

STATUS OF THE MEMORY INDUSTRY 2020

Market & Technology Report - July 2020

The entrance of Chinese players and the rise of new technical solutions are poised to trigger profound changes in the memory business.

WHAT'S NEW

- Analysis of COVID-19's impact on the stand-alone memory market: effect on demand, bit shipments, and CAPEX
- Updated market forecast (2019 - 2025) for NAND and DRAM markets, considering COVID-19's effect and the entrance of new players from China
- Overview of the NOR memory business: players, growth drivers, density-dependent applications, market share, ASP, revenue, and more
- Updated financial analysis of leading IDM companies – including Samsung, SK hynix, Kioxia, Western Digital, Micron, and Intel
- Updated list of Chinese memory players and detailed presentation of their activities in the DRAM, NAND, NOR, and emerging NVM businesses

KEY FEATURES

- Summary of the stand-alone memory market and related technologies, including NAND, DRAM, persistent memory, NOR, (NV)SRAM, emerging NVM, and more
- Description of technical trends and challenges, scaling roadmaps, and overview of main players for stand-alone memory technologies
- Breakdown of the memory market from a system point of view, detailing present and future memory needs for servers, smartphones, personal computers, enterprise/client SSDs, and vehicles
- Profile of the most important end-markets for stand-alone memory, i.e. datacenters, mobile, automotive, PC, and consumer electronics
- Presentation of packaging solutions for memory devices, and description of emerging packaging technologies and market trends
- Overview of embedded memory technology and progress towards in-memory computing applications
- Mapping of the stand-alone memory supply chain, analysis of recent M&A and joint ventures, list of noteworthy news, and company announcements in 2019 - 2020

IN 2020 NAND AND DRAM WILL DRIVE NEW GROWTH IN THE STAND-ALONE MEMORY MARKET, DESPITE THE COVID-19 PANDEMIC

Driven by important megatrends such as mobility, cloud computing, artificial intelligence (AI), and the Internet of Things (IoT), the stand-alone memory market has experienced extraordinary growth over the past decade. However, this exciting growth period ended in Q4-2018 when both the NAND and DRAM markets started experiencing oversupply caused by weak demand. This included lower-than-expected smartphone sales and a slowdown in datacenter demand. Inventory levels increased for memory suppliers and their OEM customers, with average selling prices (\$/Gb) declining by more than 40% in 2019. Meanwhile, combined DRAM and NAND revenue reached ~\$106B, down 34% from 2018. In 2019, significant DRAM and NAND capex cuts initiated a market recovery that began in late-2019, and which has continued in 2020. Despite the COVID-19 outbreak – which negatively impacted the smartphone and automotive markets, but spurred demand for server and PC memory for stay-at-home activities – 2020 is expected to be a year of recovery and the beginning of a new era of prosperity for the memory industry.

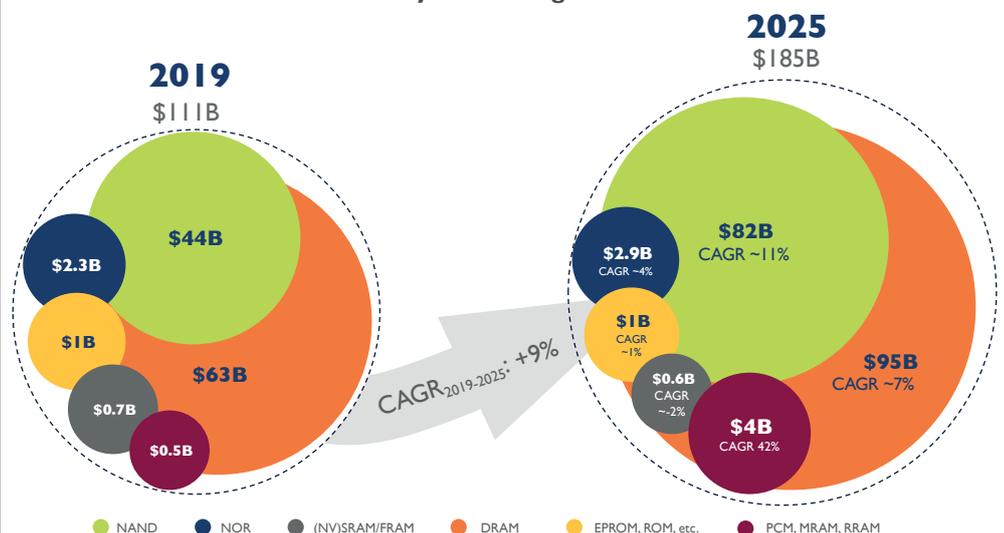
NAND and DRAM are ubiquitous technologies, together accounting for 96% of the overall stand-alone memory market. Thus, they have considerable influence over the memory

industry's overall status and dynamics. However, besides NAND and DRAM, there exists a broad spectrum of technologies that fit the requirements of different end-systems and markets. NOR flash is the third-largest market (~\$2.3B in 2019), fueled by numerous applications including industry and security (e.g. surveillance cameras), consumer and automotive electronics, as well as telecom infrastructure (e.g. 5G base stations). Despite some seasonality and cyclicity, NOR revenue is expected to grow at a CAGR₂₀₁₉₋₂₀₂₅ of 4%.

Other technologies, such as volatile and non-volatile (NV) SRAM, ferroelectric RAM (FRAM), and EEPROM represent “niche” markets that are rather static and collectively account for just ~1.5% of the stand-alone memory market.

On the other hand, emerging non-volatile memory (NVM) technologies – e.g. MRAM, PCM, and RRAM – are taking off in the storage-class memory (SCM) market. Their combined revenue is expected to reach around ~\$4B by 2025, with a CAGR₂₀₁₉₋₂₀₂₅ of over 40%. In this area, PCM (3D XPoint) will maintain its leadership until 2025 thanks to the involvement of Intel, which leads the persistent memory business with its Optane™ non-volatile memory modules.

2019 – 2025 stand-alone memory market revenue forecast with breakdown by technologies



THE ENTRANCE OF NEW PLAYERS FROM CHINA IS POISED TO CHANGE THE MEMORY MARKET LANDSCAPE

Market concentration has accelerated dramatically in the last decade and is now remarkably high. Three dominant NAND and DRAM players – namely Samsung, Micron, and SK hynix – and two pure NAND players, Kioxia and Western Digital, together hold ~90% of the stand-alone memory market. In 2019, all major NAND manufacturers were developing the new 1xxL generation and ramping-up production of 92/96L 3D NAND. However, to mitigate the oversupply situation, most manufacturers chose to slow their ramping of 92/96L, and many products launched in 2019 were still based on 64L 3D NAND. In the DRAM business, market equilibrium was sought

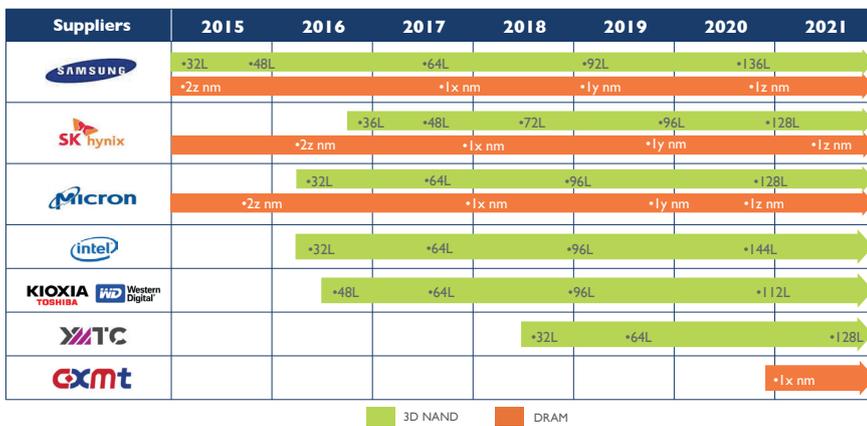
via significant capital expenditure cuts in 2019 (25% - 30%) – and as late as Q3-19, plans existed at suppliers to reduce capital expenditure by as much again in 2020. Both Micron and Samsung are expected to introduce products based on 1z technology by 2020; SK hynix will follow.

Meanwhile, Chinese players are starting to threaten the market's equilibrium and could trigger profound changes in the memory business. In the NAND business, Yangtze Memory Technologies Co. (YMTC) is the leading memory maker in China. The company is currently shipping 64L NAND domestically in low volumes (including SSDs), with 128L production in development and shipments expected in 2021. YMTC's 2020 ramp-up has been in part hampered by COVID-19, with delays in equipment deliveries/installations at its Wuhan manufacturing site.

In comparison, Chinese DRAM is still in the technology development phase. DRAM manufacturing is incredibly difficult, and it will likely take a while longer for China to achieve competitive parity with the industry at-large. Changxin Memory Technologies (CXMT), China's most advanced DRAM maker, is expected to ramp up production on the 1xnm node in 2020.

For NAND, we expect that significant output (~4%) from YMTC could reach the market in 2021, while it will take longer for DRAM. Meanwhile, stand-alone NOR flash will remain the sturdiest memory business in China thanks to a well-developed local supply-chain system and the activities of GigaDevice, a key local player.

3D NAND & DRAM: timeline and time-to-market of technology generation by key players



(Yole Développement, July 2020)

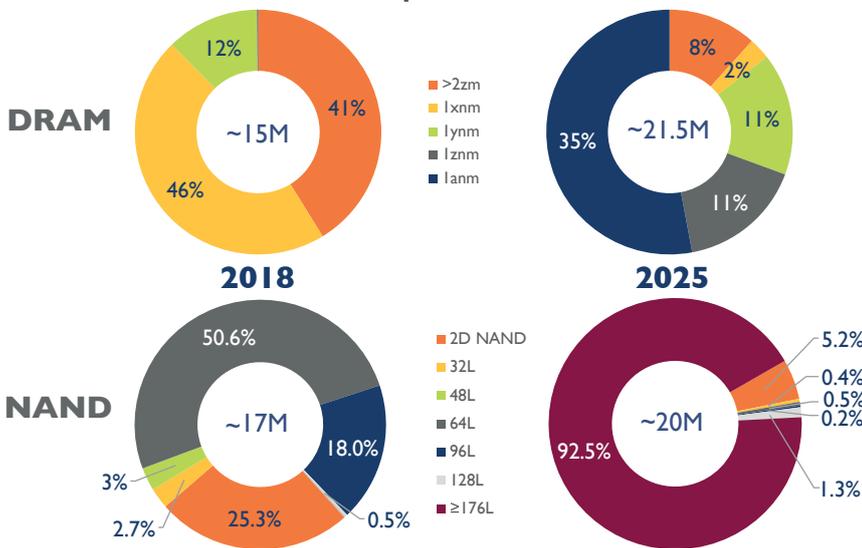
TECHNOLOGY-NODE MIGRATION IS BECOMING INCREASINGLY DIFFICULT AND EXPENSIVE

NAND and DRAM scalability was supposed to peak in 2020, but memory manufacturers and equipment

players have found new solutions to exceed this limit. New manufacturing techniques include self-aligned multiple patterning, extreme ultra-violet (EUV) lithography and metrology, as well as high aspect ratio (HAR) etching to produce contact holes in 3D NAND devices. Novel advanced packaging methods for heterogeneous integration, i.e. 3D stacking and 2.5D silicon interposer, enable high-bandwidth memory (HBM) for fast data transfer between computing units (CPU/GPU) and DRAM.

All these singular technical solutions create new opportunities for the semiconductor industry to increase bit density in next-generation memory devices, improve their bandwidth, and reduce their power consumption and cost-per-bit. However, with each technology generation, bit growth is becoming significantly more expensive. For instance, multi-patterning requirements in DRAM are increasing with each node migration, resulting in additional processing steps and therefore more cleanroom space per wafer produced. As DRAM shrinks and defect probability augments, DRAM manufacturers are evaluating the idea of switching

DRAM & NAND process mix evolution in 300mm wafer units production



(Yole Développement, July 2020)

from self-aligned multiple patterning to EUV lithography. Noteworthy, Samsung recently announced the shipment of one million DDR4 DRAM modules that were manufactured using the EUV technology at the 1x node.

Leveraging our comprehensive expertise in memory technologies and related markets, Yole introduces the second edition of its Status

of the Memory Industry report. This report seeks to provide the broadest overview of the stand-alone memory market and its competitive landscape, detailing technical challenges, opportunities, and trends in the field of stand-alone memory, including NAND, DRAM, NOR, (NV)SRAM, emerging NVM, and much more.

COMPANIES CITED IN THE REPORT (non exhaustive list)

4DS, Adata, Adesto, Advantest, Alliance Memory, AP Memory, Apacer, Apple, Applied Materials, ASE Tech. Hold., ASML, Avalanche, Buffalo, Canon, Centon, CXMT, Cisco, CNE, Crocus, Crossbar, Cypress, Dell, Dosilicon, Etron, ESMT, Everspin, Facebook, Ferroelectric Memory Company, Fidelix, Freescale, Fudan Microelectronics, Fujitsu, Fusion IO, GigaDevice, GlobalFoundries, Google, GSI Technology, H-Grace, Hikstor, Hitachi, HLMC, Honeywell, HP, Huawei, IBM, IDT, Imec, Infineon, Intel, ISSI, JHICC, Kingston, KLA Tencor, Lam Research, Lapis, Lenovo, Longsys, Liteon, Lyontek, Macronix, Marvell, Maxio, Maxim, Materion, Mediatek, Microchip, Micron, Montage Technology, Nantero, Nanya, Naura, Nikon, NEC, NetApp, NetList, Numonyx, NXP, ON Semiconductors, Panasonic, Phison, Powerchip, Powertech, ProMOS Technologies, Qualcomm, Rambus, Reliance, Realtek, Renesas, Rohm, Samsung, Sandisk, Seagate, Semtech, Silicon Motion, SK hynix, SK Materials, Smart Modular Technologies, SMIC, Sony, SPIL, SST, Spin Memory, STMicroelectronics, STEC, Swissbit, TDK, Texas Instruments, Tezzaron, TEL, Teledyne e2v, Toshiba, TowerJazz, TPSCo, Transcend, Tsinghua Unigroup, TSMC, UMC, UnilC Semiconductors, Unimos Microelectronics, Viking, Violin Memory, Weebit, Western Digital, Winbond, X-Fab, XMC, YMTC, new Chinese emerging NVM players, and many more.

TABLE OF CONTENTS (complete content on i-micronews.com)

Glossary and definitions	2	> Persistent memory	
Table of contents	10	> Other stand-alone memory	
Report objectives	11	Memory Players and Supply Chain	202
Report scope	12	> Memory players – financial analysis	
Report methodology	13	> Supply chain	
About the authors	14	> Merger and acquisitions, and new companies	
Companies cited in this report	17	Memory packaging	251
Comparison with the 2019 report	18	China’s memory landscape	267
Who should be interested in this report?	19	NAND – market forecast	297
Yole Group’s related reports	20	<i>Revenue, market share, ASP, shipments & demand, CAPEX, and more</i>	
Three-slide summary	22	DRAM – market forecast	307
Executive summary	26	<i>Revenue, market share, ASP, shipments & demand, CAPEX, and more</i>	
COVID-19’s impact on the memory market	67	Emerging NVM technology, forecast, and players	316
Memory Markets – Drivers and Dynamics	76	<i>Technology description, challenges, roadmap, forecast, main trends, and more</i>	
> Datacenters		Embedded memory business – overview	341
> Mobile devices		General conclusions	357
> Automotive		Noteworthy news	361
> PC and consumer electronics		How to use our data?	370
Stand-Alone Memory Market and Technology	125	Yole Développement’s presentation	371
> NAND market and technology			
> DRAM market and technology			

RELATED REPORTS, MONITORS & TRACKS



- NAND and DRAM Quarterly Market Monitors
- MRAM Technology and Business 2019
- YMTC’s 3D-NAND Flash Memory – by System Plus Consulting
- LPDDR4 Memory Comparison 2019 – by System Plus Consulting
- Samsung 3D V-NAND 92-Layer Memory – by System Plus Consulting

More information and details about our offers and bundles opportunities on www.i-micronews.com

REPORT OBJECTIVES

Provide an understanding of stand-alone memory technologies and applications:

- Roadmaps with technology nodes, product development status, chip density, scaling challenges, and potential solutions
- Memory content evolution in key systems: servers, smartphones, personal computers, vehicles, enterprise, and client SSDs
- Main memory end-markets: datacenter, mobile, automotive, PC, and consumer electronics

Offer market forecasts for the stand-alone memory business:

- Market forecast (2019 - 2025) for NOR, (NV)SRAM, and other technologies including PCM, MRAM, and RRAM
- Market forecast (2019 - 2025) for NAND and DRAM, with details on capex by players, price per bit, market share, bit demand, bit shipments, wafer production, and more.

Detail and analyze the competitive landscape:

- Financial analysis: key memory companies’ revenue, capex, R&D, operating costs, and margins
- Recent mergers and acquisitions, start-up funding, and latest company news



AUTHOR

Simone Bertolazzi, PhD is a Technology & Market analyst at Yole Développement (Yole) working with the Semiconductor & Software division. He is member of the Yole’s memory team and he contributes on a day-to-day basis to the analysis of nonvolatile memory technologies, their related materials and fabrication processes. Previously, Simone carried out experimental research in the field of nanoscience and nanotechnology, focusing on emerging semiconducting materials and their opto-electronic device applications. He (co-) authored several papers in high-impact scientific journals and was awarded the prestigious Marie Curie Intra-European Fellowship. Simone obtained a PhD in physics in 2015 from École Polytechnique Fédérale de Lausanne (Switzerland), where he developed novel flash memory cells based on heterostructures of two-dimensional materials and high-k dielectrics. Simone earned a double M. A. Sc. degree from Polytechnique de Montréal (Canada) and Politecnico di Milano (Italy), graduating cum laude.

CONTACT



Western US & Canada

Steve Laferriere - steve.laferriere@yole.fr
+1 310 600-8267

Eastern US & Canada

Chris Youman – chris.youman@yole.fr
+1 919 607 9839

Europe and RoW

Lizzie Levenez – lizzie.levenez@yole.fr
+49 15 123 544 182

Benelux, UK & Spain

Marine Wybraniez - marine.wybraniez@yole.fr
+49 69 96 21 76 78

India and RoA

Takashi Onozawa – takashi.onozawa@yole.fr
+81-80-4371-4887

Korea

Peter Ok - peter.ok@yole.fr
+82 1040890233

Japan

Miho Ohtake – miho.ohtake@yole.fr
+81 34405-9204

Toru Hosaka – toru.hosaka@yole.fr
+81 90 1775 3866

Japan and Singapore

Itsuyo Oshiba – itsuyo.oshiba@yole.fr
+81-80-3577-3042

Greater China

Mavis Wang – mavis.wang@yole.fr
+886 979336809 +86 136 61566824

Sales Coordination & Customers Service

David Jourdan – david.jourdan@yole.fr
+33 472 83 01 90

Fayçal El Khamassi – faycal.khamassi@yole.fr
+33 472 83 01 95

ABOUT YOLE DEVELOPPEMENT

Founded in 1998, Yole Développement (Yole) has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services, reverse engineering and reverse costing services. With a strong focus on emerging applications using silicon and/or micro manufacturing, the Yole group of companies has expanded to include more than 120 collaborators worldwide covering MEMS and Image Sensors, Compound Semiconductors, RF Electronics, Solid-state Lighting, Displays, Software, Optoelectronics, Microfluidics & Medical, Advanced Packaging, Manufacturing, Power Electronics, Batteries & Energy Management and Memory.

The “More than Moore” market research, technology and strategy consulting company Yole Développement, along with its partners System Plus Consulting, PISEO and Blumorpho, supports industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to grow their business.

CONSULTING AND ANALYSIS

- Market data & research, marketing analysis
- Technology analysis
- Strategy consulting
- Reverse engineering & costing
- Design and characterization of innovative optical systems
- Financial services (due diligence, M&A)

More information on www.yole.fr

MEDIA & EVENTS

- i-Micronews.com website, application & related e-newsletter
- Communication & webcast services
- Events: TechDays, forums...

More information on www.i-Micronews.com

REPORTS & MONITORS

- Market & technology reports
- Market and reverse technology quarterly monitors
- Structure, process and cost analysis and teardowns
- Cost simulation tool

More information on www.i-micronews.com/reports

CONTACTS

For more information about :

- Consulting & Financial Services: Jean-Christophe Eloy (eloy@yole.fr)
- Reports & Monitors: David Jourdan (david.jourdan@yole.fr) & Fayçal Khamassi (faycal.khamassi@yole.fr)
- Marketing & Communication: Camille Veyrier (camille.veyrier@yole.fr)
- Public Relations: Sandrine Leroy (sandrine.leroy@yole.fr)

Definitions: **“Acceptance”**: Action by which the Buyer accepts these General Terms and Conditions of Sale in their entirety. It is done by signing the purchase order which states “I hereby accept Yole Développement’s General Terms and Conditions of Sale”.

“Buyer”: Any business user (i.e. any person acting in the course of its business activities for its business needs) placing an order pursuant to these General Terms and Conditions of Sale, with the exclusion of any individual consumer acting for his/her sole personal interest.

“Seller”: Headquartered in Villeurbanne (France), Yole Développement provides marketing, technology and strategy consulting, media and corporate finance services, reverse engineering/costing services as well as IP and patent analysis. With dedicated teams of technology & market analysts, Yole Développement operates worldwide with the key industrial companies, R&D institutes and investors to help them understand the market and technology trends.

“Contracting Parties” or **“Parties”**: The Seller on the one hand and the Buyer on the other hand.

“Intellectual Property Rights” (“IPR”) means any rights held by the Seller in its Products, including any patents, trademarks, registered models, designs, copyrights, inventions, commercial secrets and know-how, technical information, company or trading names and any other intellectual property rights or similar in any part of the world, notwithstanding the fact that they have been registered or not and including any pending registration of one of the above mentioned rights.

“Products”

Our products can be bought either on a unit basis or as a bundled offer (i.e. subscription for a period of 12 calendar months).

“Report”

Reports are established in PowerPoint and delivered in a PDF format with an additional Excel file. 30 min of Q&A session with an analyst/author can be included for all purchased reports (except the ones bought as a one user license). More time can be allocated on a fee basis.

“Monitor”

Monitors are established and delivered in Excel. An additional PDF can also be added. Q&A with an Analyst is possible for each monitor (except where specified otherwise). Frequency of the release vary according to the monitor or service (quarterly and monthly). All monitor products are eligible for a Corporate License.

“Tracks”

Yearly subscription to access a web-based interactive portal to view features and specs of a device or component based on a complete turnaround process.

“License”

For the reports 3 different licenses are proposed. Buyer has to choose one license type:

- One User License: The report is intended for only one identified user at the Company purchasing the report - Sharing is strictly forbidden
- Multi-User License: The report can be shared by an identified user at the Company purchasing the report with an unlimited number of employees of said Company, working in the country where the identified user is based. No rights are granted to any employees of any Subsidiaries or Joint Ventures of the Company.
- Corporate License: The report or monitor can be shared by an identified user of the Company purchasing the report with an unlimited number of employees of said Company on a global basis. Subsidiaries controlled by the Company are included, however Joint Ventures involving the Company are excluded.

DISCLAIMER: Notwithstanding the fact that certain persons within an organisation may be entitled to access a report pursuant to a Multi-User or a Corporate License, Yole Développement shall in no event incur any liability in any form whatsoever, if Yole Développement should sell one or more licenses directly to any such persons.

1. SCOPE

1.1 Both Contracting Parties undertake to comply with these General Terms and Conditions of Sale.

ANY ADDITIONAL, DIFFERENT, OR CONFLICTING TERMS AND CONDITIONS IN ANY OTHER DOCUMENTS ISSUED BY THE BUYER AT ANY TIME ARE HEREBY OBJECTED TO BY THE SELLER, ARE DEEMED WHOLLY INAPPLICABLE TO ANY SALE MADE HEREUNDER, AND SHALL NOT BE BINDING IN ANY WAY ON THE SELLER.

1.2 These General Terms and Conditions of Sale shall be deemed valid and enforceable between the Contracting Parties after acceptance of an order from the Buyer by the Seller pursuant to Article 1.3 below. For such purpose, the Buyer, when signing the purchase order which mentions “I hereby accept Yole Développement’s Terms and Conditions of Sale” is deemed to have fully and unequivocally accepted these Terms and Conditions of Sale.

1.3 Orders are deemed to be accepted only upon written acceptance and confirmation by the Seller, within [7 days] from the date of order, to be sent either by email. In the absence of any confirmation in writing, no order shall be deemed to have been accepted.

2. MAILING OF THE PRODUCTS

2.1 Products are sent by email to the Buyer after Seller’s confirmation:

- Within a few days from the Seller’s confirmation of the order for Products already released and paid; or
- Within a reasonable time for Products ordered prior to their effective release. In this case, the Seller shall use its best endeavours to inform the Buyer of an indicative release date and the evolution of the work in progress.

2.2 The Seller shall by no means be responsible for any delay pursuant to Article 2.1 above, in particular in cases where a new event or access to new contradictory information would require the Seller analyst to dedicate extra time to compute or compare the data in order to enable the Seller to deliver a high quality Product.

2.3 The mailing of the Product will occur only upon payment by the Buyer, in accordance with the conditions contained in Article 3 above.

2.4. The mailing is operated through electronic means either by email via the sales department or automatically online via an email/password. The Buyer is responsible for ensuring that the Buyers platform has the required capacities and authorisations to receive the Product(s) emailed by the Seller. If the Product’s electronic delivery format is defective, the Seller undertakes to replace it at no charge to the Buyer provided that the Seller is informed of the defective formatting within 90 days from the date of the original download or receipt of the Product.

2.5 The person receiving the Products on behalf of the Buyer shall immediately verify the quality of the Products and their conformity with the order. Any claim for apparent defects or for non-conformity shall be sent in writing to the Seller within 8 days of receipt of the Products. For this purpose, the Buyer agrees to produce sufficient evidence of such defects.

2.6 No return of Products shall be accepted without prior written notification from the Buyer to the Seller, even in case of delayed delivery. Any Product returned to the Seller without the Buyer providing prior notification to the Seller as required under Article 2.5 above shall remain at the Buyer’s risk. In no event shall the Seller incur any liability for Products erroneously ordered by the Buyer, or for any request from the Buyer to replace a Product previously ordered by a different Product.

3. PRICE, INVOICING AND PAYMENT

3.1 Prices are given in the orders corresponding to each Product sold on a unit basis or corresponding to annual subscriptions. They are deemed to be inclusive of all taxes applicable in the country where the Seller is based (except for France where VAT will be added). The prices are re-evaluated from time to time by the Seller. The effective price is deemed to be the one applicable at the time of the order.

3.2 Payments due by the Buyer shall be sent by cheque payable to Yole Développement, or made by credit card or by electronic transfer to the following account:

HSBC, 1 place de la Bourse 69002 Lyon France
Bank code: 30056
Branch code: 00170
Account n°: 0170 200 1565 87
BIC or SWIFT code: CCFRFRPP
IBAN: FR76 3005 6001 7001 7020 0156 587

To secure the payments due to the Seller, the Seller reserves the right to request down payments from the Buyer. In such case, the need for a down payment will be mentioned on the corresponding order.

3.3 Payment is due by the Buyer to the Seller within 30 days from invoice date, except as otherwise specifically agreed in writing by the Buyer and the Seller. If the Buyer fails to pay at the due date and fails to request and obtain from the Seller a payment extension, the latter shall be entitled to invoice interest in arrears based on the annual rate Refi of the “BCE” + 7 points, in accordance with article L.441-6 of the French Commercial Code.

3.4 The Seller publications (reports, monitors, tracks...) are due for delivery only after receipt by the Seller of any payment due by the Buyer prior to delivery.

3.5 In the event of termination of the contract by the Seller attributable to Buyer misconduct during the contract, the Seller will have the right to invoice all work performed at the time of termination, and to take legal action for damages.

4. LIABILITIES

4.1 The Buyer or any other individual or legal person acting on its behalf, being a business user buying the Products for its business activities, shall be solely responsible for the choice of the Products purchased as well as for the use and interpretations the Buyer makes of the documents it purchases, of the results the Buyer obtains, and of the advice and acts the Buyer bases thereon .

4.2 In no event shall the Seller be liable for:

- a) Damages of any kind, including without limitation, incidental or consequential damages (including, but not limited to, damages for loss of profits, business interruption and loss of programs or information) arising out of the use of a Product or the use of or the inability by the Buyer to use the Seller’s website, or any information provided on the website, or contained in a Product;
- b) Any claim attributable to errors, omissions or other inaccuracies in a Product or interpretations thereof.

4.3 All the information contained in the Products has been obtained from sources believed to be reliable. The Seller does not warrant the accuracy, completeness adequacy or reliability of such information, which cannot be guaranteed to be free from errors.

4.4 Any Product that the Seller sells may, upon prior notice to the Buyer from time to time be modified by Seller or substituted with a similar Product meeting the needs of the Buyer. Such modification shall not lead to any liability of the Seller, provided that the Seller ensures the substituted Product is similar to the Product initially ordered.

4.5 In the case where, after inspection, it is acknowledged that a Product contain defects, the Seller undertakes to replace the defective product to the extent reasonably feasible and without indemnification or compensation of any kind for labour costs, delays, loss caused or any other reason being due by the Buyer . This undertaking from the Seller shall be effective for a maximum of two months starting from the delivery date but shall not be applicable in the event of force majeure as described in Article 5 below.

4.6 The deadlines that the Seller is asked to provide for the mailing of a Product are given for information purposes only and are not guaranteed. If such deadlines are not met, this shall not, without the agreement of the Seller lead to any claim for damages or right of cancellation of one or more orders by the Buyer, except for non-acceptable delays exceeding [3] months from the stated deadline. In such case only i.e. only in the event of a delay exceeding (3) months from the stated deadline the Buyer shall be entitled to ask for a reimbursement of any down payment previously made to the Seller, to the exclusion of any other damages.

4.7 The Seller does not make any warranties, express or implied, including, without limitation, those of sale ability and fitness for a particular purpose, with respect to any Products. Although the Seller shall take reasonable steps to screen Products for infection of viruses, worms, Trojan horses or other codes containing contaminating or destructive properties before making Products available, the Seller cannot guarantee that any Product will be free from infection.

5. FORCE MAJEURE

The Seller shall not be liable for any delay in performance directly or indirectly caused by or resulting from acts of nature, fire, flood, accident, riot, war, government intervention, embargoes, strikes, labour difficulties, epidemics, major health event (e.g. Corona virus), equipment failure, late deliveries by suppliers or other difficulties which are beyond the control, and not attributable to the fault of the Seller.

6. PROTECTION OF THE SELLER’S IPR

6.1 All the IPR attached to the Products are and remain the property of the Seller and are protected under French and international copyright law and conventions.

6.2 The Buyer agreed not to disclose, copy, reproduce, redistribute, resell or publish a Product, or any part of it to any other party other than employees of the Buyer Company (and only in the country of the Primary User for Multi-User Licenses). The Buyer shall have the right to use Products solely for its own internal information purposes. In particular, the Buyer shall therefore not use any Product for purposes such as:

- Information storage and retrieval systems;
- Recordings and re-transmittals over any network (including any local area network);
- Use in any timesharing, service bureau, bulletin board or similar arrangement or public display;
- Posting any Product to any other online service (including bulletin boards or the Internet);
- Licensing, leasing, selling, offering for sale or assigning a Product or any derivative thereof.

6.3 If the Buyer would like to use data coming from a Product for presentations, press announcements and any other projects, the Buyer needs to contact Yole Développement’s Public Relations Director (info@yole.fr) to get an official authorization and confirm that the data are up to date. In return the Seller will make sure to provide up-to-date data under a suitable public format.

6.4 The Buyer shall be solely responsible towards the Seller for any infringement of the obligation described in Article 6.3 above, whether such infringement originates from the Buyer’s employees or any person to whom the Buyer has sent the Products. Furthermore, the Buyer shall initiate and personally take care of any related proceedings in coordination with the Seller, and the Buyer shall bear the related financial consequences in their entirety.

6.5 The Buyer shall define within its Company an identified user who shall serve as a contact person for the License purchased by the Buyer. This person will be the recipient of each new report. This person shall also be responsible on behalf of the Buyer, for compliance with all copyrights and other obligations relating to the protection of the Seller’s IP rights and general compliance with the terms of the License purchased by the Company. In the context of Bundle and Annual Subscriptions, the contact person shall decide within the Buyer which person(s) shall be entitled to receive the protected link that will allow the Buyer to access the Products.

6.6 It is acknowledged and accepted by the Buyer that whether purchased in the form of Bundles or Annual Subscription, all unselected reports will be deemed cancelled and lost after a period of 12 month following acceptance of the corresponding order by the Seller in accordance with provisions of Article 1.3 above .

6.7 It is further acknowledged and agreed by the Buyer that any investor in the Buyer Company, any external consultant of the Buyer Company or any joint venture done with a third party in which the Buyer Company is involved , is not entitled to use a Product, without paying to the Seller the full price for a license to the required Product..

7. TERMINATION

If the Buyer cancels the order in whole or in part or postpones the date of mailing, the Buyer shall indemnify the Seller for the entire costs that have been incurred as at the date of notification by the Buyer of such delay or cancellation. This may also apply for any other direct or indirect consequential loss that may be incurred by the Seller, pursuant to such cancellation or postponement.

8. MISCELLANEOUS

8.1 All the provisions of these General Terms and Conditions of Sale are for the benefit of the Seller, but also for that of its licensors, resellers and agents. Each of them is entitled to assert and enforce these provisions against the Buyer.

Any notices under these Terms and Conditions shall be given in writing and shall be effective upon receipt by the other Party.

8.2 The Seller may, from time to time, update these General Terms and Conditions of Sale, and the Buyer, shall be deemed to have accepted the latest version of such General Terms and Conditions of Sale, once they have been duly communicated to the Buyer by the Seller.

9. GOVERNING LAW AND JURISDICTION

9.1 Any dispute arising out or linked to these General Terms and Conditions of Sale or to any Licenses or Products purchased in application thereof shall be submitted to the French Commercial Court of Lyon, which shall have exclusive jurisdiction upon such issues.

9.2 French law (without reference to any applicable conflict of law provisions) shall apply to these General Terms and Conditions of sale and any agreement between the Buyer and the Seller made pursuant thereto.