** of 3.5%, derived from the average Yield to Maturity of the two bonds outstanding. We also believe that the company will not see its funding cost to increase in the future.

Terminal Growth Rate

The terminal growth rate assumption of 3.7% is based on the OECD 2060 regional real GDP growth forecast weighted by the expected future regional revenue. This approach led us to a 1.9% real GDP growth rate. Furthermore, since the IMF expects a 1.8% long-term inflation rate, we added this value to the previous one in order to generate our terminal growth rate of 3.7%.

Relative Valuation

Figure 32: U-Blox Peers

Company	EV	Sales 19	Sales 20	Sales 21
Lantronix Inc.	42	47	58	71
Mediatek Inc.	379	246	281	308
Nordic Semiconductor	463	288	357	450
Sequans Communications S.A.	137	31	51	75
Sierra Wireless Inc.	106	714	698	742
STMicroeletronics N.V.	15.540	9.556	10.520	11.424
Telit Communications PLC	102	393	407	430
Wistron NeWeb Corp	18.612	62.240	69.505	72.120
U-Blox	**390**	**385**	**387**	**402**

Source: Thomson Reuters

The very specific GNSS market nieces in which U-Blox operates sets some challenges to identify the most similar comparable. We identified as the most appropriate valuation multiple for U-Blox the EV to Sales ratio. Traditional EV to EBITDA or EV to EBIT in this case would be inappropriate due to different R&D accounting policies for the companies involved in the relative valuation. The variety of calculation method for the R&D are directly reflected on the EBITDA value, distorting the final outcome of our valuation. In order to obtain the most accurate value possible we selected U-Blox's peers looking at their business models, size, growth rate, profitability and credit risk (**Fig. 32**). Looking at the 2020 forward-looking EV to Sales ratio, then, we derived a multiple valuation of CHF 49.80/share.

Target Price

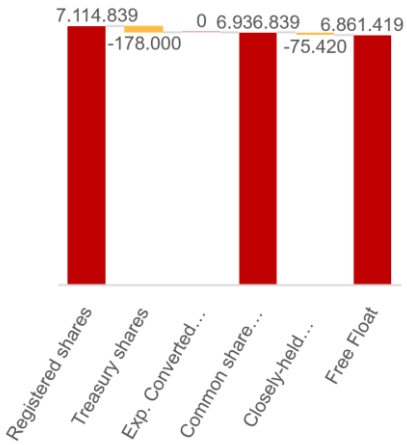
Starting from the CHF 30.19/share obtained from the Discounted Cash Flow valuation and the CHF 49.80/share resulted from the Relative Valuation we have concluded to weight evenly the two valuations resulting in a twelve-month target price of **CHF 39.99/share**, resulting in a **40.48% downside** from the price of CHF 67.20 registered the 22nd of May.

Piotroski F-Score

The team also performed the Piotroski F-Score. This methodology was published in a paper called "Value Investing: the use of Historical Financial Statements Information to separate Winners from Losers" in the year 2000 by Joseph Piotroski an accounting Professor from the Chicago University. In his study, Professor Piotroski explained that by creating a simple score using 9 accounting measures it was possible to increase the return of many different portfolios built with several strategies. In his study Mr Piotroski only considered the companies that had a F-Score of at least 8 points out of 9. The criteria of the strategy are:

$ROA > 0$	$ROA_0 > ROA_{-1}$	$CFO > 0$
$CFO > Net\ Income$	$LTD_0 < LTD_{-1}$	$WC_0 > WC_{-1}$
$\#\ Shares_0 < \#\ Shares_{-1}$	$EBIT\ Margin_0 > EBIT\ Margin_{-1}$	$Asset\ Turnover_0 > Asset\ Turnover_{-1}$

Figure 33: U-Blox equity breakdown



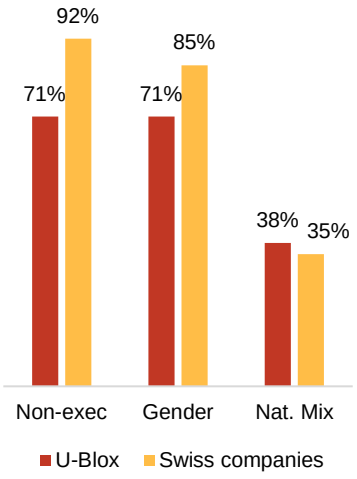
Source: Company data

Figure 34: U-Blox board members

Board Member	Other Boards
André Muller	3
Gina Domanig	8
Thomas Seiler	1
JP. Wyss	1
Ulrich Looser	9
Annette Rinck	1
Markus Borchert	3

Source: Company data, Team analysis

Figure 35: U-Blox vs Swiss companies board diversity



Source: Company, Thomson Reuters, Team analysis

Analysing the Piotroski F-Score for the last fiscal year we discovered that U-Blox only reaches a score of 3 (Appendix 11). This strengthens our conviction that right now U-Blox is not a sound investment.

Corporate Governance

U-Blox revolutionized its leadership in 2019.

The four co-founders have supported U-Blox's development from the very first day. It must be noted that the vast majority of the managers are within the company for a very long time showing strong commitment and conservative leadership. However, in 2019, we have observed major changes. In fact, two of the co-founders left the company as well as the Vice-Chairman. Mr. Daniel Ammann created a consulting company and Prof. Gerhard Throster retired after a long and successful career. On the other hand, Mr. Markus Borchert, Dr. Annette Rinck and Mr. Markus Schaefer joined the company in 2019. All of them, have a rich telecommunication experience and have deep expertise in "Industry 4.0", crucial skills for helping U-Blox to develop its business strategy. U-Blox welcomed Markus Schaefer as Global Marketing and Sales Director. Mr. Schaefer achieved stunning results during his successful career, and we are confident that he will improve the company's sales strategy. During his time at NXP, he was able to increase radio-frequency products' market share from 10% to 40% and he achieved similar results at MACOM. Within this six-month time, Mr. Schaefer already implemented an innovative and more aggressive "go-to-market strategy" that was totally absent in the past. Furthermore, U-Blox recently signed a partnership agreement with Future Electronics, the 3rd largest electronic distributor worldwide. Finally, the arrival of Mr. Schaefer enables the CEO, Mr. Seiler to focus its efforts on the corporate strategy.

Outsiders on the board seem terribly busy

Following the exit of Dr. Van Iseghem and Dr. Troster, two new members are sitting in the board of directors: Mrs. Annette Rinck and Mr. Markus Borchert. These two new directors, along with Ms. Domanig are the only ones without an engineering background, making them the only real outsiders. It must be considered that Mr. Ulrich Looser already seats on 9 other boards, Ms. Domanig already seats on 8 other boards, while Mr. Borchert on 3 other boards.

The board of directors is more diverse than the Swiss average in terms of backgrounds, gender and country of origin, on the other hand with 5 out of 7 non-executive directors, the board is less independent than the Swiss average.

Shareholder information

As of December, 31st 2019, U-Blox had 7,144,839 shares outstanding with 99% of the shares on free-float. Since 2011, U-Blox always distributed a dividend, ranging from CHF 0,90 to CHF 2,25 per share. U-Blox has only one class of shares and all shareholders own equal voting rights. As of 29 February 2020, Baillie Gifford & Co (5.7% of total shares) is the largest shareholder, followed by Mondrian Investment Partners (4.8% of total shares) and Norges Bank Investment Management (3% of total shares).

Figure 36: *U-Blox top shareholders*

Shareholders	# shares	%
Baillie Gifford & Co	388.481	5,66%
Mondrian Investment Partners	331.665	4,83%
Norges Bank Investment Management	205.303	2,99%
The Vanguard Group	188.759	2,75%
Dimensional Fund Advisors	172.661	2,52%
BlackRock Institutional Trust Company	127.899	1,86%
Other	*5.446.651*	*79,38%*

Source: Thomson Reuters

FIG. 37 Executive Committee Members

Name	Position	Background
Thomas Seiler	Chief Executive Officer	Electrical Engineering
Andreas Thiel	Head of Production Centers (Co-founder)	Electrical Engineering
Jean-Pierre Wyss	Head of Production & Logistics (Co-founder)	Electrical Engineering
Roland Jud	Chief Financial Officer	Economics
Markus Schaefer	Executive Director of Global Marketing & Sales	Electrical Engineering

Source: Company Data

Appendix

Appendix 1 – Pro Forma Income Statement

(CHF m)	2017	2018	2019	2020	2021	2022	2023	2024
Revenue	404	393	385	387	402	447	501	556
COGS	-220	-216	-211	-212	-225	-253	-285	-310
Gross Profit	**184**	**177**	**174**	**176**	**177**	**194**	**217**	**246**
Distribution and Marketing expenses	-36	-37	-37	-36	-38	-43	-48	-53
Research and Development	-66	-75	-96	-96	-96	-101	-108	-117
General and Administrative	-19	-21	-23	-19	-20	-22	-25	-28
Other Income	2	4	4	3	4	4	4	5
EBIT	**65**	**48**	**22**	**27**	**26**	**33**	**41**	**53**
Net financial cost	0	0	-8	-3	-4	-6	-5	-6
EBT	**65**	**48**	**14**	**24**	**22**	**27**	**36**	**47**
Income tax	-13	-10	-1	-5	-4	-5	-6	-9
Net Profit	**51**	**38**	**13**	**19**	**18**	**22**	**29**	**39**
EPS	**7**	**6**	**2**	**3**	**3**	**3**	**4**	**6**
EBITDA	**87**	**72**	**53**	**58**	**56**	**64**	**81**	**98**

Source: Company data, team analysis

Appendix 2 – Pro Forma Balance Sheet

(CHF m)	2017	2018	2019	2020	2021	2022	2023	2024
Cash and cash equivalents	170	136	127	93	88	71	57	56
Marketable securities	3	1	1	1	1	1	1	1
Trade accounts receivables	50	61	48	64	55	55	60	64
Other receivables	10	11	14	13	13	14	16	18
Current tax assets	3	2	6	6	6	6	6	6
Inventories	44	58	52	58	56	59	62	64
Prepaid expenses and accrued income	3	8	12	10	10	11	12	14
Derivative financial assets	0	1	1	1	1	1	1	1
Total Current Assets	**283**	**277**	**260**	**244**	**229**	**218**	**216**	**223**
PP&E	18	15	13	11	11	13	16	18
Right-of-use of assets	0	0	22	22	22	22	22	22
Goodwill	58	55	56	56	56	56	56	56
Intangible assets	154	193	219	250	283	317	345	370
Financial assets	1	1	1	1	1	1	1	1
Equity-accounted investees	7	8	8	8	8	8	8	8
Deferred tax assets	4	4	7	7	7	7	7	7
Total Non-current Assets	**241**	**276**	**325**	**355**	**388**	**423**	**454**	**482**
TOTAL ASSETS	**524**	**553**	**586**	**599**	**617**	**642**	**670**	**705**
Trade accounts payables	20	22	25	20	23	29	33	37
Other payables	7	7	9	8	8	9	10	11
Lease liabilities			5	5	5	5	5	5
Current tax liabilities	6	3	1	1	1	1	1	1
Accrued expenses	26	24	22	22	24	27	30	33
Total Current Liabilities	**59**	**55**	**61**	**56**	**61**	**71**	**79**	**87**
Long-Term debt	119	119	119	119	119	119	119	119
Other payables	1	0	0	0	0	0	0	0
Provisions	8	7	8	8	8	8	8	8
Pension liability	16	18	21	21	21	21	21	21
Lease liabilities	0	0	17	22	22	22	22	22
Deferred tax liabilities	4	5	7	7	7	7	7	7
Total Non-current Liabilities	**147**	**149**	**173**	**178**	**178**	**178**	**178**	**178**
TOTAL LIABILITIES	**206**	**204**	**234**	**234**	**239**	**249**	**257**	**264**
Common shares	6	6	110	110	110	110	110	110
Share premium	67	66	17	17	17	17	17	17
Treasury shares	-24	-32	-32	-32	-32	-32	-32	-32
Cumulative translation differences	-10	-14	-18	-18	-18	-18	-18	-18
Retained earnings	280	322	275	288	301	316	337	364
Total Equity	**319**	**349**	**351**	**365**	**377**	**393**	**413**	**440**
TOTAL LIABILITIES and EQUITY	**525**	**553**	**586**	**599**	**617**	**642**	**670**	**705**

Source: Company data, team analysis

Appendix 3 – Pro Forma Cash Flow Statement

(CHF m)	2017	2018	2019	2020	2021	2022	2023	2024
Net Profit	**51**	**38**	**13**	**19**	**18**	**22**	**29**	**39**
Depreciation	9	9	14	12	10	9	10	11
Amortization	13	14	17	19	20	22	30	33
Share-based compensations	8	8	5					
Impairment of Intangibles	0	0	13					
Other non-cash transaction	3	2	4					
Net financial costs	0	0	4	7	1	-1	-1	-1
Income tax expenses	13	10	1	5	4	5	6	9
Change in trade and other receivables	-13	-17	6	-15	9	0	-5	-4
Change in inventories	-13	-14	6	-6	2	-3	-3	-1
Change in trade payables	5	-1	2	-5	3	6	4	4
Change in provisions	3	-1	1					
Change in Other Receivables				1	0	-1	-2	-2
Change in Prepaid expenses				2	0	-1	-1	-1
Change in Other Payables				-1	0	1	1	1
Change in Accrued expenses				1	1	3	3	3
Income tax paid	-19	-13	-9	-5	-4	-5	-6	-9
NET CASH FROM OPERATING ACTIVITIES	**61**	**36**	**77**	**33**	**64**	**56**	**65**	**82**
Capex	-11	-7	-6	-10	-10	-11	-13	-14
Acquisition of intangibles	-55	-54	-50	-50	-52	-54	-55	-56
Proceeds from disposal	0	0	0					
Proceeds from sale of securities	5	1	0					
Acquisition of businesses	0	0	-7					
Capital increase	-4	-4	-3					
Interest received	0	1	0					
NET CASH USED IN INVESTING ACTIVITIES	**-64**	**-63**	**-67**	**-60**	**-62**	**-65**	**-68**	**-70**
Proceeds from exercise of options	7	15	1					
Dividends paid	-15	-15	-11	-6	-5	-7	-9	-12
Repayments of financial liabilities	0	0	-5					
Proceeds from financial liabilities	59	0	0					
Share repurchase	-24	-8	0					
Interest paid	-1	-2	-2	-2	-2	-2	-2	-2
NET CASH FROM INVESTING ACTIVITIES	**26**	**-10**	**-18**	**-8**	**-7**	**-8**	**-11**	**-13**
Net increase in cash	23	-37	-7	-34	-5	-17	-14	-1
Cash at beginning of the year	150	170	136	127	93	88	71	57
FX gains/losses	-3	3	-2					
CASH AT THE END OF THE YEAR	**170**	**136**	**127**	**93**	**88**	**71**	**57**	**56**

Source: Company data, team analysis

Appendix 4 – Research and Development Breakdown

R&D Overview	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Revenue	270	338	360	404	393	385	387	402	447	501	556
R&D expensed	50	65	63	66	75	96	96	96	101	108	117
% of Sales	***18%***	***19%***	***18%***	***16%***	***19%***	***25%***	***25%***	***24%***	***23%***	***22%***	***21%***
R&D capitalised	21	27	37	54	54	50	50,3	52,3	53,7	55,1	55,6
% of Sales	***8%***	***8%***	***10%***	***13%***	***14%***	***13%***	***13%***	***13%***	***12%***	***11%***	***10%***
Total Gross R&D	**71**	**92**	**101**	**119**	**129**	**146**	**147**	**149**	**154**	**163**	**172**
Amortization %	***-2%***	***-2%***	***-2%***	***-2%***	***-4%***	***-2%***	***-5%***	***-5%***	***-5%***	***-6%***	***-6%***
Amortization	-5	-8	-7	-7	-14	-9	-19	-20	-22	-30	-33
Impairment	0	-3	0	0	0	-13	0	0	0	0	0
Total cash R&D spent	**65**	**81**	**94**	**112**	**115**	**124**	**127**	**128**	**132**	**133**	**139**
Total cash R&D / Sales	24%	24%	26%	28%	29%	32%	33%	32%	30%	27%	25%
Capitalized R&D / Total R&D	32%	33%	40%	48%	47%	40%	40%	40%	40%	40%	40%
Capitalized R&D on BS	**38**	**55**	**85**	**131**	**171**	**199**	**230**	**262**	**294**	**319**	**341**

Source: Company data, team analysis

Appendix 5 – U-Blox competitors analysis

Ticker	Company Name	Country	Mkt. Cap. ($ m)	P	C	SR	Business Description	R&D Budget ($ m)
2151	Beijing BDStar Navigation Co. Ltd	China	2.035	X			Main products are Global Navigation Satellite System (GNSS) chips, modules and board cards, navigation positioning antennas & microwave communication devices.	53
AVGO	Broadcom Inc.	USA	79.762	X	X	X	Designer, developer and global supplier of a range of semiconductor devices with a focus on digital and mixed signal complementary metal oxide semiconductor based devices and analog III-V based products.	3.768
300638	Fibocom Wireless Inc.	China	1.281		X		Main business is primarily engaged in the sales of wireless modules which have been applied in machine to machine (M2M) and MI (Multi-intelligent) consumer electronics, provision of solution plans, sales of parts and components.	19
4906	Gemtek Technology Co. Ltd	Taiwan	193	X			Engaged in the manufacture & sale of marine electronic equipment & industrial electronic equipment that utilize ultrasound & electromagnetic wave sensor technologies.	42
6814	Furuno Electric Co. Ltd	Japan	212		X	X	Primary products include wireless gateways & wireless local area network cards. Products are mainly used in the manufacturing of office computers & computer wireless transmission equipment, as well as wireless & wired network transmission equipment.	28
LTRX	Lantronix Inc.	USA	56	X	X	X	Provider of secure data access and management solutions for Internet of things and information technology assets. Its connectivity solutions serves a range of industries, including data center, medical, security, environmental and government.	8
2454	Mediatek Inc.	Taiwan	15.877	X	X	X	Principal products include mobile communication chipsets, Bluetooth chips, wireless local area network (WLAN) chips, global positioning system (GPS) chips, optical storage chipsets, DVD player system-on-chips (SOCs), high integrated digital television control chips and television decoding chipsets, among others.	2.033
NOD	Nordic Semiconductor	Norway	572		X	X	Engaged in the development and sell of integrated circuits and related solutions for short-range wireless communication. Its solutions are applied to a range of end products, such as PC and tablet accessories, mobile and wearable devices, home electronic devices, sports and health monitors, toys, as well as installed sensor networks.	49
QCOM	Qualcomm Inc.	USA	78.710	X	X	X	Engaged in the development and commercialization of a digital communication technology called code division multiple access. The products principally: integrated circuits and system software used in mobile devices and in wireless networks.	5.619
603236	Quectel Wireless Solutions Co. Ltd	China	2.428	X	X	X	Main products include GSM/GPRS (2G category), WCDMA/HSPA (3G category), LTE (4G category) and NB-IoT cellular communication modules, as well as GNSS t module and EVB tool. The Company's products are mainly used in the fields of wireless payment, vehicle transportation, smart energy, smart city, intelligent security, wireless gateway, industrial applications, medical health and agricultural.	33
SQNS	Sequans Communications S.A.	France	94		X		The Company offers semiconductor solutions for wireless broadband applications, with a specific focus on the single-mode device market. The solutions integrate baseband processor and radio frequency (RF) transceiver integrated circuits (ICs) along with its signal processing techniques, algorithms and software stacks.	36
SWIR	Sierra Wireless Inc.	Canada	179	X	X	X	Offers a portfolio of second, third, & fourth generation cellular embedded wireless modules & gateways, integrated with its secure cloud & connectivity services.	94
STM	STMicroeletronics N.V.	Switzerland	15.000	X		X	Range of products, including discrete and standard commodity components, & application-specific integrated circuits (ASICs) for analog, digital & mixed-signal applications.	1.684
002313.SZ	Sunsea AIoT Technology Co. Ltd	China	842		X	X	Design and research & development of wireless communication modules. In 2017, after u-blox failed the acquisition of SiMCom, Sunsea AIoT acquired SiMCom.	30
TELT	Telit Communications PLC	Italy	134	X	X	X	Modules are integrated in a range of applications, including asset tracking, remote in- dustrial monitoring, automated utility meter reading, insurance telematics, consumer electronics and mobile health devices.	77
6285	Winstron NeWeb Corp	Taiwan	648		X	X	Main products include satellite communications products, mobile and home communications products and other wireless communications products	83
UBXN	**U-Blox**	**Switzerland**	**392**	**X**	**X**	**X**	**U-Blox is a supplier of chipsets and modules that provide GNSS, Wi-fi, cellular and Bluetooth functionality to industrial devices.**	**111**

Source: Thomson Reuters, team analysis

Appendix 6 – U-Blox SWOT analysis

Strengths	
Qualified workforce	U-Blox has access to highly skilled and educated young employees coming from ETH which is very close and still connected with the company.
New executives with APAC expertise	Mr. Markus Borchert has a broad experience in the cellular industry and a unique network in Asia. During his time at Nokia Greater China, he contributed to make the company as the main non-Chinese player.
New executive in Sales and Marketing	Mr. Markus Schaefer has an impressive track record in growing market shares of semiconductor companies such as NXP and MACOM. Furthermore, the CEO will only focus on corporate strategy.
Complementary products	U-Blox has a broad and complementary portfolio of products: Positioning, Cellular and Short-Range and many combinations of these technolgies (Modules).
Liquidity	Currently, U-Blox has CHF 136.3m of cash accounting for ¼ of total assets.
Reputation	With 20+ years of experience, the company has a high reputation in the industry.

Opportunities	
CNY appreciation	Higher CNY means higher prices for Chinese products, translated in more competitive U-Blox's products.
Demand for high precision positioning	The demand for centimeter accuracy chips in mass market application is expected to grow. U-Blox would benefit from this demand with the F9 module.
Growing GNSS market	Global annual GNSS receiver shipments are expected to increase from 1.8B units in 2019 to 2.9B units in 2029.
Switzerland partnership with china	In early 2019, Switzerland signed with China a declaration of intending to grow their cooperation in trade and investment under the Belt and Road initiative. Moreover, Switzerland is the only European country to have an FTA with China.

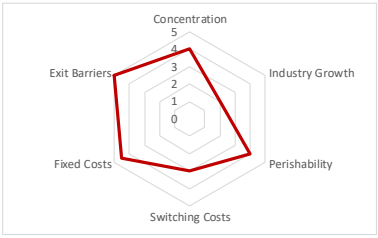
Weaknesses	
Employee compensation	U-Blox operates most crucial R&D activities at HQ just outside of Zurich, where 300 of its total 700 engineers are based. Switzerland, and especially Zurich is the world's most expensive labor market where new grad engineers expect a salary of $79k versus a global median salary of $42k.
R&D	U-Blox's survival heavily depends on its R&D investments. However, the ROI could become negative in case its solutions are not adopted.
Bet on IoT	U-Blox is investing for products that have no market yet (NB-IoT and V2X).
Bet on AV	U-Blox is currently betting on AV however this market is expected to start developing in 10 years.
Missed guidance	U-Blox constantly missed its guidance since 2016. More recently, in 2018, the company missed its revenue guidance of CHF 460 475m, with CHF 393m.
Missing patents	U-Blox relies more on constant innovation rather than on patents and copyrights. Competitors or other parties duplicating U-Blox's products could threat the company's competitive position.
Failed acquisition of SIMCom	In 2017, U-Blox failed to purchase SIMCom a Chinese wireless solution supplier, which eventually signed a deal with SunSea a Chinese competitor of U-Blox.

Threats	
Economic slowdown	A general slowdown in the global economy or in a key region, that is becoming more and more probable, could negatively impact U-Blox's business, financial strength and liquidity.
Increasing chinese competition	U-Blox operates in highly competitive markets in terms of pricing, innovation and distribution quality. Most Chinese companies operate with half the gross margin of U-Blox.
Fast pace of technology innovation	New technologies and solutions may make U-Blox's products obsolete, threatening the company's revenue. Semiconductor sector's technology changes at high speed, making companies improving technologies frequently.

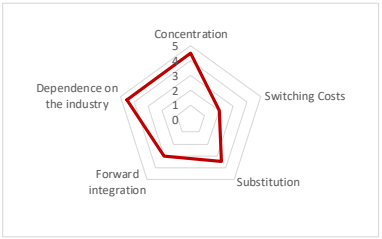
Source: Team analysis

Appendix 7 – Porter Five Forces

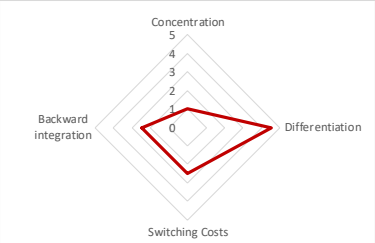
Competitive Rivalry		3,8
Concentration	The GNSS sector is quite concentrated with U-Blox being the market leader. In the cellular market there are thousands of competitors ranging from Qualcomm with a $100B market cap to very small players.	4
Industry Growth	GNSS unit sales are expected to increase at 12% CAGR between 2019 and 2023, while the cellular market will experience a faster growth at 27% CAGR over the same horizon.	2
Perishability	The semiconductor industry heavily relies on R&D and all players need to release new solutions in order to out-innovate their peers.	4
Switching Costs	Many competitors offer similar products and switching costs are moderate since clients can pretty easily adapt the design of their products to new generations of products.	3
Fixed Costs	The industry is very focused on fixed-costs since it needs to support high R&D efforts and the associated salaries, which cannot cut because of talent competition.	4,5
Exit Barriers	Launching new products requires important investments, that are not recoverable, so companies hardly exit from the market.	5



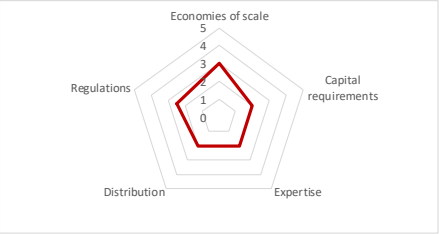
Supplier Power		3,5
Concentration	U-Blox's suppliers are very concentrated and the same can be said for the entire industry	4,5
Switching Costs	Switching costs between wafer processor are quite small, however those for services such as inventory management and distribution are higher.	2
Substitution	There are no substitutes for the processing of wafers. However, companies in the industry could easily backward-integrate the services firm activities.	3,5
Forward integration	Processors are very specialized in the semiconductor production, therefore is unlikely that they forward integrate design creation. On the other hand, services companies are already providing design solutions to their clients.	3
Dependence on the industry	GNSS and cellular are still niche markets and account for a small part of the full semiconductor market. Therefore, suppliers do not depend on them.	4,5



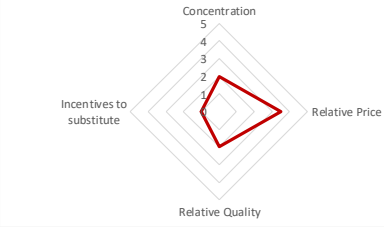
Buyer Power		2,6
Concentration	GNSS and cellular products have a broad range of applications. Clients come from different industries and can be very large or very small. U-Blox has roughly 7000 customers with 99% of them representing only 20% of sales.	1
Differentiation	GNSS and cellular manufacturers offer very similar products.	4,5
Switching Costs	Switching costs are moderate to high depending on how much time a new generation of a particular product is launched.	2,5
Backward integration	On the chip side, customers may have incentives to produce their own chips, as they purchase bigger volumes. Talking about modules, clients are specialized in specific products and have little to no incentives to produce GNSS or cellular modules, as they requires high investments in R&D and deep expertise.	2,5



Threat of New Entrants		2,3
Economies of scale	Suppliers offer lower prices for higher volume orders, meaning that there are strong economies of scale for larger comapnies. There are also R&D economies of scope from a reduction in the cost of development for new generations of products.	3
Capital requirements	Developing adavanced solutions requires important R&D investments, causing a barrier to entry for other companies.	2
Expertise	Being heavily dependent on R&D, the existing firms already have a deep expertise in the field and employ highly-skilled engineers. However, module development requires less expertise than chip design.	2
Distribution	U-Blox has 22+ years of experience in this market and created very strong relationships with its clients and distributors. New entrants would need time and large efforts in order to create reliable distribution channels.	2
Regulations	Regulations on IoT, espescially in Europe, may prevent the entry of new competitors.	2,5



Threat of Substitutes		2,1
Concentration	Many different technologies are present in the cellular industry such as NB-IoT, LTE-M, Sigfix, LoRa and Win-Sun. U-Blox only designs modules for NB-IoT and LTE-M technology, which are both licensed meaning that they	2
Relative Price	LTE-M and NB-IoT networks, necessary for using U-Blox's solutions, are more expensive and makes modules having a higher cost ($13 and $9 respectively) than the ones used for SigFox, LoRa and Win-Sun networks ($3, $9 and $8.5 respectively).	3,5
Relative Quality	Obviously, the quality of each technology is dependent on the different application. As an example, LTE-M, NB-Io	2
Incentives to substitute	If a client has already applied for a specific design, switching to another technology would be very expensive as the full setup would have to be adpated to the nee network.	1



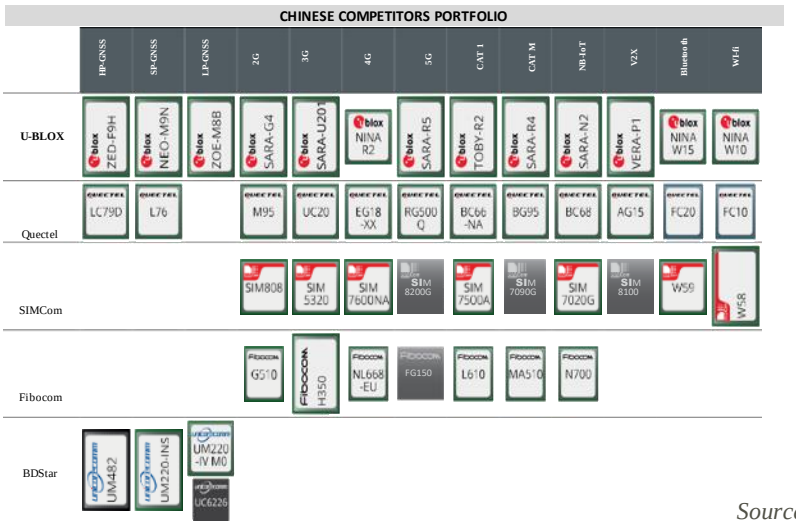
Source: Team analysis

Appendix 8 – U-Blox competitor per market

Market Presence	Logo	Name	Mkt Cap. (Bln $)	EBITDA (Mln $)
GNSS Market	Trimble	Trimble	8,88	634
	NXP	NXP Semiconductors	27,43	2.708
Both Markets	BROADCOM	Broadcom	107,32	9.478
	Qualcomm	Qualcomm	88,22	9.509
	MEDIATEK	Mediatek	23,33	1.231
	STMicroelectronics	STMicroeletronics	22,72	2.097
Connectivity Market	SAMSUNG	Samsung	264,01	49.566
	intel	Intel	247,22	35.373
	Gemtek Wireless Broadband Anywhere	Gemtek	7,98	694
	QUECTEL Build a Smarter World	Quectel	3,03	26
	Fibocom	Fibocom	1,63	31
	NORDIC SEMICONDUCTOR	Nordic Semiconductor	1,09	34
	SUNSEA AIOT 日海智能	Sunsea	0,79	45
	LANTRONIX	Lantronix	0,78	2
	SIERRA WIRELESS	Sierra wireless	0,31	- 26
	Telit	Telit	0,20	86
	SEQUANS COMMUNICATIONS	Sequans	0,12	- 19

Source: Thomson Reuters

Appendix 9 – U-Blox Chinese competitors portfolio



Source: Company data, team analysis

Appendix 10 – U-Blox product portfolio

U-BLOX PRODUCT PORTFOLIO

GNSS

Group	Class	Application	SP-GNSS	HP-GNSS	Dead-rec	Timing	Raw data	V2X
CAM	Antenna	C-drones, transportation	M8					
LEA	Module	Transportation	M8S			M8F/T	M8T	
MAX	Module	C-drones	8, M8					
NEO	Module	P-Drones, transportation, emergency	8Q, M8Q/U	M8P	M8L/U	M8T	M8P/T	
SAM	Antenna	G&A	M8Q					
UBX	Chip	Consumer, IVS, transportation	G82, M83 /823 /914					M914, P3
ZED	Module	P-drones, G&A, Time		F9H/P		F9T		
ZOE	SiP	Time	M8B					

Short Range

Group	Class	Application	V2x	BT-LTE	BT-BR	Wi-Fi	NFC
ANNA	SiP	Other		B112			B112
BMD	Module	Other		33/34X			34x
ELLA	Module	IVS, Other			W1	W1	
EMMY	Module	IVS, Consumer		W1	W1	W1	
JODY	Module	IVS		W1		W1	
LILY	Module	Other				W1	
NINA	Module	Insurance tel, C-health, Smart meters		B1/2/3, W1/15	B2, W1/15	W1/13/15	B1/3
ODIN	Module	Other		W2	W2	W2	
R	Module	Smart meters		412			
VERA	Module	Fleet, eCall, Asset tracking	P1				

Cellular

Group	Class	Application	2G	3G	4G	Cat-1	Cat-M	NB-IoT
LARA	Moduke	eCall, C-health, Insurance tel.	R2	R2	R2, R3121	R2, R3121		
LISA	Module	eCall, Asset Tracking	U2	U2				
SARA	Module	Agriculture, Smart meters, eBike	G3/45, R4, U2	U2	N2, R4/5		R4/5	N2/3, R4/5
TOBY	Module	Asset Tracking, Insurance tel.	R2	R2	R2	R2		
UBX	Chip	Other						R5

C-Health: Connected health
Insurance tel: Insurance telematics
C-drones: Consumer drones
P-drones: Professional drones
G&A: Geomatics and Agriculture
IVS: in vehicle system
SiP: System in Package
SP-GNSS: Standard precision GNSS
HP-GNSS: High precision GNSS
Dead-rec: Dead reckoning
BT-LE: Bluetooth low energy
BT-BR: Bluetooth basic rate
V2X: Vehicle to everything

Source: Company data, team analysis

Appendix 11 – U-Blox competiors WACC

Bottom-up Beta

Country	Company	Beta	D/E	Tax Rate	Unlevered Beta
China	BDStar	1,03	39%	25%	0,80
China	Fibocom	1,52	13%	25%	1,38
Japan	Furuno	1,26	24%	23%	1,07
Taiwan	Gemtek	1,19	19%	20%	1,03
US	Lantronix	1,9	0%	21%	1,90
Taiwan	Mediatek	1,36	20%	20%	1,18
Norway	Nordic Semi	1,5	10%	22%	1,39
China	Quectel	1,79	21%	25%	1,54
France	Sequans	1,45	88%	28%	0,89
Canada	Sierra W.	2,36	0%	15%	2,36
Switzerland	STM	0,99	32%	20%	0,79
China	Sunsea AIoT	1,01	121%	25%	0,53
Italy	Telit	1,23	30%	34%	1,03
Average Beta					**1,22**
U-Blox D/E					38,78%
U-Blox's Tax rate					20%
U-Blox's Levered Beta					**1,60**

CAPM	
Risk-free	0,50%
U-Blox's Beta	1,60
Market Risk Premium	6,20%
Cost of Equity	**10,4%**

WACC	
% Debt	28%
Cost of debt	3,50%
Tax rate	20%
After-tax cost of debt	2,81%
% Equity	72%
Cost of equity	10,43%
Cost of Capital	**8,3%**

Terminal Growth Rate

Area	Weight	LT Real GDP growth	
Americas	36%	1,9%	
EMEA	39%	2,1%	*OECD*
APAC	23%	2%	
Weighted GDP Growth		1,9%	*IMF*
Long-term inflation		1,8%	
Terminal Growth Rate		**3,7%**	

Source: OECD, IMF

Source: Thomson Reuters

Appendix 12 – U-Blox DCF valuation

DCF	2020	2021	2022	2023	2024
EBIT	27,0	26,0	32,9	40,5	53,3
Tax Rate	-21%	-20%	-20%	-18%	-18%
NOPAT	21,3	20,9	26,4	33,1	43,6
Depreciation	11,6	10,1	8,9	10,0	11,1
Amortization	19,4	20,1	22,4	30,1	33,4
Change NWC	-23,4	15,3	3,6	-3,6	-0,6
Capex	-60,0	-62,3	-64,9	-67,7	-69,5
FCFF	**-31,1**	**4,0**	**-3,6**	**1,9**	**18,0**
Time factor	0	1	2	3	4
Present Value	**-31,1**	**3,7**	**-3,1**	**1,5**	**13,1**

Valuation	
Free Cash Flow at Year 4	18,0
WACC	8,3%
Perpetuity Growth Rate	3,7%
Perpetuity Value at End of Year 4	402,5
Present Value of Perpetuity	292,6
(+) Present Value of Free Cash Flows	276,7
(=) Current Enterprise Value	569,3
Debt	-162,6
Cash	93,0
Equity	207,1
Shares outstanding	6,9
Estimated Value per Share (CHF)	**30,2**
Current Price (CHF)	68,5
Consensus Price Target (CHF)	52,5
Estimated Upside/Downside	-55,9%

Appendix 13 – U-Blox relative valuation

EV / Sales	2019	2020	2021
Lantronix Inc.	0,90	0,72	0,60
Mediatek Inc.	1,54	1,35	1,23
Nordic Semiconductor	1,61	1,30	1,03
Sequans Communications S.A.	4,44	2,68	1,84
Sierra Wireless Inc.	0,15	0,15	0,14
STMicroeletronics N.V.	1,63	1,48	1,36
Telit Communications PLC	0,26	0,25	0,24
Wistron NeWeb Corp	0,30	0,27	0,26
Median	**1,22**	**1,01**	**0,81**
U-Blox	1,01	1,01	0,97

U-Blox EV	475	389	315
Debt	136	141	141
Cash	128	94	89
Equity	467	342	262
# Share	7	7	7
Price per Share	**68,1 CHF**	**49,8 CHF**	**38,2 CHF**

Source: Thomson Reuters

Source: Thomson Reuters

Appendix 14 – Piotroski F-Score

Company Name	Piotroski F-Score
U Blox Holding AG	3
Telit Communications PLC	5
Sunsea AIoT Technology Co Ltd	2
STMicroelectronics NV	5
Silicon Laboratories Inc	4
Sierra Wireless Inc	2
Sequans Communications SA	3
Quectel Wireless Solutions Co Ltd	2
Nordic Semiconductor ASA	3
MediaTek Inc	7
Lantronix Inc	2
Gemtek Technology Co Ltd	7
Fibocom Wireless Inc	6
Dialog Semiconductor PLC	7
Beijing BDStar Navigation Co Ltd	5

Source: Thomson Reuters, Team analysis

Disclosures and Disclaimers

Report Recommendations

Buy	Expected total return (including expected capital gains and expected dividend yield) of more than 10% over a 12-month period.
Hold	Expected total return (including expected capital gains and expected dividend yield) between 0% and 10% over a 12-month period.
Sell	Expected negative total return (including expected capital gains and expected dividend yield) over a 12-month period.

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A Work Project presented as part of the requirements for the Award of a Master Degree in Finance from the NOVA – School of Business and Economics.

INDIVIDUAL REPORT ON THE VALUATION OF U-BLOX

GABRIELE GATTI 34414

A Project carried out on the Master in Finance Program, under the

supervision of: Rosario André

2nd of June 2020

Abstract

This individual report aims to illustrate the analysis of Asian Pacific market situation and how the consolidation of big Chinese competitors will impact U-Blox market share. The data utilized to analyze the market situation have been the GNSS Market Report 2019 published by the European GNSS Agency (GSA), the companies' public reports together with the Asian Review on economy and policy.

Keywords

U-Blox, Asian Pacific, Made in China 2025, Fabless manufacturer

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Introduction

As already defined Global Navigation Satellite System (GNSS) is the infrastructure that allows users with a compatible device to determine their position, velocity and time by processing signals from a variety of satellite positioning systems. The market greatly increased in the past decades and its high edge technology level of know-hows makes it critical for most sovereigns' grand strategy.

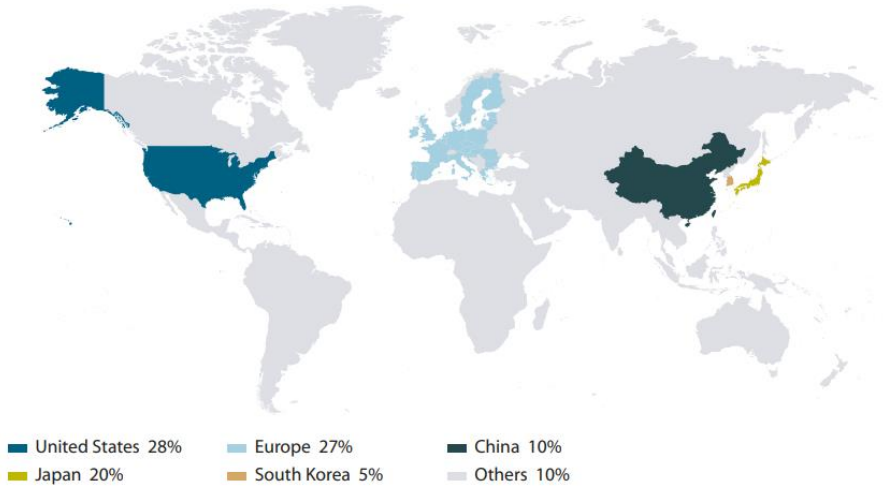
GNSS market is set to continue its expansion even through the next decade, with forecast showing a growth up to 9.4 billion units by 2029, up from the 6.4 of nowadays. The protagonist role in this market enlargement will be played by the Asia Pacific region which will account for more than half of the global GNSS market. In this report we will discuss the role of Chinese competitors as determinant role in the future of U-Blox and its presence in the region, analyzing how those emerging champions could put its market share at stake.

GNSS industry geographical concentration

Overall, the Revenue generation in GNSS industry is concentrated in three major geographic regions: North America, Europe and Asia (including China, Japan and South Korea). United States continue to lead the GNSS market with a share of 28%, thanks to key components & receiver manufacturers, system integrators and service providers. Europe (27%) is closing its gap with U.S.A. due to its steady market share increase lead by the development and use of Galileo, the European GNSS first launched in 2011.

Considering the three Asian countries as a single block the total market share jumps to 35% of the worldwide industry, representing the largest revenue generation area. However, from a geographical point of view, non-EU players are dominant in the mass market. North American companies are leading the chipset market, and Asian companies are ahead in terms of handset revenues.

***Figure 1**: Revenue generation in the GNSS industry by key domains*



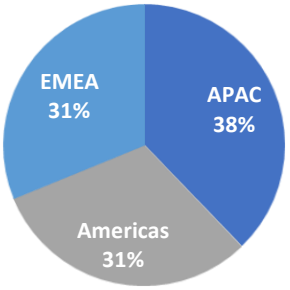
Source: GSA Market Report 2019

The rapid growth of urbanization across Asia is pushing to a radical change in the way of using devices present in the technological environment, this radical shift is feeding the incredible demand of Internet of Things (IoT) application towards the continent. This includes the devices, services and solutions which have connectivity feature with internet consuming large quantity of sensors and chips embedded in devices to enhance the user's experience. This trend is spinning the technological advancements in semiconductors industry developing lightweight and efficient devices which are much smarter than the conventional and heavy devices. Asian trend is exactly the opposite of the European and North American one which is rapidly proceeding to a complete saturation.

Asian Pacific importance on U-Blox accounts

From the geographical segmentation of the company's revenue, in the annual report, we can identify Asia Pacific as the most important market, generating 37.8% of the total sales, followed by EMEA 31.2% and the Americas with 31.0%.

Figure 2: U-Blox revenue shares



Source: Company

In Asia Pacific, revenues grew by 5% to CHF 145.6 million in 2019 from CHF 139.3 million in 2018, driven by solid demand in the industrial and automotive end markets. China alone generate CHF 81.5 million, with a share of 56% of the regional sales, marking a strong rebound with 16.0% increase in revenues from 2018, driven by increased domestic investment in technology for infrastructure and growth in industrial IoT. The relevance of the Asia Pacific region is even clearer when this market offsets the declines in EMEA and Americas regions, which struggle due to broader industry and macroeconomic forces, with a specific focus on the ongoing trade war between U.S.A. and China deeply impacting the semiconductors industry.

Those numbers do not surprise us, being perfectly in line with expected growth of the GSA market report, where Asia play a key role in global market expansion. The indicators of this renewed growth come from:

1) strong technology momentum in China, boosted by increased investment in technology, specifically the intensive focus on smart city solutions to manage its Megacities[1].
2) increased demand for consumer applications.
3) growth in industrial IoT, with China alone accounting for about 25% of the IoT market globally and Japan, Korea, and Taiwan already showing increasing demand for industrial IOT and automotive solutions as well.

Asia Pacific emerging low cost leadership

The region has already strategic importance for fabless manufacturer since out of the 10 biggest foundries worldwide 7 are located in the Asia Pacific region[2] this specifically due to the high efficiency of manufacturing work and its low cost of production. The strong presence of important raw material manufacturer poses a fertile terrain for the flourishing of companies specialized in other segment of the supply chain, as the fabless manufacturer.

Those advanced semiconductor companies focus mainly on success in innovation and implementation, which are beyond metrics like market share but, in terms of hardware supply, Asian manufacturers have become increasingly competitive in the mature markets of high-end receivers and professional applications, turning driven down the average price of professional receivers. This pressure has forced manufactures to maintain competitiveness by delivering higher performance through less complex and more cost-effective solutions.

The consequences of China's hunger for semiconductors, and its attempts to procure the technologies supporting the production of high-end chips, became key element in the trade war between China and the United States, this lead to an increase scrutiny from policymakers in the US halting to Chinese technology acquisitions overseas over the past years.

[1] The United Nations Department of Economic and Social Affairs in its 2018 "World Urbanization Prospects" defines "Megacity" a counted urban agglomeration having over 10 million inhabitants.

[2] Ranked by revenues: 1) TSMC, Taiwan 2) Globalfoundries U.S.A. 3) UMC, Taiwan 4) SMIC, China 5) PowerChip, Taiwan 6) TowerJazz, Istrael 7) Ruselectronics, Russia 8) Vanguard (VIS), Taiwan 9) Hua Hong Semi, China 10) Dongbu HiTek, South Korea.

China as regional champion

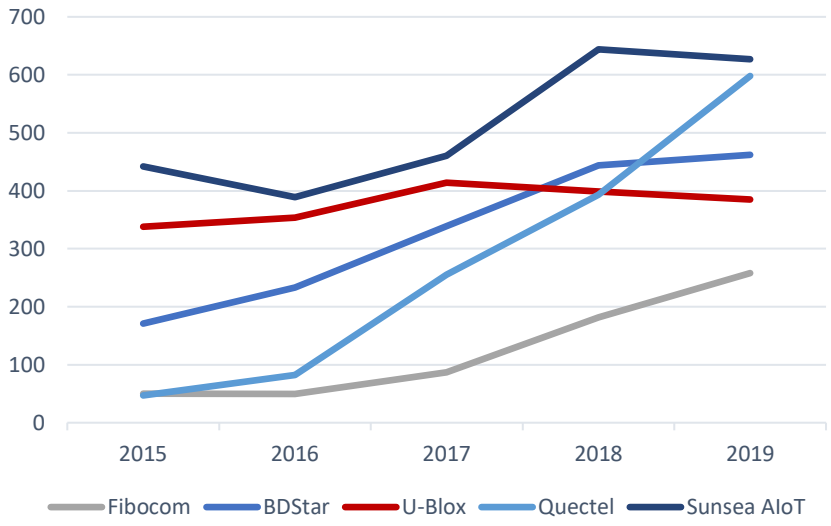
Since the launch in May 2015 of the People's Republic of China decennial strategic plan "Made in China 2025", promoted by Premier Li Keqiang and his cabinet, the Asian giant started to move away from being the "world's factory"[3] and move to producing higher-value products and services, such as aerospace and semiconductors, in order to achieve independence from foreign suppliers for such products and services. Chinese economic system works in mainly following a strict top-down design, this means that after the government impulse the state machine start to run in that direction giving the blueprint to upgrade the manufacturing capabilities of Chinese industries into a more technology-intensive powerhouse.

This new paradigm posed a new challenge, since semiconductor manufacturing is both capital and talent-intensive because even with the best equipment on the market, a company cannot mass-produce chips without navigated technicians working on them. Made in China 2025 plan to foster self-sufficiency in high-tech industries accelerated the need to attract foreign talent to overcome the entry barrier by recruiting not only top executives, but entire production teams from Taiwan. This aggressive strategy is producing the first result since Mainland China is expected to surpass Taiwan as the world's largest market for semiconductor manufacturing equipment next years.

Main competitors

Those new competitors are challenging U-Blox in their domestic market, with the probable outcome to negatively affect its Asia Pacific market share. The consolidation of those companies as mature players is best shown by the **Fig. 3** and **Fig. 4** where we compare the Revenue Evolution of both U-Blox and its Chinese rivals, such as: Sunsea, BdStar, Fibocom and Quectel.

Figure 3: *U-Blox and Chinese peers revenue evolution ($ Mln)*



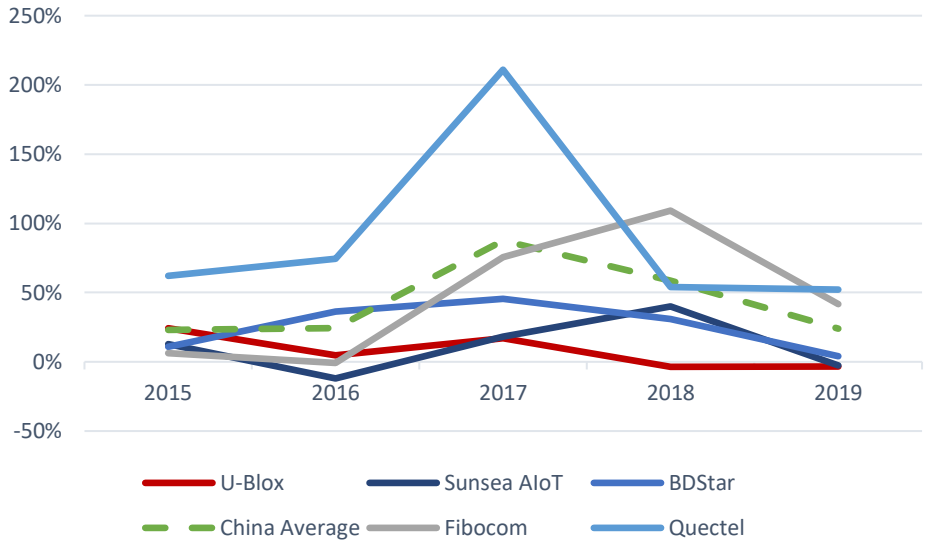
Source: Thomson Reuters

These companies achieved very high growth rates during the last 5 years surpassing easily U-Blox, which growth is stagnating, and are expected to continue along this trend. The strength of those companies is dual: they can afford to sell products at a much lower price without impacting too negatively their performances and to have a solid and potentially illimited source of financing to invest in innovative Research and Development projects, thanks to the particular attention from the Chinese state which own a participation in their equity[4]. Focusing on the growth rate from year to year the present situation is clear, the average growth rate of Chinese players is cruising on exceptional pace, the CAGR of between the period of 2015 – 2019 shows the result of 40%. Quectel peaked a CAGR of 83%, which is made noticeable by the revenue jump in 2017 which marked an increase of 211% on the previous year (**Fig. 4**).

[3] Producing cheap, low-quality goods due to lower labour costs and supply chain advantages

[4] In China every company which growth to relevant dimension or is "of public interest" is obliged to allow the state or local state entities to enter in its shareholder base and even have seats in the board.

Figure 4: U-Blox and Chinese peers revenue growth rate %



Source: Thomson Reuters

U-Blox in the same period achieved a 7% CAGR in the last 5 years which is impossible to directly compare but is a great indicator of how those companies are building a strong market presence in their domestic markets. With a further analysis we can identify as starting moment of this steep growth the 2015 and the implementation of "Made in China" program. The real threat posed by those players rely not only in the aggression to U-Blox's market share in Asia but after a consolidation of the Chinese market the natural expansion will be the global market. Analyzing deeper the Chinese product portfolio composition we can rapidly noticing how internal demand in china for Automotive, IoT and positioning technology is pushing those company to enter those segments.

We can further analyze U-Blox portfolio and the similarities with its Chinese competitors **Fig. 5**

Figure 5: U-Blox and Chinese competitors' portfolio

CHINESE COMPETITORS PORTFOLIO

	HP-GNSS	SP-GNSS	LP-GNSS	2G	3G	4G	5G	CAT 1	CAT M	NB-IoT	V2X	Bluetooth	Wi-fi
U-BLOX	ZED-F9H	NEO-M9N	ZOE-M8B	SARA-G4	SARA-U201	NINA R2	SARA-R5	TOBY-R2	SARA-R4	SARA-N2	VERA-P1	NINA W15	NINA W10
Quectel	LC79D	L76		M95	UC20	EG18 -XX	RG500 Q	BC66 -NA	BG95	BC68	AG15	FC20	FC10
SIMCom				SIM808	SIM 5320	SIM 7600NA	SIM 8200G	SIM 7500A	SIM 7090G	SIM 7020G	SIM 8100	W59	W58
Fibocom				G510	H350	NL668 -EU	FG150	L610	MA510	N700			
BDStar	UM482	UM220-INS	UM220 -IV M0 / UC6226										

Source: Company Data, Team Analysis

Fibocom was the first wireless communication module and Internet of Things solution provider listed in China. They are headquartered in Shenzhen, which is known as the "Chinese Silicon Valley", the main product lines include 5G, smartphones connectivity, short range connectivity, automotive and industrial applications. Their deep market penetration is leading them to challenge directly U-Blox designing chips aimed to compete in the cellular segment (2G, 3G, 4G, etc).

Beijing BDStar Navigation Co. is principally engaged in the distribution of satellite navigation positioning products and other navigation products producing: Global Navigation Satellite System (GNSS) chips, modules and board cards, navigation positioning antennas and microwave communication devices. Replicating the entire GNSS market segment of U-Blox with a strong focus in navigation and positioning industrialization, in the specific with High Precision (HP) and Standard Precision (SP) GNSS chips.

Sunsea is principally engaged in smart Internet of things business and communications network infrastructure products. The Company mainly provides cable, fiber, mobile and wireless broadband network solutions as well as the Internet of Things products and services. Through its controlled company SimCom they are specializing in cellular and short-range market segmentation.

Lastly, we have Quectel, their business space from design, research and development of cellular communication modules in the field of Internet of Things to solutions services. The Company's main products include GSM/GPRS (2G category) series, WCDMA/HSPA (3G category) series, LTE (4G category) series and NB-IoT series cellular communication modules, as well as GNSS series positioning module series and EVB tool series. The Company's products are mainly used in the field of vehicle transportation, smart city, intelligent security, wireless gateway, industrial applications, medical health and agricultural environment. With a total presence on the market this company represent the biggest threat to U-Blox since they replicated entirely its product portfolio. Also, Quectel in those years build a strong network of distribution easily serving its domestic and overseas markets.

Figure 6: *U-Blox products' portfolio*

GNSS

Group	Class	Application	SP-GNSS	HP-GNSS	Dead-rec	Timing	Raw data	V2X
CAM	Antenna	C-drones, transportation	M8					
LEA	Module	Transportation	M8S			M8F/T	M8T	
MAX	Module	C-drones	8, M8					
NEO	Module	P-Drones, transportation, emergency	8Q, M8Q/U	M8P	M8L/U	M8T	M8P/T	
SAM	Antenna	G&A	M8Q					
UBX	Chip	Consumer, IVS, transportation	G82, M83 /823 /914					M914, P3
ZED	Module	P-drones, G&A, Time		F9H/P		F9T		
ZOE	SiP	Time	M8B					

Cellular

Group	Class	Application	2G	3G	4G	Cat-1	Cat-M	NB-IoT
LARA	Moduke	eCall, C-health,	R2	R2	R2, R3121	R2, R3121		
LISA	Module	eCall, Asset Tracking	U2	U2				
SARA	Module	Agriculture, Smart meters, eBike	G3/4S, R4, U2	U2	N2, R4/5		R4/5	N2/3, R4/5
TOBY	Module	Asset Tracking, Insurance tel.	R2	R2	R2	R2		
UBX	Chip	Other						R5

Short Range

Group	Class	Application	V2x	BT-LTE	BT-BR	Wi-Fi	NFC
ANNA	SiP	Other		B112			B112
BMD	Module	Other		33/34X			34x
ELLA	Module	IVS, Other			W1	W1	
EMMY	Module	IVS, Consumer		W1	W1	W1	
JODY	Module	IVS		W1		W1	
LILY	Module	Other				W1	
NINA	Module	Insurance tel, C-health, Smart meters		B1/2/3, W1/15	B2, W1/15	W1/13/15	B1/3
ODIN	Module	Other		W2	W2	W2	
R	Module	Smart meters		41Z			
VERA	Module	Fleet, eCall, Asset tracking	P1				

C-Health: Connected health
Insurance tel: Insurance telematics
C-drones: Consumer drones
P-drones: Professional drones
G&A: Geomatics and Agriculture
IVS: in vehicle system
SiP: System in Package
SP-GNSS: Standard precision GNSS
HP-GNSS: High precision GNSS
Dead-rec: Dead reckoning

BT-BR: Bluetooth basic rate
V2X: Vehicle to everything

Source: Company Data, team Analysis

A Work Project presented as part of the requirements for the Award of a Master Degree in Finance from the NOVA – School of Business and Economics.

EQUITY RESEARCH REPORT:
VALUATION OF U-BLOX

DAVID COPPINI 34451

A Project carried out on the Master in Finance Program, under the

supervision of: Professor Rosario André

2nd of June 2020

Abstract

This individual report aims to illustrate a data driven approach to analyze U-Blox's products portfolio and forecast sales. The company's disclosure on this matter is not exhaustive, therefore a deep analytical data driven approach has been adopted. The main source was the GNSS Market Report 2019 published by the European GNSS Agency (GSA).

Keywords
U-Blox, Internet of Things, positioning, connectivity, revenue

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Introduction

As we already discussed, U-Blox disclosure is not exhaustive. The company only presents data on number of chips and modules sold and an estimation of the average selling price (ASP henceforth). Stakeholders do not receive any detailed information on types of modules and chips sold or products sold by applications. Therefore, for having a clear picture of U-Blox's products portfolio along with a revenue forecast with solid grounds, we performed a bottom up, data driven analysis.

The Source

Fortunately, the European GNSS[1] Agency issues every year the GNSS market report[2]. The European GNSS Supervisory Authority (GSA) was initially established as a Community Agency on 12 July 2004, by Council Regulation 1321/2004, status amended in 2006 by Council Regulation No 1942/2006. The GSA's mission is to support the EU goals and achieve the highest return on European GPS investment, in terms of benefits to users and economic growth an increased competitiveness.
The 2019 GSA GNSS Market Report was used as our starting point, since it contains detailed 10-year unit market size projections per region for more than 70 different positioning solutions. We identified 20 applications that apply to U-Blox and we separated them by technology and revenue segment.

Table 1 - U-Blox's products applications

GNSS: Positioning			
1. Consumer	4. Professional drones	7. Trains	10. Agriculture
2. In vehicle system (IVS)	5. Consumer drones	8. Geomatics	11. Timing
3. Transportation (Other)	6. Marine	9. Emergency	
Cellular: Connectivity			
12. Asset Tracking	14. Fleet Management	16. Smart meters	
13. eCall	15. Connected health	17. LP Asset tracking	
14. Bike/e-scooter	16. Insurance Telematics	20. Agriculture 4.0	

Source: GSA Market Report 2019, Team Analysis

Product portfolio and Average Selling Price

The team built a matrix from U-Blox's product portfolio along with retail prices in order to estimate all the different ASPs (Appendix 1). From this base, it was possible to estimated ASP decline for each application, accounting for new products launch and an 8% ASP decline p.a for GNSS and a 10% ASP decline p.a. for Cellular (Appendix 2 and 3) It should be noted that for 2020 and 2021 the ASP decline was increased by 200bps for both segments due to the Covid-19 impact on global economy. This dynamic was estimated looking to U-Blox and its competitors' reaction to the Covid-19 emergency. In fact, most of them, started to offer between 10% and 20% price discounts and we strongly believe that this dynamic will last at least until mid-2021.

Applications' Growth Rates

Growth rates from the 2019 GNSS Market report had been applied to the previous identified 20 applications applicable to U-Blox. Once more, this source was the most reliable for forecasting future market data. Overall, the GNSS market (excluding smartphones) is expected to grow at an 11% CAGR from 2019 to 2024 while the Cellular Market is expected to increase at a 17% CAGR (Appendix 4 and 5).

[1] GNSS: Global Navigation Satellite System. It refers to a constellation of satellites providing signals from space that transmit positioning and timing data to GNSS receivers. The receivers then use this data to determine location. https://www.gsa.europa.eu/european-gnss/what-gnss
[2] https://www.gsa.europa.eu/market/market-report

Market Shares and Revenues

Then, U-Blox market share in each products segment was estimated by looking at data disclosed by the company itself, competitors, clients, market research reports and by interviewing two professors from the University of Florence. For estimating market shares we ran several simulations starting from our initial estimates until our model perfectly balanced with U-Blox's 2019 disclosed financial statements. Then, to forecast market shares for all the different applications, for both GNSS and Cellular, we applied a linear increase or decrease depending on the forecasted segment dynamic based on the GSA GNSS Market Report 2019. This detailed model, forecast the company's revenue by geographical area, technological segment, products, platform and application. As we already anticipated, global sales are expected to reach CHF 556M in 2024, far below management guidance of CHF 700 – 800M (Appendix 6).

1. **Automotive:** The automotive segment is expected to grow at a 12.2% CAGR between 2020 and 2024, thanks to stronger penetration rates of hybrid and electric cars, which require 2x the semiconductor content of conventional cars. However, we strongly believe that U-Blox will lose market shares in all regions. In fact, in vehicle systems (IVS) and eCall for example are designed with quite simple chips and modules that Chinese competitors are starting to offer at a much lower price than U-Blox.

2. **Drones:** Both Professional Drones and Consumer Drones are expected to increase from 14.8M units in 2020 to 21M units in 2024, meaning a 9% CAGR through the analyzed period. However, most of this growth will come from APAC, especially China, that will see the number of drones to double. As we already pointed out, Chinese companies, under the pressure of the Chinese government will likely switch to local producers, especially for consumer drones that require less sophisticated positioning and connectivity solutions. This is translated in global revenue increasing from CHF 119.7M in 2020 to CHF 213.6M in 2024.

3. **Insurance telematics:** this segment is expected to grow at a 16% CAGR between 2020 and 2024 due to the adoption of more and more digital and connected insurance solutions along with pay per use insurances. We expect U-Blox to strengthen its position in this application thanks to the need of reliable and efficient products that Chinese competitors are not able to offer at this stage. Overall, we estimated an increase in market share from 7% in 2020 to 17% in 2024. This mean that Insurance Telematics revenues will increase from CHF 11.5M to CHF 34.6 during the same period.

4. **Asset tracking:** knowing where an object is will be a must in the connected world of the future, in fact this segment is expected to grow from 26.2M units in 2020 to 82.9M units in 2024, reflecting a 27% CAGR. In terms of market shares we expect U-Blox to increase its position in EMEA and Americas from ~10% to ~20% in both regions, while losing roughly its entire market share in APAC. This dynamic is consistent with the simple products needed in this market segment. Therefore, in Revenue terms we estimated an overall increase from CHF 26.2M in 2020 to CHF 54.5M with a contribution from APAC of only CHF 2.3M.

5. **Others:** Marine, Trains, Emergency, and Timing are negligible. All these applications start from an exceptionally low installed base of 3.2M in 2020 and are expected to reach only 4.4M units in 2024. This is translated in a starting base of CHF 5.1M in 2020 estimated to grow to CHF 7M in 2024.

Appendix 1 - U-Blox's Product Matrix

U-BLOX PRODUCT PORTFOLIO

	Group	Class	Application	SP-GNSS	HP-GNSS	Dead-rec	Timing	Raw data	V2X
GNSS	CAM	Antenna	C-drones, transportation	M8					
	LEA	Module	Transportation	M8S			M8F/T	M8T	
	MAX	Module	C-drones	8, M8					
	NEO	Module	P-Drones, transportation, emergency	8Q, M8Q/U	M8P	M8L/U	M8T	M8P/T	
	SAM	Antenna	G&A	M8Q					
	UBX	Chip	Consumer, IVS, transportation	G82, M83 /823 /914					M914, P3
	ZED	Module	P-drones, G&A, Time		F9H/P		F9T		
	ZOE	SiP	Time	M8B					

	Group	Class	Application	2G	3G	4G	Cat-1	Cat-M	NB-IoT
Cellular	LARA	Moduke	eCall, C-health, Insurance tel.	R2	R2	R2, R3121	R2, R3121		
	LISA	Module	eCall, Asset Tracking	U2	U2				
	SARA	Module	Agriculture, Smart meters, eBike	G3/45, R4, U2	U2	N2, R4/5		R4/5	N2/3, R4/5
	TOBY	Module	Asset Tracking, Insurance tel.	R2	R2	R2	R2		
	UBX	Chip	Other						R5

	Group	Class	Application	V2x	BT-LTE	BT-BR	Wi-Fi	NFC
Short Range	ANNA	SiP	Other		B112			B112
	BMD	Module	Other		33/34X			34x
	ELLA	Module	IVS, Other			W1	W1	
	EMMY	Module	IVS, Consumer		W1	W1	W1	
	JODY	Module	IVS		W1		W1	
	LILY	Module	Other				W1	
	NINA	Module	Insurance tel, C-health, Smart meters		B1/2/3, W1/15	B2, W1/15	W1/13/15	B1/3
	ODIN	Module	Other		W2	W2	W2	
	R	Module	Smart meters		41Z			
	VERA	Module	Fleet, eCall, Asset tracking	P1				

C-Health: Connected health
Insurance tel: Insurance telematics
C-drones: Consumer drones
P-drones: Professional drones
G&A: Geomatics and Agriculture
IVS: in vehicle system
SIP: System in Package
SP-GNSS: Standard precision GNSS
HP-GNSS: High precision GNSS
Dead-rec: Dead reckoning
BT-LE: Bluetooth low energy
BT-BR: Bluetooth basic rate
V2X: Vehicle to everything

Source: Company data, Team Analysis

Appendix 2 - GNSS Price dynamic

GNSS Prices	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
ASP reduction	8%	8%	10%	10%	8%	8%	8%
ASP factor 2009	0,39	0,36	0,32	0,29	0,27	0,24	0,22
ASP factor 2012	0,53	0,49	0,44	0,40	0,36	0,34	0,31
ASP factor 2015	0,73	0,67	0,60	0,54	0,50	0,46	0,42
ASP factor 2018	1,00	0,92	0,83	0,75	0,69	0,63	0,58
ASP factor 2020			1	0,90	0,83	0,76	0,70

Consumer GNSS	Price CHF						
ASP M6 Chip (2009)	2,6						
ASP M7 Chip (2012)	2,6						
ASP M8 Chip (2015)	2,6						
ASP M9 Chip (2020)	2,6	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
M6	8%	1%	0%	0%	0%	0%	0%
M7	44%	21%	10%	0%	0%	0%	0%
M8	49%	78%	85%	90%	70%	40%	15%
M9	0%	0%	5%	10%	30%	60%	85%
ASP	**1,60 CHF**	**1,64 CHF**	**1,58 CHF**	**1,51 CHF**	**1,56 CHF**	**1,67 CHF**	**1,71 CHF**
IVS		**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Equal to Consumer GNSS	**1,60 CHF**	**1,64 CHF**	**1,58 CHF**	**1,51 CHF**	**1,56 CHF**	**1,67 CHF**	**1,71 CHF**
Transortation (Other)		**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
ASP M8 Module (2015)	8,5						
ASP M9 Module (2020)	8,5	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
M8	100%	100%	100%	85%	60%	40%	10%
M9	0%	0%	0%	15%	40%	60%	90%
ASP	**6,20 CHF**	**5,70 CHF**	**5,13 CHF**	**5,07 CHF**	**5,36 CHF**	**5,45 CHF**	**5,72 CHF**
Professional Drones		**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
ASP M8 HP (2015)	50,4						
ASP F9 Drone (2018)	102						
M8 HP	100%	100%	95%	75%	55%	35%	10%
F9 Drone	0%	0%	5%	25%	45%	65%	90%
ASP	**36,74 CHF**	**33,80 CHF**	**33,12 CHF**	**39,54 CHF**	**45,32 CHF**	**49,93 CHF**	**55,40 CHF**
Consumer Drones		**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
ASP M8 Module (2015)	10,2						
ASP M9 Module (2020)	10,2						
M8 Module	100%	100%	90%	80%	50%	30%	10%
M9 Module	0%	0%	10%	20%	50%	75%	90%
ASP	**7,44 CHF**	**6,84 CHF**	**6,56 CHF**	**6,27 CHF**	**6,77 CHF**	**7,23 CHF**	**6,87 CHF**
Marine & Trains		**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Equal to Transportation (Other)	**6,20 CHF**	**5,70 CHF**	**5,13 CHF**	**5,07 CHF**	**5,36 CHF**	**5,45 CHF**	**5,72 CHF**
Geomatics		**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
ASP Geomatics M8 HP	60,48						
ASP Geomatics F9 HP	112,2						
Geomatics M8 HP	100%	90%	75%	60%	35%	10%	0%
Geomatics F9 HP	0%	10%	25%	40%	65%	90%	100%
ASP	**44,09 CHF**	**46,83 CHF**	**50,61 CHF**	**53,16 CHF**	**60,58 CHF**	**66,47 CHF**	**65,11 CHF**
Emergency		**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
ASP Emergency M8	12,75						
ASP Emergency M9	12,75						
Emergency M8	100%	100%	75%	55%	30%	10%	0%
Emergency M9	0%	0%	25%	45%	70%	90%	100%
ASP	**9,29 CHF**	**8,55 CHF**	**8,96 CHF**	**8,97 CHF**	**9,30 CHF**	**9,33 CHF**	**8,94 CHF**
Agriculture							
Equal to Geomatics	**44,09 CHF**	**46,83 CHF**	**50,61 CHF**	**53,16 CHF**	**60,58 CHF**	**66,47 CHF**	**65,11 CHF**
Timing		**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
ASP CI M8 Timing (2015)	45						
ASP CI M9 Timing (2018)	136						
CI M8 Timing	100%	90%	80%	70%	60%	50%	50%
CI M9 Timing	0%	10%	20%	30%	40%	50%	50%
ASP	**32,81 CHF**	**39,67 CHF**	**44,25 CHF**	**47,52 CHF**	**50,79 CHF**	**53,24 CHF**	**48,98 CHF**

Source: Company data, Team Analysis

Appendix 3 - Cellular and Short-Range Price dynamic

Cellular Prices		2018	2019	2020	2021	2022	2023	2024
ASP reduction		10%	10%	12%	12%	10%	10%	10%
ASP Factor		1	0,90	0,79	0,70	0,63	0,56	0,51
Modules	Retail	Wholesale						
2G	8,4 CHF	5,0 CHF	4,5 CHF	4,0 CHF	3,5 CHF	3,2 CHF	2,8 CHF	2,6 CHF
3G	27,9 CHF	13,9 CHF	12,5 CHF	11,0 CHF	9,7 CHF	8,7 CHF	7,9 CHF	7,1 CHF
4G	63,5 CHF	31,8 CHF	28,6 CHF	25,2 CHF	22,1 CHF	19,9 CHF	17,9 CHF	16,1 CHF
NB-IoT	11,9 CHF	10,7 CHF	9,7 CHF	8,5 CHF	7,5 CHF	6,7 CHF	6,1 CHF	5,5 CHF
Cat-M1	36,0 CHF	18,0 CHF	16,2 CHF	14,2 CHF	12,5 CHF	11,3 CHF	10,2 CHF	9,1 CHF

Short-Range	2018	2019	2020	2021	2022	2023	2024
ASP reduction		5%	8%	8%	8%	8%	8%
ASP Retail	9,43						
Wholesale discount	20%						
ASP Wholesale	7,54 CHF	7,17 CHF	6,63 CHF	6,13 CHF	5,67 CHF	5,25 CHF	4,85 CHF

Source: Company Data, Team Analysis

Appendix 4 - GNSS market size, market share, revenue

Source: GNSS Market Report (Issue 6, 2019, GSA)	*Market size (million units)*						*U-Blox's Market Share*						*U-Blox's Revenue (CHF million)*					
	2019	2020	2021	2022	2023	2024	2019	2020	2021	2022	2023	2024	2019	2020	2021	2022	2023	2024
Consumer GNSS	**1.709**	**1.774**	**1.844**	**1.919**	**1.999**	**2.087**	**1,4%**	**1,3%**	**1,2%**	**1,2%**	**1,3%**	**1,2%**	**38,6**	**36,0**	**32,3**	**35,5**	**43,0**	**43,0**
Americas																		
Phones	381	388	395	402	409	417	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	-	-	-	-	-	-
Other	57	64	72	81	91	102	9,0%	8,0%	7,0%	6,0%	6,0%	5,0%	8,4	8,1	7,6	7,5	9,1	8,7
EMEA																		
Phones	295	303	310	318	326	335	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	-	-	-	-	-	-
Other	44	50	57	64	73	83	9,0%	8,0%	7,0%	6,0%	6,0%	5,0%	6,5	6,3	6,0	6,0	7,3	7,1
APAC																		
Phones	811	832	854	877	900	924	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	-	-	-	-	-	-
Other	121	137	156	176	200	227	12,0%	10,0%	8,0%	8,0%	8,0%	7,0%	23,8	21,7	18,7	21,9	26,7	27,2
IVS	**45,2**	**47,9**	**50,8**	**53,9**	**57,3**	**60,9**	**74%**	**70%**	**67%**	**63%**	**59%**	**57%**	**54,5**	**53,1**	**51,1**	**52,8**	**56,7**	**59,0**
Americas	14,0	14,3	14,7	15,1	15,4	15,8	77%	74%	71%	68%	65%	65%	17,6	16,8	15,7	15,9	16,7	17,6
EMEA	17,1	18,1	19,1	20,2	21,4	22,7	78%	76%	74%	71%	69%	67%	21,8	21,7	21,3	22,4	24,6	26,0
APAC	14,1	15,5	17,0	18,6	20,4	22,4	65%	60%	55%	50%	45%	40%	15,0	14,7	14,1	14,5	15,3	15,4
Transportation (Other)	**14,4**	**12,5**	**11,0**	**9,6**	**8,4**	**7,4**	**18%**	**17%**	**18%**	**17%**	**18%**	**18%**	**14,5**	**11,2**	**9,8**	**9,0**	**8,2**	**7,7**
Americas	4,4	3,6	3,0	2,4	2,0	1,6	18%	18%	19%	20%	23%	25%	4,5	3,3	2,9	2,6	2,5	2,3
EMEA	5,5	4,8	4,2	3,6	3,2	2,8	18%	18%	19%	20%	23%	25%	5,6	4,4	4,0	3,9	4,0	3,9
APAC	4,5	4,1	3,8	3,5	3,3	3,0	17%	16%	15%	13%	10%	8%	4,4	3,4	2,9	2,5	1,8	1,4
Professional Drones	**2,4**	**2,7**	**3,0**	**3,4**	**3,8**	**4,3**	**79%**	**77%**	**76%**	**73%**	**69%**	**67%**	**63,7**	**68,8**	**90,5**	**112,1**	**131,7**	**160,5**
Americas	0,8	0,9	1,0	1,1	1,2	1,4	80%	80%	80%	78%	75%	75%	21,6	23,7	31,6	39,5	46,7	57,9
EMEA	0,9	1,0	1,1	1,3	1,4	1,6	80%	80%	80%	78%	75%	75%	24,3	26,7	35,7	44,7	53,0	65,9
APAC	0,7	0,8	0,9	1,0	1,2	1,3	75%	70%	65%	60%	55%	50%	17,7	18,4	23,2	27,9	32,0	36,6
Consumer Drones	**11,2**	**12,1**	**13,1**	**14,2**	**15,3**	**16,6**	**67%**	**64%**	**59%**	**56%**	**52%**	**47%**	**51,3**	**50,8**	**48,2**	**53,3**	**57,4**	**53,1**
Americas	3,6	3,9	4,2	4,5	4,8	5,2	70%	68%	65%	63%	60%	55%	17,2	17,3	16,9	19,1	20,8	19,5
EMEA	4,2	4,5	4,8	5,1	5,5	5,9	70%	68%	65%	63%	60%	55%	20,1	20,0	19,6	21,9	23,8	22,2
APAC	3,4	3,8	4,1	4,6	5,0	5,6	60%	55%	45%	40%	35%	30%	14,0	13,5	11,7	12,4	12,8	11,5
Marine	**1,8**	**1,9**	**1,9**	**2,0**	**2,1**	**2,2**	**7%**	**7%**	**7%**	**7%**	**8%**	**7%**	**0,7**	**0,7**	**0,7**	**0,8**	**0,9**	**0,9**
Americas	1,0	1,0	1,0	1,0	1,0	1,0	5,0%	5,0%	5,0%	5,0%	5,0%	5,0%	0,3	0,3	0,3	0,3	0,3	0,3
EMEA	0,4	0,4	0,5	0,5	0,5	0,6	20%	20%	20%	20%	20%	18%	0,5	0,4	0,5	0,5	0,6	0,6
APAC	0,4	0,4	0,5	0,5	0,5	0,6	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	-	-	-	-	-	-
Trains	**0,1**	**0,2**	**0,2**	**0,2**	**0,3**	**0,3**	**32%**	**32%**	**32%**	**32%**	**32%**	**32%**	**0,2**	**0,3**	**0,3**	**0,4**	**0,5**	**0,6**
Americas	0,1	0,1	0,1	0,1	0,2	0,2	40%	40%	40%	40%	40%	40%	0,2	0,2	0,2	0,3	0,3	0,4
EMEA	0,1	0,1	0,1	0,1	0,1	0,1	20%	20%	20%	20%	20%	20%	0,1	0,1	0,1	0,1	0,1	0,1
APAC	0,0	0,0	0,0	0,0	0,0	0,1	33%	31%	29%	27%	25%	24%	0,0	0,0	0,0	0,0	0,1	0,1
Geomatics	**0,5**	**0,6**	**0,6**	**0,6**	**0,7**	**0,7**	**34%**	**34%**	**33%**	**32%**	**31%**	**31%**	**8,5**	**10,0**	**10,9**	**12,3**	**14,0**	**15,1**
Americas	0,1	0,1	0,1	0,1	0,1	0,2	30%	30%	30%	30%	30%	30%	1,7	2,0	2,2	2,5	2,8	2,9
EMEA	0,2	0,2	0,2	0,2	0,2	0,3	40%	40%	40%	40%	40%	40%	2,8	3,6	4,0	4,8	5,8	6,7
APAC	0,3	0,3	0,3	0,3	0,3	0,3	33%	31%	29%	27%	25%	25%	4,0	4,4	4,6	4,9	5,3	5,5
Emergency	**0,2**	**0,2**	**0,2**	**0,2**	**0,2**	**0,3**	**43%**	**43%**	**42%**	**42%**	**42%**	**41%**	**0,6**	**0,6**	**0,7**	**0,8**	**0,9**	**0,9**
Americas	0,1	0,1	0,1	0,1	0,1	0,1	50%	50%	50%	50%	50%	50%	0,2	0,2	0,3	0,3	0,4	0,4
EMEA	0,1	0,1	0,1	0,1	0,1	0,1	50%	50%	50%	50%	50%	50%	0,2	0,2	0,3	0,3	0,4	0,4
APAC	0,1	0,1	0,1	0,1	0,1	0,1	29%	28%	27%	26%	25%	24%	0,1	0,1	0,1	0,2	0,2	0,2
Agriculture	**0,6**	**0,7**	**0,8**	**0,9**	**1,1**	**1,3**	**34%**	**34%**	**33%**	**33%**	**33%**	**33%**	**9,5**	**11,8**	**14,3**	**18,8**	**23,9**	**27,3**
Americas	0,3	0,4	0,4	0,5	0,6	0,7	40%	40%	40%	40%	40%	40%	5,6	7,2	9,0	12,1	15,7	18,2
EMEA	0,1	0,1	0,2	0,2	0,2	0,3	25%	25%	25%	25%	25%	25%	1,2	1,6	2,0	2,8	3,8	4,5
APAC	0,2	0,2	0,2	0,2	0,3	0,3	29%	28%	27%	26%	25%	24%	2,7	3,1	3,3	3,9	4,5	4,5
Timing	**0,3**	**0,3**	**0,3**	**0,4**	**0,4**	**0,4**	**25%**	**25%**	**25%**	**24%**	**24%**	**24%**	**3,0**	**3,5**	**3,9**	**4,4**	**4,9**	**4,6**
Americas	0,1	0,1	0,1	0,1	0,1	0,1	25%	25%	25%	25%	25%	25%	1,0	1,2	1,4	1,6	1,8	1,8
EMEA	0,1	0,1	0,1	0,1	0,1	0,1	25%	25%	25%	25%	25%	25%	1,0	1,2	1,3	1,5	1,6	1,6
APAC	0,1	0,1	0,1	0,1	0,1	0,1	25%	24%	24%	23%	23%	21%	1,0	1,1	1,3	1,3	1,5	1,3
Total GNSS	**299**	**330**	**366**	**407**	**453**	**506**	**23%**	**21%**	**19%**	**17%**	**16%**	**14%**	**245,2**	**246,9**	**262,7**	**300,1**	**342,1**	**372,7**
Americas	81	88	96	106	116	128	26%	23%	21%	19%	18%	17%	78,4	80,2	88,0	101,7	117,1	130,1
EMEA	73	79	87	96	106	117	32%	30%	28%	26%	24%	22%	84,1	86,3	94,8	108,9	125,0	139,0
APAC	145	162	183	205	231	260	19%	17%	14%	13%	12%	11%	82,7	80,4	80,0	89,5	100,0	103,6

Total GNSS	2019	2020	2021	2022	2023	2024
Americas	462	476	491	508	525	545
EMEA	368	382	397	414	432	452
APAC	956	995	1.037	1.082	1.131	1.184

GNSS (No phones)	2019	2020	2021	2022	2023	2024
Americas	81	88	96	106	116	128
EMEA	73	79	87	96	106	117
APAC	145	162	183	205	231	260
Total	**299**	**330**	**366**	**407**	**453**	**506**

Source: GSA GNSS Market report 2019, Team analysis

Appendix 5 - Cellular market size, market shares, revenue

	Market Size (million units)						*U-Blox's Market share*						*U-Blox's Revenues (CHF million)*					
	2019	2020	2021	2022	2023	2024	2019	2020	2021	2022	2023	2024	2019	2020	2021	2022	2023	2024
2G	**33,9**	**34,8**	**34,1**	**31,2**	**24,2**	**18,5**	**20%**	**20%**	**18%**	**17%**	**17%**	**17%**	**31,3**	**27,5**	**21,4**	**17,2**	**11,7**	**7,9**
Asset Tracking	**7,9**	**8,6**	**8,7**	**7,9**	**5,3**	**3,7**	**8%**	**8%**	**8%**	**8%**	**8%**	**9%**	**2,8**	**2,7**	**2,4**	**2,0**	**1,2**	**0,9**
Americas	2	2,2	2,2	2	1,3	1	10%	12%	14%	16%	18%	20%	0,9	1,1	1,1	1,0	0,7	0,5
EMEA	1,6	1,7	1,7	1,6	1,1	0,7	5%	8%	11%	14%	17%	19%	0,4	0,5	0,7	0,7	0,5	0,3
APAC	4,3	4,7	4,8	4,3	2,9	2	8%	6%	4%	2%	1%	0%	1,6	1,1	0,7	0,3	0,0	-
eCall	**8,4**	**7,9**	**7,3**	**6,6**	**5,9**	**5**	**50%**	**50%**	**43%**	**40%**	**36%**	**33%**	**19,2**	**15,9**	**11,1**	**8,3**	**6,0**	**4,2**
Americas	2,6	2,3	2,1	1,8	1,5	1	55%	53%	50%	48%	45%	45%	6,5	4,9	3,7	2,7	1,9	1,2
EMEA	3,2	3	2,7	2,5	2,2	2	55%	53%	50%	48%	45%	45%	8,0	6,3	4,7	3,8	2,8	2,3
APAC	2,6	2,6	2,5	2,3	2,2	2	40%	45%	30%	25%	20%	15%	4,7	4,7	2,6	1,8	1,3	0,8
Bike/Scooter	**7,5**	**8,2**	**8,8**	**8,9**	**8,1**	**6,8**	**19%**	**17%**	**14%**	**13%**	**10%**	**9%**	**6,4**	**5,4**	**4,4**	**3,6**	**2,4**	**1,6**
Americas	2,3	2,4	2,5	2,4	2,1	1,8	23%	21%	19%	17%	15%	13%	2,4	2,0	1,7	1,3	0,9	0,6
EMEA	2,8	3,1	3,3	3,4	3	2,5	23%	21%	19%	17%	15%	13%	2,9	2,6	2,2	1,8	1,3	0,8
APAC	2,4	2,7	3	3,1	3	2,5	10%	8%	5%	5%	3%	3%	1,1	0,8	0,5	0,5	0,2	0,2
Fleet Management	**2,1**	**1,8**	**1,4**	**1**	**0,5**	**0,2**	**6%**	**9%**	**11%**	**15%**	**16%**	**15%**	**0,6**	**0,6**	**0,6**	**0,5**	**0,2**	**0,1**
Americas	0,6	0,5	0,4	0,3	0,1	0	7%	11%	15%	19%	23%	25%	0,2	0,2	0,2	0,2	0,1	-
EMEA	0,8	0,7	0,5	0,4	0,2	0,1	7%	11%	15%	19%	23%	25%	0,3	0,3	0,3	0,2	0,1	0,1
APAC	0,7	0,6	0,5	0,3	0,2	0,1	5%	5%	5%	5%	5%	5%	0,2	0,1	0,1	0,0	0,0	0,0
Connected Health	**0,9**	**0,9**	**0,9**	**0,9**	**0,6**	**0,3**	**5%**	**5%**	**5%**	**5%**	**5%**	**5%**	**0,2**	**0,2**	**0,2**	**0,1**	**0,1**	**0,0**
Americas	0,3	0,3	0,3	0,3	0,2	0,1	5%	5%	5%	5%	5%	5%	0,1	0,1	0,1	0,0	0,0	0,0
EMEA	0,3	0,3	0,3	0,3	0,2	0,1	5%	5%	5%	5%	5%	5%	0,1	0,1	0,1	0,0	0,0	0,0
APAC	0,3	0,3	0,3	0,3	0,2	0,1	5%	5%	5%	5%	5%	5%	0,1	0,1	0,1	0,0	0,0	0,0
Insurance Telematics	**7,1**	**7,4**	**7**	**5,9**	**3,8**	**2,5**	**6%**	**9%**	**12%**	**14%**	**16%**	**17%**	**2,1**	**2,7**	**2,8**	**2,6**	**1,8**	**1,1**
Americas	2,2	2,2	2	1,6	1	0,5	7%	11%	15%	19%	23%	25%	0,7	1,0	1,1	1,0	0,7	0,3
EMEA	2,7	2,8	2,6	2,2	1,4	1	7%	11%	15%	19%	23%	25%	0,9	1,2	1,4	1,3	0,9	0,6
APAC	2,2	2,4	2,4	2,1	1,4	1	5%	5%	5%	5%	5%	5%	0,5	0,5	0,4	0,3	0,2	0,1
3G	**24,8**	**29,2**	**34,7**	**41,3**	**49,5**	**59,7**	**19%**	**18%**	**17%**	**17%**	**17%**	**16%**	**58,1**	**58,0**	**58,4**	**61,2**	**64,4**	**69,5**
Asset Tracking	**5,1**	**6,7**	**8,8**	**11,5**	**15,1**	**19,8**	**8%**	**8%**	**8%**	**8%**	**8%**	**9%**	**5,1**	**5,8**	**6,7**	**7,9**	**9,4**	**12,6**
Americas	1,3	1,7	2,2	2,9	3,7	4,8	10%	12%	14%	16%	18%	20%	1,6	2,2	3,0	4,0	5,3	6,8
EMEA	1,0	1,3	1,8	2,3	3,1	4,1	5%	8%	11%	14%	17%	20%	0,6	1,2	1,9	2,8	4,1	5,7
APAC	2,8	3,7	4,8	6,3	8,3	10,9	8%	6%	4%	2%	0%	0%	2,8	2,4	1,9	1,1	-	-
eCall	**6,9**	**7,6**	**8,3**	**9,1**	**10,0**	**11,0**	**50%**	**47%**	**43%**	**40%**	**36%**	**34%**	**43,4**	**39,2**	**34,7**	**31,7**	**28,2**	**26,1**
Americas	2,1	2,2	2,4	2,5	2,7	2,9	55%	53%	50%	48%	45%	43%	14,5	13,1	11,6	10,7	9,6	8,8
EMEA	2,6	2,8	3,1	3,3	3,6	3,9	55%	53%	50%	48%	45%	43%	17,9	16,5	14,9	14,0	12,8	12,0
APAC	2,2	2,5	2,8	3,2	3,6	4,1	40%	35%	30%	25%	20%	18%	11,0	9,6	8,2	7,0	5,7	5,3
Fleet Management	**2,0**	**2,1**	**2,2**	**2,3**	**2,4**	**2,5**	**6%**	**9%**	**12%**	**15%**	**18%**	**19%**	**1,6**	**2,1**	**2,6**	**3,0**	**3,4**	**3,4**
Americas	0,6	0,6	0,6	0,6	0,7	0,7	7%	11%	15%	19%	23%	25%	0,5	0,7	0,9	1,1	1,2	1,2
EMEA	0,8	0,8	0,9	0,9	0,9	0,9	7%	11%	15%	19%	23%	25%	0,7	1,0	1,2	1,5	1,7	1,7
APAC	0,6	0,6	0,7	0,8	0,8	0,9	5%	5%	6%	7%	8%	9%	0,4	0,4	0,4	0,5	0,5	0,6
Connected Health	**3,9**	**4,5**	**5,3**	**6,2**	**7,2**	**8,3**	**5%**	**5%**	**5%**	**5%**	**5%**	**5%**	**2,4**	**2,5**	**2,6**	**2,7**	**2,8**	**3,0**
Americas	1,3	1,5	1,8	2,1	2,4	2,8	5%	5%	5%	5%	5%	5%	0,8	0,8	0,9	0,9	0,9	1,0
EMEA	1,3	1,5	1,8	2,1	2,4	2,8	5%	5%	5%	5%	5%	5%	0,8	0,8	0,9	0,9	0,9	1,0
APAC	1,3	1,5	1,8	2,1	2,4	2,8	5%	5%	5%	5%	5%	5%	0,8	0,8	0,9	0,9	0,9	1,0
Insurance Telematics	**6,9**	**8,4**	**10,1**	**12,3**	**14,9**	**18,0**	**6%**	**9%**	**12%**	**15%**	**18%**	**19%**	**5,5**	**8,3**	**11,8**	**15,9**	**20,7**	**24,5**
Americas	2,1	2,5	2,9	3,4	4,0	4,7	7%	11%	15%	19%	23%	25%	1,8	3,0	4,2	5,7	7,2	8,3
EMEA	2,6	3,1	3,8	4,6	5,6	6,8	7%	11%	15%	19%	23%	25%	2,3	3,8	5,6	7,7	10,1	12,0
APAC	2,2	2,7	3,4	4,2	5,3	6,6	5%	5%	6%	7%	8%	9%	1,4	1,5	2,0	2,6	3,3	4,2
NB-IoT	**1,7**	**3,1**	**6,0**	**11,6**	**22,9**	**45,6**	**11%**	**10%**	**10%**	**11%**	**12%**	**12%**	**1,7**	**2,8**	**4,7**	**8,6**	**16,0**	**29,3**
Bike/Scooter	**0,2**	**0,3**	**0,5**	**0,8**	**1,5**	**2,7**	**20%**	**18%**	**15%**	**14%**	**11%**	**10%**	**0,3**	**0,4**	**0,5**	**0,8**	**1,0**	**1,4**
Americas	0,0	0,0	0,1	0,2	0,3	0,7	23%	21%	19%	17%	15%	13%	0,0	0,1	0,1	0,2	0,3	0,5
EMEA	0,1	0,2	0,3	0,4	0,7	1,1	23%	21%	19%	17%	15%	13%	0,2	0,3	0,4	0,5	0,6	0,8
APAC	0,0	0,1	0,1	0,2	0,5	0,9	10%	8%	5%	5%	3%	3%	0,0	0,0	0,0	0,1	0,1	0,2
Smart Meters	**0,3**	**0,4**	**0,6**	**0,9**	**1,2**	**1,8**	**19%**	**18%**	**17%**	**15%**	**14%**	**14%**	**0,6**	**0,6**	**0,8**	**0,9**	**1,1**	**1,4**
Americas	0,1	0,1	0,2	0,2	0,3	0,4	20%	20%	20%	20%	20%	20%	0,2	0,2	0,2	0,3	0,3	0,4
EMEA	0,1	0,1	0,2	0,3	0,5	0,7	20%	20%	20%	20%	20%	20%	0,2	0,3	0,3	0,4	0,6	0,8
APAC	0,1	0,1	0,2	0,3	0,5	0,7	17%	14%	11%	8%	5%	5%	0,2	0,2	0,2	0,2	0,1	0,2
Asset Tracking	**0,4**	**0,8**	**1,6**	**3,2**	**6,4**	**12,9**	**8%**	**8%**	**8%**	**9%**	**9%**	**10%**	**0,3**	**0,5**	**1,0**	**1,9**	**3,7**	**6,8**
Americas	0,1	0,2	0,4	0,8	1,6	3,2	10%	12%	14%	16%	18%	19%	0,1	0,2	0,4	0,9	1,8	3,4
EMEA	0,1	0,2	0,4	0,7	1,4	2,8	5%	8%	11%	14%	17%	20%	0,0	0,1	0,3	0,7	1,5	3,1
APAC	0,2	0,4	0,8	1,7	3,4	6,9	8%	6%	4%	3%	2%	1%	0,2	0,2	0,2	0,3	0,4	0,4
LP Asset Tracking	**0,4**	**0,8**	**1,8**	**3,8**	**8,1**	**17,3**	**8%**	**8%**	**8%**	**9%**	**10%**	**10%**	**0,3**	**0,6**	**1,1**	**2,3**	**4,8**	**9,5**
Americas	0,1	0,2	0,5	1,0	2,1	4,4	10%	12%	14%	16%	18%	19%	0,1	0,2	0,5	1,0	2,3	4,6
EMEA	0,1	0,2	0,4	0,9	1,9	4,0	5%	8%	11%	14%	17%	20%	0,0	0,1	0,4	0,9	2,0	4,4
APAC	0,2	0,4	0,9	1,9	4,1	8,8	8%	6%	4%	3%	2%	1%	0,2	0,2	0,3	0,4	0,5	0,5
Fleet Management	**0,1**	**0,2**	**0,3**	**0,5**	**0,9**	**1,4**	**6%**	**9%**	**11%**	**13%**	**16%**	**17%**	**0,1**	**0,1**	**0,3**	**0,5**	**0,8**	**1,3**
Americas	0,0	0,0	0,1	0,1	0,2	0,3	7%	11%	15%	19%	23%	25%	0,0	0,0	0,1	0,1	0,3	0,4
EMEA	0,1	0,1	0,1	0,2	0,3	0,6	7%	11%	15%	19%	23%	25%	0,0	0,1	0,1	0,3	0,5	0,8
APAC	0,1	0,1	0,1	0,2	0,3	0,6	5%	5%	5%	5%	5%	5%	0,0	0,0	0,0	0,1	0,1	0,2
Insurance Telematics	**0,3**	**0,6**	**1,2**	**2,4**	**4,7**	**9,5**	**6%**	**9%**	**11%**	**14%**	**16%**	**17%**	**0,2**	**0,5**	**1,0**	**2,2**	**4,7**	**9,0**
Americas	0,1	0,2	0,3	0,6	1,2	2,2	7%	11%	15%	19%	23%	25%	0,1	0,2	0,4	0,8	1,7	3,0
EMEA	0,1	0,2	0,4	0,9	1,8	3,6	7%	11%	15%	19%	23%	25%	0,1	0,2	0,5	1,1	2,5	5,0
APAC	0,1	0,2	0,4	0,9	1,8	3,6	5%	5%	5%	5%	5%	5%	0,0	0,1	0,2	0,3	0,5	1,0
Cat-M1 + 4G	**15,7**	**19,0**	**23,1**	**28,1**	**34,3**	**41,8**	**7%**	**7%**	**7%**	**8%**	**8%**	**8%**	**18,7**	**19,8**	**21,1**	**24,2**	**27,6**	**30,9**
Connected Health	**3,3**	**4,3**	**5,6**	**7,3**	**9,5**	**12,4**	**0,05**	**0,05**	**0,05**	**0,05**	**0,05**	**0,05**	**2,7**	**3,1**	**3,5**	**4,1**	**4,8**	**5,7**
Americas	1,1	1,4	1,9	2,4	3,2	4,1	5%	5%	5%	5%	5%	5%	0,9	1,0	1,2	1,4	1,6	1,9
EMEA	1,1	1,4	1,9	2,4	3,2	4,1	5%	5%	5%	5%	5%	5%	0,9	1,0	1,2	1,4	1,6	1,9
APAC	1,1	1,4	1,9	2,4	3,2	4,1	5%	5%	5%	5%	5%	5%	0,9	1,0	1,2	1,4	1,6	1,9
Asset Tracking	**2,4**	**2,9**	**3,4**	**4,1**	**4,8**	**5,8**	**8%**	**8%**	**8%**	**9%**	**9%**	**10%**	**3,1**	**3,2**	**3,4**	**3,9**	**4,5**	**5,1**
Americas	0,6	0,7	0,9	1,0	1,3	1,5	10%	12%	14%	16%	18%	20%	1,0	1,2	1,5	1,9	2,3	2,8
EMEA	0,5	0,6	0,7	0,8	1,0	1,2	5%	8%	11%	14%	17%	19%	0,4	0,7	1,0	1,3	1,7	2,0
APAC	1,3	1,5	1,8	2,2	2,6	3,1	8%	6%	4%	3%	2%	1%	1,7	1,3	0,9	0,7	0,5	0,3
LP Asset Tracking	**9,9**	**11,8**	**14,0**	**16,6**	**19,7**	**23,4**	**8%**	**8%**	**8%**	**8%**	**9%**	**9%**	**12,7**	**13,2**	**13,8**	**15,7**	**17,8**	**19,7**
Americas	2,5	2,9	3,5	4,1	4,8	5,7	10%	12%	14%	16%	18%	20%	4,0	5,0	6,1	7,4	8,8	10,4
EMEA	2,0	2,4	2,8	3,3	3,9	4,7	5%	8%	11%	14%	17%	19%	1,6	2,7	3,9	5,2	6,8	8,1
APAC	5,4	6,4	7,7	9,2	11,0	13,1	8%	6%	4%	3%	2%	1%	7,0	5,5	3,9	3,1	2,2	1,2
Agriculture	**0,1**	**0,1**	**0,1**	**0,1**	**0,2**	**0,2**	**27%**	**25%**	**23%**	**22%**	**22%**	**23%**	**0,3**	**0,3**	**0,3**	**0,4**	**0,4**	**0,5**
Americas	0,0	0,0	0,0	0,0	0,1	0,1	40%	40%	40%	40%	40%	40%	0,1	0,1	0,1	0,2	0,2	0,3
EMEA	0,0	0,0	0,0	0,0	0,1	0,1	25%	25%	25%	25%	25%	25%	0,1	0,1	0,1	0,1	0,1	0,2
APAC	0,0	0,0	0,1	0,1	0,1	0,1	25%	20%	15%	10%	5%	3%	0,2	0,1	0,1	0,1	0,0	0,0
Total Cellular	**76,0**	**86,2**	**97,8**	**112,2**	**130,9**	**165,6**	**17%**	**16%**	**15%**	**14%**	**13%**	**13%**	**109,7**	**108,2**	**105,5**	**111,1**	**119,7**	**137,7**
Americas	22,1	24,3	27,1	30,4	34,7	42,9	18%	18%	17%	17%	17%	17%	36,5	37,4	39,0	42,7	48,0	56,4
EMEA	23,9	26,7	29,6	33,7	38,5	47,8	20%	19%	19%	19%	19%	19%	38,4	40,0	41,8	46,7	53,2	63,5
APAC	30,1	35,2	41,1	48,1	57,7	74,9	11%	10%	7%	6%	4%	4%	34,8	30,8	24,8	21,7	18,4	17,8

Source: GSA GNSS Market report 2019, Team analysis

Appendix 6 - Revenue forecast

Revenue Forecast	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Total GNSS	**237,66**	**245,18**	**246,85**	**262,69**	**300,09**	**342,09**	**372,69**
Americas	73,02	78,39	80,17	87,98	101,66	117,07	130,07
EMEA	79,30	84,10	86,29	94,75	108,92	125,04	139,04
APAC	85,34	82,69	80,40	79,96	89,51	99,99	103,57
Total Cellular	**114,81**	**109,74**	**108,16**	**105,53**	**111,11**	**119,67**	**137,68**
Americas	37,05	36,53	37,38	38,95	42,68	48,00	56,37
EMEA	39,87	38,41	40,01	41,83	46,73	53,23	63,52
APAC	37,89	34,80	30,77	24,75	21,70	18,43	17,79
GNSS + Cellular	***352,46***	***354,92***	***355,01***	***368,22***	***411,20***	***461,76***	***510,37***
Americas	110,07	114,92	117,55	126,93	144,34	165,07	186,44
EMEA	119,17	122,51	126,30	136,58	155,65	178,27	202,56
APAC	123,23	117,49	111,17	104,71	111,21	118,42	121,36
Revenue	**385,51**	**379,38**	**380,66**	**395,16**	**439,78**	**492,59**	**546,45**
Short Range	**33,04**	**24,47**	**25,65**	**26,93**	**28,58**	**30,83**	**36,09**
ASP	7,54	7,17	6,63	6,13	5,67	5,25	4,85
# modules	4,38	3,41	3,87	4,39	5,04	5,88	7,44
Cellular Growth Rate			0,13	0,14	0,15	0,17	0,27
Other Revenue	7,79	5,72	6,66	6,92	7,70	8,62	9,56
Total Revenue	**393,30**	**385,10**	**387,32**	**402,07**	**447,48**	**501,21**	**556,02**
		-2%	1%	4%	11%	12%	11%

Source: GSA GNSS Market report 2019, Team analysis