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Mobile World Congress: State of the Industry 2018

March 2018

Preface

The 2018 edition of MWC - Creating a Better Future - comes at a time of hope for what 5G can bring amid a slump in revenues for major ecosystem players. Restructuring and consolidation are key undercurrents as the nature of business opportunities and networks change. Applications are at the forefront while network technology took a back seat. Virtualization is a fundamental transformation that's well underway: it is set to change competitive dynamics as past partners become competitors and vice versa. Technology evolution and the applications it enables will lead new players to rise to prominence while the stars of yesteryears fade. Artificial intelligence, edge computing, network slicing, and other technologies provide telcos an opportunity to monetize new services in both the consumer and enterprise segments. The OTTs who prevented telcos from monetizing additional consumer services have a head start and continue to move aggressively into the enterprise space. This makes it imperative for a transformation of telcos much as the vendor ecosystem is transforming. Herein lies a challenge that will shape the future of the industry.

The Xona Partners Team

Xona Partners at MWC, from left: Rolf Lumpe, Frank Rayal, Riad Hartani, Shervin Bakhtiari, Ananda Sen Gupta. Not pictured: Richard Jeffares, James Shanahan.

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Mobile World Congress 2018 Summary

As big as last year, but better!?

Ongoing consolidation in hardware is raising risk, while diversity in software solutions is raising buzz!

Operational efficiency is a key focus justified by pressure to improve financials: AI is set to play but progress could be hampered by scarcity of expertise.

The vertical players had a smaller presence at the events in comparison to previous years, while country pavilions have expanded with many featuring unique solutions to local markets that could potentially grow at a global scale

IoT hype dipped a notch over prior years as technologies have been validated and many networks were launched over 2017: the revenue challenge is now central.

Strong focus on the enterprise segment through different concepts and technologies like private networks and edge compute. However, this requires multiple elements to fall in place, particularly business models and regulatory frameworks.

Africa showed little presence at MWC18 even as it holds tremendous growth potential!

Artificial intelligence, while a major theme, remains at very early stage in telco. Very few in the ecosystem have the potential to leverage a very important tool that OTTs excelled at leveraging.

A Look Back at 2008

- **MWC Visitors:** 55,000 (‘18: 107,000)
- **MWC Exhibitors:** 1,300 (‘18: 2,400)
- **Market milestones:** 32 m HSPA global subscribers
- **Technology milestone:** LTE standard finalized in December 2008
- **Technology talk:** making peace between LTE and WiMAX
- **MWC Demos:** Ericsson demonstrated the world’s first end-to-end LTE call on handheld

The first commercial Android device, the HTC Dream, was released in 2008

The Industry Big Picture

Consolidation and transformation are headlines

Service providers are focused on operational efficiency are expected to hold capex steady with potential for small decline through 2020.

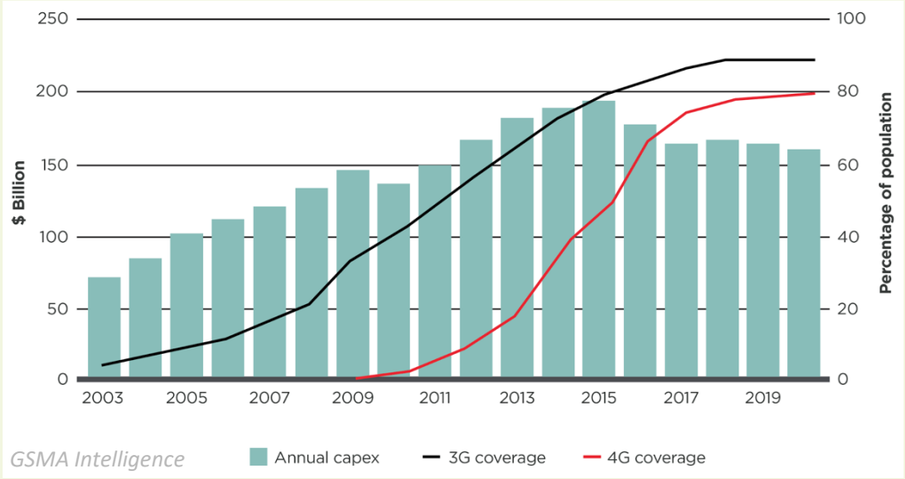
Investment activities center on: a. infrastructure upgrade, notably fiber networks for fixed access and mobile backhaul; and b. network virtualization, notably the core network and in support for IoT services.

Network equipment and silicon/component vendor ecosystems are highly consolidated and predatory pricing risks of furthering the damage. Trend of asset breakup and spin-out to emerge.

Majority of operators lack the power to respond to vendor consolidation. The few large ones could leverage new technologies and processes (e.g. virtualization, open source) but that requires a fundamental structural transformation.

Revenues from IoT remain low, < 1% for the vast majority of operators. Operators need to surpass connectivity to offer value added services and improve enterprise go-to-market strategy.

With consolidation of service providers held by regulatory force, a few are beginning to explore international expansion.



Connections by 2025:

- 5G: 1.22 B
- LTE: 5.47 B
- 3G: 1.36 B
- GSM: 800 m

GSMA

5G: Where's the Money?!

Operators questioned the business case, even in public!

Operators are uncertain how 5G will impact revenues and profitability as financials become tighter. Unlike US operators, KT declined to commit to deployment timelines.

3 Faces to 5G: fixed in the US, mobile broadband in Korea and Japan, IoT connectivity in China. Anticipate many marketing battles ahead on who really has 5G!

Fragmentation of 5G threatens technology adoption - a classic technology trap: fixed or mobile? Standalone or non-standalone? Sub 6 GHz or mmWave? Phase 1 or Phase 2?

Infrastructure 5G readiness, ease of upgradeability and commercial readiness were high on the vendors' agendas as they jockey for position.

Enhanced broadband use case remains prime driver for 5G: the success of massive and ultra reliable communications hinges on economy of scale driven by eMBB use case.

The stepped migration to 5G favors few major carriers as most operators will wait post 2020. Vendors will focus on few of the many profiles which raises risk if timelines slide.

5G IoT came onto the scene this year and was part of several debates. With 4G IoT deployed and revenue generation slow, 5G IoT will not help accelerating the market.

Technology gap widens as trials in Korea, Japan and the US proceed at faster pace than the rest of the world.

5G deployment timelines by US operators are far ahead of the rest of the industry. Consider spectrum and device availability on 5G launch: room for creative marketing!

Economic value of 5G:

eMBB: $910 B

Fixed Wireless: $90 - $110 B

Massive and critical MTC: $204 – $619 B

Ericsson

eMBB: Enhanced Mobile Broadband

Virtualization: A Competitive Necessity

Could virtualization hedge against vendor consolidations?

The transformation to virtualized networks is no longer an option to service providers: it is mandated for strategic competitive reasons both on the revenue and cost sides.

A technology gap is widening between the few leading operators and the rest who are yet to leverage the power of virtualization.

Leading operators need to harmonize: Verizon joining ONAP is a major step in the right direction - it helps to streamline open source initiatives.

The major vendors are set their RAN virtualization plans. 5G technology requirements will favor economics of hardware in the lower layers to the advantage of the deep-pocketed vendors.

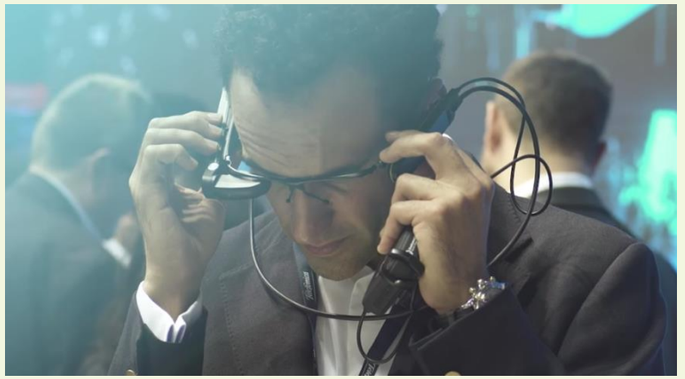
RAN slicing was on display in addition to core slicing. While this provides significant competitive advantage to secondary RAN vendors, few are capable of leveraging the technology.

Virtualization is fundamental to implement a number of technologies required to generate future revenues: edge computing, network slicing, IoT services.

The long-term impact of open source initiatives where large system integrators are missing is questionable: TIP is an example.

Operators are rethinking the OpenStack strategy as key requirements are missing.

M-CORD, TIP: examples of open source projects with participation by Google and Facebook.



Telefonica, Netsia, Ericsson and Huawei collaborate to demonstrate end-to-end network slicing.

M-CORD: Mobile Central Office Re-architected as Data Center
TIP: Telecom Infra Project

IoT: Seeking the Inflection Point

Technology bets in place; revenue is slow

The hype has worn off IoT as MNOs launched their LTE Cat-M and NB-IoT networks. Operators pick “trust” as key differentiator against the unlicensed-band LPWA ecosystem.

The shine has faded off LPWA, particularly off SigFox, while the LoRa ecosystem continues to expand despite slow but steady rise in deployments.

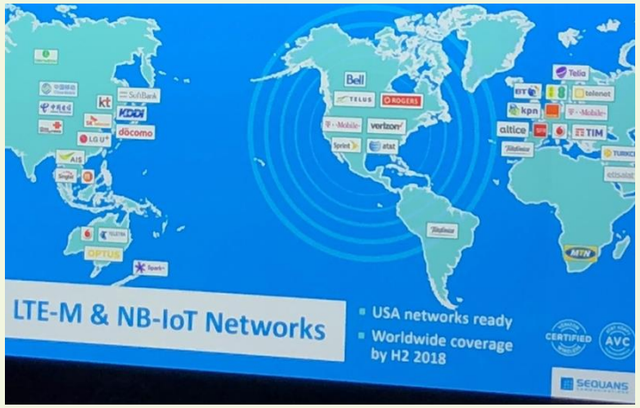
Operators remain fixated on connectivity and lack the initiative to provide added services where margins are high.

China making strides in IoT connecting >10 million devices / month. China is increasingly looking at 5G from IoT perspective.

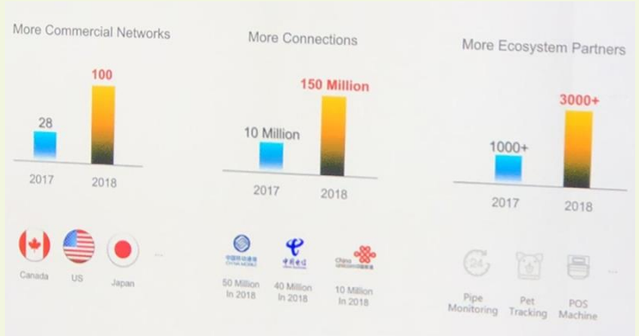
Vendors in process of re-aligning their IoT go-to-market strategy to new realities. Ecosystem, partnerships and integration are cornerstone in what promises to be a ‘profound’ transformation.

Two classes of operators has emerged: A few leaders who execute and many laggards who stop at planning!

Globally, IoT accounts for less than 0.5% of total operator revenue. However, a few leading operators broke through 1% giving hope that an inflection point is reached.



Sequans demonstrating traction of LTE-M and NB-IoT.



With 41 IoT network launches, 32 NB-IoT and 9 LTE-M, Huawei hoping for NB-IoT ‘Big Bang’ in 2018!

Artificial Intelligence: Planting Roots

Leveraging AI remains a challenge due to lack of expertise

AI garnering increased attention, particularly as a path to higher network efficiency and lower opex: “predictive analytics” and “deep learning” amongst the buzzwords.

Telcos are urged to develop solutions around voice recognition and counter services by OTT, such as Amazon Alexa.

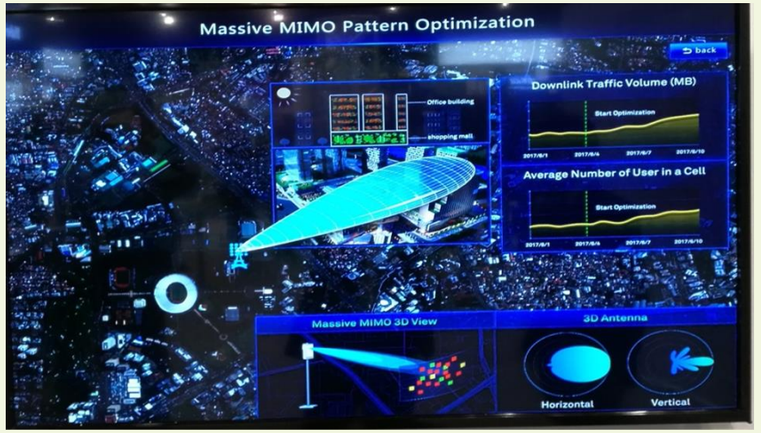
Talent scarcity: To truly benefit from AI, more expertise is required within many of the companies aiming at leveraging it.

Great disconnect between companies talking about AI and effectively implementing it – many lack the appropriate talent pools in house.

Telcos are split on monetizing big data particularly as new consumer privacy laws are enacted such as GDPR in Europe.

Video analytics featured as key AI application, yet it does not require cellular connectivity to leverage it!

We strong assert that the “AI + everything” story will not last: only the companies with strong AI teams will leverage its potential while most others will have to partner with specialized AI companies to achieve their goals.



Huawei introduced the Atlas platform to apply AI to network operations and the intent-driven networks (IDNs) concept that predicts traffic and SLA status based on real-time data,

iPhone X integrates a neural engine in the A11 to run machine learning algorithms.

Hardware acceleration for machine learning algorithms are now common on most high-end smartphones.

Edge Computing: Application Enabler

Augmented and virtual reality, industrial IoT, and gaming are few of the featured applications

Edge computing gaining mindshare by providing the opportunity to monetize new services (big pie), and to save operational expenses (small pie).

Competition for revenue is with web-scale OTTs experienced in building strong ecosystems and developer communities (e.g. AWS Greengrass, Microsoft Azure).

Telcos have not yet capitalized on proximity to end customer and naturally limited to national or regional operations. Infrastructure virtualization is mandatory.

A business model focusing on enterprise is necessary: Prior operator entry into data center space did not yield favorable results:

On-premise deployments of small cells and edge computing remains very limited although this could benefit from unlicensed and shared spectrum regimes.

Operators need to win the developer community with open interfaces and easy integration process. Very few operators are thinking on how to tackle this.

Edge computing becoming key for several vendors: Huawei already calls connectivity “our legacy business.”

Vasona demonstration of cloud gaming illustrates how operators can monetize edge computing

Edge computing evolving along different dimensions: technology, market, regulations, business models, etc.

No doubts on the benefits of edge computing: the challenge centers on business models.

Startups @4YFN: Harvesting Quality out of Quantity

Starting a venture is easy, scaling it is hard!

With hundreds of startups on premise from dozens of countries filtering potential winners from the rest is a daunting task. We believe the classic startup pitching model needs a radical shift.

Few technology-differentiated startups exist; the focus is on market segments and business differentiation. Scaling is the main challenge to tackle along with the required funding support.

The presence of different countries highlights the importance of technology as a foundation for social development. But heavy reliance on public funding could become counterproductive, favoring quantity over quality.

Bringing technology into mainstream industries is a slow process that requires different funding, innovation and M&A models. The existing incubation / acceleration models need a regional and industry specific adaptations.

The tech industry is driven mainly by the Internet and Cloud players. Players in different industry verticals have a challenge in integrating new technologies (Cloud, AI, data, etc.) with existing ones (transport, energy, etc.). In less regulated markets (e.g. Fintech in China) startups have a better chance to scale and compete against the industry giants.

Initial coin offerings (ICOs) are now the primary vehicle to fund fintech startups. ICOs accelerated in the second half of 2017 to raise over $4 billion. While many are set to fail it signals a new approach to crowdfunding.

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Cloud Players & Telcos: Coopetition!

Cloud players are gradually inserting themselves in the MNO value chain

Fewer OTTs than usual at MWC (and no keynotes!): Either they realized that they have won the battle or they don't care as much about connectivity?

Telcos recognize that they cannot challenge Cloud players on their own turf: telcos need to develop their own competitive advantage.

Operators view open source initiatives such as Facebook-led TIP, as a way to improve leverage over a consolidated vendor-base. But higher commitment is required: The few remaining vendors are brushing it off.

Cloud players are moving data centers closer to users and creating new services to leverage lower latency. Telcos falling behind as virtualization is key for cost effective edge computing.

Cloud players continue to insert themselves in the telecom value chain with little response from telcos. Amazon Alexa is but the latest of examples. Voice recognition is one of the applications telcos are urged to plan around.

GSMA chairman and Bharti CEO Sunil Mittal's call for a consortium approach to network buildout, the 'NetCo', is a direct recognition that the operators national and regional focus cannot match the economies of scale of the Internet giants.

BT CEO warns against going head-to-head with Netflix

Priorities of the Cloud players

- Reduce the cost of Internet access infrastructure to increase subscribers and traffic on their networks
- Use open source models, open networks and dynamic spectrum access to reduce cost
- Positioning as potential partners with telcos, but at the same time compete with them

Success of these initiatives will depend on the region. Regulators, mainly influenced by telcos, will push back on any rapid and significant change. The net neutrality ruling by the FCC in 2017 is an example.

Blockchains: Too Early?!

Really. Not a whole lot to report!

The GSMA inserted blockchains as a key theme this year: the ecosystem is largely unaware of the power, promise, threat and opportunity provided by this technology.

There was very little blockchains in comparison with expectations: either the industry is late getting into newer technologies, or is too smart not jumping in!

The power of blockchain is in enabling new business models that could make existing technologies viable: herein lies the threat to incumbents.

A few operators rely on their corporate VC arm to keep track of developments in blockchains; others made investments in select blockchain companies in adjacent fields such as IoT. We believe in an alternative more effective approach.

Blockchains, when discussed, were often tied to IoT application in the telco context, and particularly in the context of security.

Blockchains is a classic example of how technology moves ahead of regulations. Regulations will be prominent in the next two years as technology keeps on evolving quickly.

Blockchains enables decentralization of networks where parties have little or no trust in each other. It is a paradigm that removes bottlenecks introduced by centralized systems.

Blockchains are not a panacea as they are perceived by some. But they do provide a new solution in the toolset - one that cannot be ignored!

Key Notes!

Notable mentions...

Barcelona keeps building on its lead as a city for innovation around mobile and Internet technologies: Xona Partners is proud to be part of the 5GBarcelona initiative to validate 5G technology and bridge the Barcelona ecosystem with other technology hubs around the world.

FCC Chairman, Ajit Pai, calls for auction in the 28 GHz band in November, followed by one in the 24 GHz Band; FCC to look into 3.7-4.2 GHz.

Verizon selecting Samsung for 4G macrocells could have many further consequences as operators assert interoperability among incumbent vendors.

The merger of C-RAN and XRAN associations to form ORAN is good step to invigorate the radio access vendor ecosystem with new viable competitors, but operators must follow with active steps to support the ecosystem.

Based on the level of silicon readiness, consensus emerging that 5 devices won't be available until 2019. Cost, power consumption, and interoperability profiles are among leading hurdles to surpass.

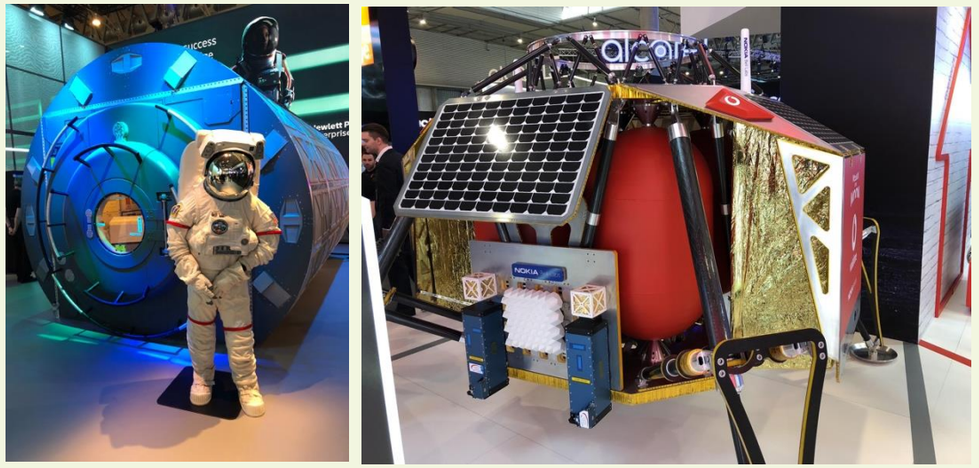
Not a lot said this year on LTE, unlike prior years where Gigabit LTE made headlines. It is the year everyone wanted to focus on 5G!

Barcelona's Open 5G Lab aims to demonstrate 5G applications in consumer and vertical markets: it solidifies Barcelona's claim as Mobile World Capital.

A race is brewing in the virtual RAN space as operators become more assertive on open interfaces and CBRS enables private networks. Dali Wireless presented a virtual fronthaul solution that positions to be indispensable in the evolution to 5G.

Other Mentions!

Forward looking: Under the banner of “Perfect 5G” SK Telecom presented one of the largest and best featured exhibit of carrier services!



A few moon-related themes and announcements made headlines!

Do we need another CES?
Many devices launched at MWC 2018, ranging from high-end Samsung Galaxy S9, to the 4G feature phone Nokia 1.

Bigger drones with every MWC!

Crowd magnet: Formula 1 at MWC!

Holograms, VR, AR made a good presence.

About Xona Partners

Boutique Advisory Firm Specialized in Developing New Technology Ventures & Growth Strategies

Private Equity & Venture Funds

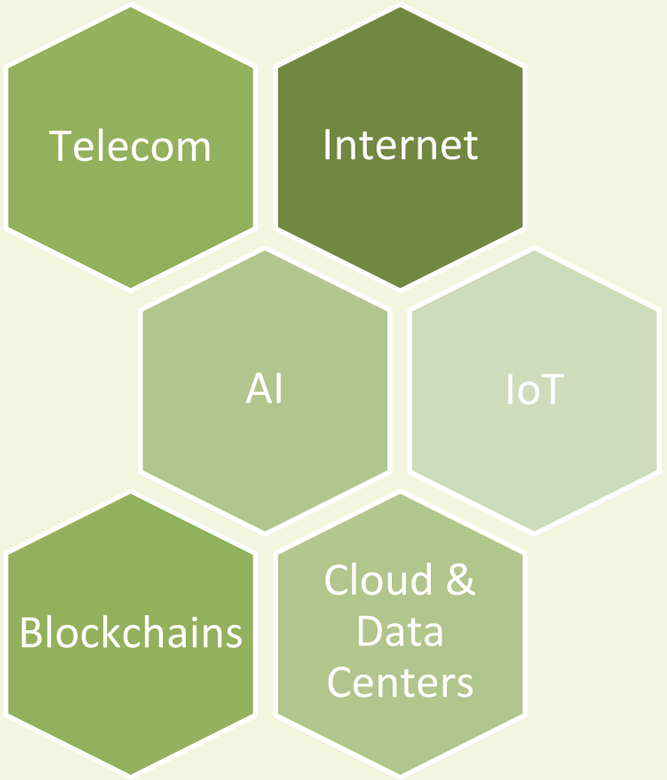
- M&A due diligence; competitive analysis & market positioning

Technology Corporations

- Develop new business ventures from concept validation to implementation

Governments, Regulatory & Policy Makers

- Market & technology assessment for policy decisions



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Meet Us Next at These Events

Xona Partners will be in London on May 22-23 at **TMT Finance M&A 2018 Forum**

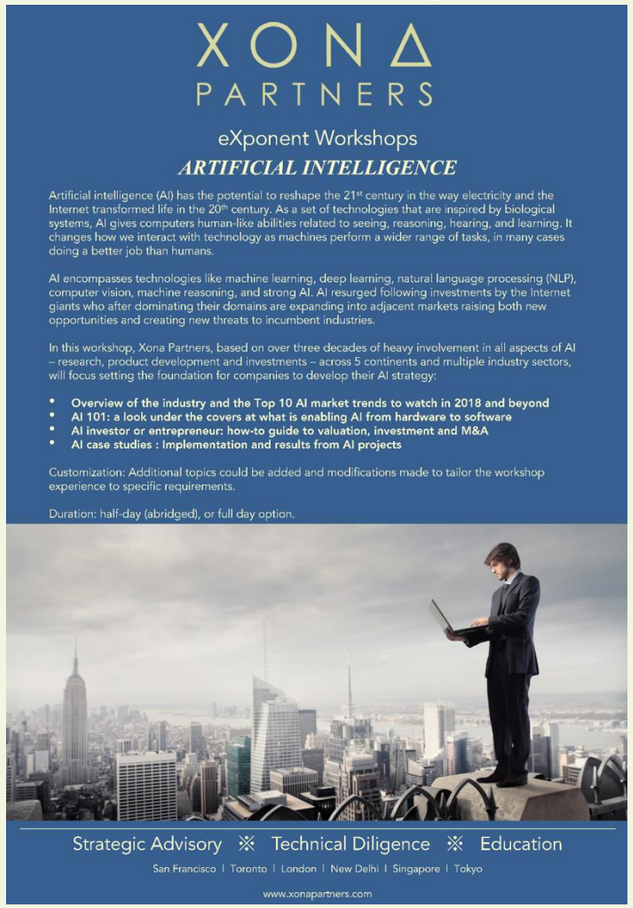
Additional information at: http://www.tmtfinance.com/merger/

To book a meeting, please contact us at: advisors@xonapartners.com

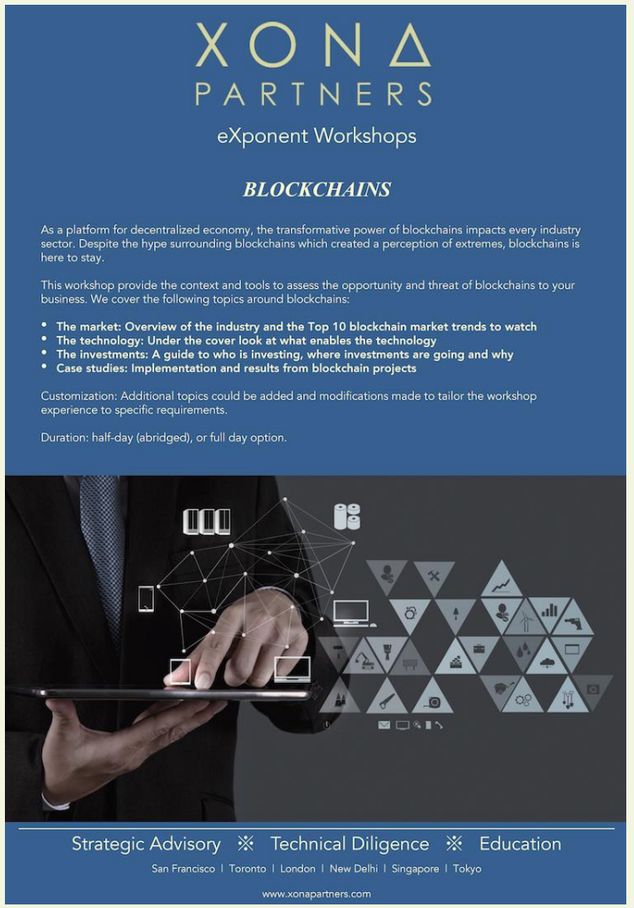
Xona eXponent Workshops

- Private workshops tailored to enable executives acquire knowledge in emerging technologies that could impact their business
- We provide factual insights into emerging technologies to differentiate hype from reality and to assess threat and opportunity

Artificial Intelligence

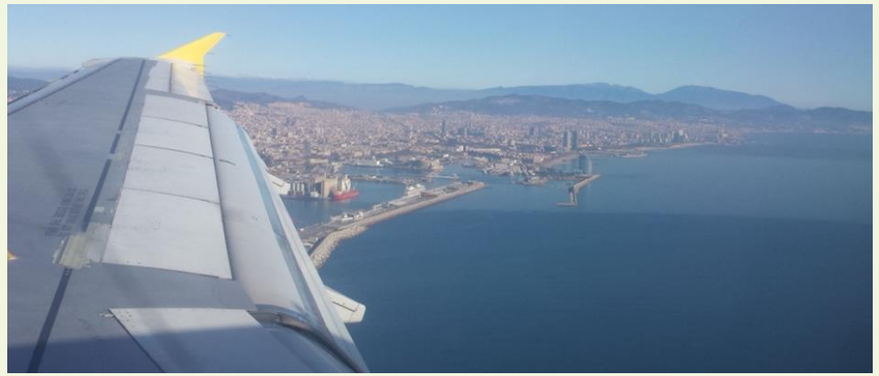


Blockchains



On the Lighter Side!

To all our clients, business partners, friends and colleagues, it was pleasure meeting you in Barcelona!



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