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The year 2021 will be remembered as the busiest year ever for Analysys Mason's transaction support team. We were nonetheless able to set aside time to get together 'virtually' and brainstorm our top-10 mergers and acquisitions (M&A) predictions for 2022. This particular series of telecoms, media and technology (TMT) predictions always generates a great deal of interest among our readers, recording the largest number of click-throughs on our website last year. So this year again, we are giving our loyal readers the opportunity to discuss the trends we foresee for 2022, which is expected to be another record-setting year for the digital industry.

Prediction 1: telecoms operators will seek in-market consolidation deals to benefit from cost efficiencies

Telecoms operators continue their struggle to find growth within their core business. Some have taken action by branching out into adjacent areas and increasing their revenue contribution from cyber security, financial services, Internet of Things (IoT) and Industry 4.0, smart homes, healthcare and e-commerce. However, diversification does not answer the question of how to make the core connectivity business competitive in the long run, a goal that can only be achieved by seeking further cost efficiencies, as working on increasing revenue alone will not be sufficient.

In this context, Analysys Mason predicts further in-market consolidation as a means for operators to gain scale and decrease fixed costs. This theme is not just a prerogative of developed markets, we see it becoming increasingly relevant in emerging economies as telecoms markets reach competitive maturity and investment requirements do not fade away. Restrictive regulations in certain regions will continue to be a hurdle that is difficult to overcome, but we understand that policy makers are expected to shift their strategic priorities, thus allowing the creation of a more sustainable telecoms landscape over time.

Prediction 2: more operators will set up separate cloud and technology divisions, triggering a deal-making spree

There is a big debate around the reliance of telecoms operators on juggernaut cloud service providers and their IT capability gaps to be competitive in the digital space beyond connectivity. Telecoms operators are following a dual strategy. On the one hand, they are inking partnerships deals to complement their capabilities, as in the case of T-Systems that created sovereign clouds in Spain and Germany with Google (see Analysys Mason's Public cloud provider and CSP partnership tracker). On the other hand, some telecoms operators are looking at strategies to bring more capabilities in house, for example Vodafone created Vodafone Technology with ambitions in Europe and Africa to hire (or retrain) 7000 software engineers to help innovate and launch new services/products.

More operators are expected to set up separate technology divisions to showcase their IT capabilities and allow these divisions to operate and grow independently from the core business. This strategic decision will trigger investments as the new entities can be expected to complement their technology portfolios with targeted acquisitions such as the Geprom deal that was recently announced by Telefónica's Tech business or the three acquisitions made by NCS (Singapore-based Singtel's IT arm) to win capabilities in data analytics and cloud.¹

66 The year 2021 will be remembered as the busiest year ever for Analysys Mason's transaction support team

Technology businesses are growing at faster rates than connectivity businesses and, therefore, attract higher valuations. Some operators will look at the financial markets to benefit from this. We have already seen some examples with Saudi operator STC that spun off its technology division and launched an IPO in September 2021. STC Solutions trades at nearly twice the EBITDA multiple of its parent company, thus highlighting the shareholder value creation benefits of this type of deal. Telefónica is rumoured to be looking for a minority stake investor for its Tech division that covers its footprint in Europe and Latin America, while Italy's TIM may be looking for an investor in its cloud division Noovle.

Prediction 3: IoT take-up driven by the COVID-19 pandemic will hasten private equity deals and consolidation

The telecoms industry has been awaiting the explosion of the demand for IoT to take place for a long time. Instead, take-up has been steady, but far from displaying the hockey stick curve many stakeholders hoped for. The good news is that Analysys Mason has seen recent contracts for a larger number of connected devices than before, potentially driven by the rapid implementation of digital strategies due to the COVID-19 pandemic, and the industry feels there is more growth to come.

Growing demand and the presence of a very fragmented landscape at both the connectivity and platform level is expected to renew the interest of financial sponsors in the IoT market. Analysys Mason predicts that private equity owners that backed winning investment platforms will aggressively drive a consolidation agenda to rationalise the sector. Analysys Mason also expects opportunities for investors in the network layer because there are scores of independent players operating LoRa networks, and Sigfox is going through a restructuring that has seen the parent company divesting its local operator Heliot in Germany, Austria, Switzerland and Liechtenstein. More divestments could follow in 2022.

Prediction 4: cable operators are turning coax into fibre and wholesale, which will create opportunities for financial investors

Cable operators have historically relied on DOCSIS upgrades to improve the quality of experience and remain competitive. However, cable operators' attitude towards fibre is shifting with an increasing number of players deciding to upgrade their existing footprint – hence, not just future roll-out – to full-fibre architecture, thus forfeiting the upgrade to the most advanced DOCSIS standards (such as 4.0). The reason behind this change in strategy is threefold:

- defensive, as coaxial overbuild by either altnets or incumbent operators is no longer a secondary strategic priority
- cost saving, as fibre networks incur lower costs
- wholesale ambitions, as resellers have historically shown a clear preference for fibre.

There will be opportunities for financial investors to support cable operators to finance the full-fibre upgrade, regardless of that being open or closed to third-party internet service providers.

Prediction 5: the tower market will undergo consolidation

Compared to the more mature US market, the tower market in the rest of the world remains fragmented. However, Analysys Mason expects the tower market to undergo consolidation, resulting in a maximum of four or five large players, plus smaller ones focusing on market niches, per geography in the long run. Financial and strategic – and to a lesser extent operational – incentives to aggregate assets across countries are clear and consolidation is likely to occur for towercos operating in a single market via mergers with larger international companies.

Consolidation is unlikely to happen within the next few years given that tower markets have different levels of maturity. For example, we see the consolidation opportunity as being particularly relevant in Europe, and it is no coincidence that this is where competition authorities have started taking an interest in the passive infrastructure market (see recent developments in France and the UK), which could trigger further deal-making. The presence of captive towercos – mainly in Europe – is not necessarily an issue as mobile network operators (MNOs) have expressed their intention to operate those companies at arm's length (that is, independently) as much as possible. The alignment of priorities and interest between MNOs that own towercos could result in the creation of regional captive towerco champions active across multiple markets.

Prediction 6: there will be further consolidation in the SME market, while incumbents will consider their options for their B2B divisions

The rapidly changing landscape for enterprise connectivity and service provision is creating winners and losers, with buy/build strategies being the obvious thesis in the small and medium-sized enterprise (SME) market. Key types of players to look out for are network aggregators (preferably with modern SD-WAN cores) and platform businesses (voice/unified comms), particularly in low penetrated cloud markets (such as Germany).

For larger investors, conversations should be happening with incumbents. It is increasingly obvious that tying the enterprise division of an incumbent operator to its own wholesale products is not value-creating for shareholders and the division should be free to use any infrastructure it can. Analysys Mason expects the divestment of incumbents' enterprise divisions to become more commonplace as part of the inexorable vertical disaggregation of fixed incumbent operators.

Prediction 7: there will be more hyperscale data centre deals and new cloud regions

The cloudification of businesses is driving an increasing demand for hyperscale data centres around the world. The number of cloud regions required by hyperscalers is increasing as more markets are reaching the critical mass necessary to justify the investment. The demand for in-market presence and sovereign clouds will be key drivers to deploy new hyperscale data centre facilities in new markets. Asia–Pacific is particularly active from an M&A point of view at the moment, but we see this as a strong trend across all continents and in particular where hyperscalers lack a strong local presence.

¹Geprom is a technology-based engineering company with headquarters in Spain.

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We predict that more hyperscale platforms will emerge and that existing ones will be seeking opportunities to expand their footprint to address cloud service providers' challenges coming from building more and operating critical facilities in new markets. The key success factor will be to secure the relevant partnerships – anchor tenant – at the outset of the project. As stated in Prediction 2, there will also be opportunities for telecoms operators to play a role by setting up dedicated businesses to meet demand and leverage existing infrastructure to support hyperscalers as partners as opposed to competitors.

Prediction 8: investors will look for the 'edge' everywhere

Infrastructure investors increasingly talk about their future investments in edge data centres. The problem is that there is no commonly accepted definition of where the edge computing capabilities should sit. The location of the edge could vary significantly between use cases. Most recent investments focused on locations in Tier 2 or 3 cities outside the more established cloud regions, but have rarely gone further than that. For instance, Lumen built 75 edge locations in the USA and is able to offer <5m/s latency to 95% of US businesses, and Proximity Data Centres expects to be able to cover 95% of businesses in the UK with a handful of locations (<20). Edge – and micro-edge – computing has many promising use cases, but only a few have a clear business case at this point, with others needing more investigating.

Investors face the challenge of needing to be ahead of the game and position themselves in a growing infra segment in spite of uncertainty on the demand side. The good news is that edge locations can be expected to sit alongside modern telecoms networks. As such, there is an opportunity to invest in selected telecoms assets (such as telecoms nodes at various levels within the fixed network hierarchy) that are likely candidates to be edge-computing locations and benefit from more stable and traditional anchor tenancy revenue from telecoms businesses. A good example is the strategy followed by digital infrastructure fund Digital Colony with its deals with Liberty Global and COLT.

Prediction 9: cyber security will continue to be a hot area for investment

We saw a flurry of high-profile M&A activity in the market in 2021. This included the merger of consumer security-focused giants NortonLifeLock and Avast, the purchase of McAfee Enterprise and FireEye by private equity group STG and the subsequent merger of the two vendors, and OpenText's acquisition of Zix Corporation to strengthen its portfolio for small and medium-sized businesses (it intends to integrate the assets of Carbonite, Webroot and Zix).

We expect this consolidation trend to continue in 2022, as many areas of cyber security remain very fragmented. We also expect private equity investors to continue to seek opportunities in areas of cyber security that are not the focus of investors in public markets (for example, email security specialists Proofpoint and Mimecast were acquired by private equity groups Thoma Bravo and Permira, respectively, in 2021). The private equity groups hope to increase the value of these businesses and take them public again in a couple of years.

2021 was also a year with significant IPO activity in the cybersecurity market. SentinelOne went public in the highest-valued cyber-security IPO ever in June (its implied valuation at its opening stock price was USD8.9 billion). Darktrace, a UK-based vendor, went public on the London Stock Exchange in April, in a rare cybersecurity IPO in a European stock market. We expect to see further significant cyber-security IPOs in 2022, primarily those of endpoint security specialists, and most likely of Bitdefender and Cybereason.

Prediction 10: ESG topics will become increasingly relevant for financial investors

Operators have started to focus on green issues and sustainability as part of their environmental, social and governance (ESG) strategies to satisfy the expectations of investors, regulators and consumers. 46% of respondents to Analysys Mason's consumer survey considered operator sustainability goals to be 'important' or 'essential' in their buying decision in 2021 (listen to the podcast or read the article - *Which ESG strategies are telecoms operators pursuing?*)

Analysys Mason predicts infrastructure investors to include more ESG themes in their due diligence processes. Investments in telecoms are closely linked to ESG priorities. Deals with a positive ESG impact will have much higher chances of being approved by investment committees and shareholders. Many initiatives can be measured in terms of carbon footprint reduction and higher digital inclusion. Telecoms investments – given the enabler nature of telecoms networks – have further spill-over effects on other sectors that must be digitally enabled to achieve their own ESG goals. This upside is harder to measure, but it should not be forgotten by the investment communities when taking capital allocation decisions. The possibility to access the green bond market could be beneficial given the success demonstrated by operators in issuing green bonds at attractive yields.

It is worth mentioning that most of the themes covered in our 2021 M&A predictions are still relevant for 2022. We would be pleased to further discuss our top predictions and those, no less important, that did not make the shortlist this year. We expect 2022 to be another exciting year for deal makers and we plan to share this journey with our clients as your most trusted commercial and technical adviser.

This article was published in TMT Finance Insights.

Questions? Please feel free to contact Alessandro Ravagnolo, Partner at alessandro.ravagnolo@analysysmason.com





Our annual telecoms, media and technology (TMT) predictions highlight the major trends that we expect to make an impact in the next 12 months.

Headline predictions

5G connection numbers will be limited by consumer upgrades to 5G handsets rather than just 5G network deployments. Chipset shortages will worsen this limitation in 2022. Operators will continue the push for more 5G coverage and more networks will be launched but subscriber numbers will largely be determined by the pace of consumers acquiring 5G handsets. Reduced 5G handset shipments in the later half of 2021 and first half of 2022 will result in 105 million fewer 5G handsets in use in 2022 than we previously forecast.

Mobile operator strategy will diverge in 2022. Unlike previous generations of mobile networking, 5G will develop on two distinct tracks. Operators that are determined to offer new types of B2B and B2B2C services will press on with 5G standalone (SA) technology and will depend on cloud partnerships to make this work. Other mobile operators will stay with 5G non-standalone (NSA) technology and a business that is tied to consumer services.

Consumer services

The metaverse will not be a killer app for 5G but it will represent a leap forward in bringing AR and VR services to the mass market. The hype around the metaverse will continue in 2022 with various visions of social/gaming/entertainment/commerce competing for attention. A major question for telecoms operators is the degree to

which AR and mobility will feature, rather than the VR-heavy vision presented by Meta (formerly known as Facebook). Some operators will be weighing up potential roles as enablers but need to qualify the opportunity with potential partners in, for example, the gaming world.

Analysys Mason Research's telecoms, media and technology predictions for 2022

Many fixed broadband operators will launch connected home offerings with services that are built on home Wi-Fi connectivity.

When faced with competition from tech giants, operators' smart home automation services and smart speaker offers have struggled, but the connected home is a promising area for operators. Early trailblazers of the 'customer premises equipment (CPE) as app store' approach, such as Comcast, show that operators have an opportunity in this segment. Operators will launch value-added services such as connected home cyber security and Wi-Fi motion detection with the objective of boosting subscriber numbers and ARPU.

Telecoms operators will add gaming to their 'super-aggregator'

strategies. Operators will use super-aggregation strategies (that is, bundling a range of third-party content) to capture some of the USD180 billion digital gaming industry in 2022. Games publishers' and operators' needs are aligning around billing for gaming services following the fall-out from the Apple/Epic Games lawsuit – the conditions are right for games developers and platforms to become more open to using operators for billing and aggregation.

Business services and IoT

Private networks will continue to increase in number, and most of the new networks will be 5G, but the adoption of edge computing will lag behind. At least 75% of new private networks in 2022 will be 5G, up from 31% at the end of 2020. The take-up of edge computing, a natural complement to 5G private networks, will continue to lag behind though. We expect just 20% of private networks to also be using edge computing. Edge computing will be deployed more widely and more than half of private networks will be combined with edge computing by 2025. Operators (and vendors) need to prepare themselves for this shift.



The business divisions of many operators will see connectivity return to revenue growth but most of the attention will be on IT services. We expect operators to strike more partnerships with vendors for security, SD-WAN, edge and cloud in 2022 than we did in 2021. Operators will also be active in developing vertical solutions (for example, in health and education), digital services for small businesses and even some niche cloud services (for example, sovereign clouds).

Many pilots and trials of new 5G-related business services will be

announced in 2022, but few services will be launched commercially. The features of 5G are well understood and, especially with the introduction of standalone networks, operators will have more capabilities to offer enterprises (for example, low-latency services, service-level guarantees). Much more thinking is needed on how to price and package these services though; for example, how to price connectivity with guaranteed throughput or latency. Operators will work through these issues in 2022 but few products will be launched.

Telecoms networks and software

2022 will be the start of a 2-year spike in 5G SA investment.

Between 2020 and 2027, a cumulative USD990 billion in capex will be allocated to 5G-related investments including the radio access network (RAN), core, cloud and transport, and will be 65% of total capex for mobile operators during the same period. This will include a big push for cloud- and edge-native technology. It will also involve far higher levels of automation and orchestration, built on Al development capabilities. Most of this investment will be predicated on new revenue streams for 5G, mainly in advanced B2B services.

Public cloud providers will gain a bigger role as the primary suppliers of important foundational technologies that will affect the value chains for OSS/BSS, AI, data management systems and 5G network functions. We expect an increase in the number of established communications service providers (CSPs) that are prepared to sign multi-dimensional, multi-year strategic partnerships with public cloud providers. These partnerships are expected to span IT and network transformation and business services, along the lines of the 2021 deals between Bell Canada, Reliance Jio and Telenor with GCP. AT&T's landmark 5G network deal with Azure will also push CSPs in the direction of public cloud providers in 2022 as they make their decisions about the cloudnative platform that they should deploy to support 5G SA core and virtualised RAN.

66 5G connection numbers will be limited by consumer upgrades to 5G handsets rather than just 5G network deployments

The pandemic-induced push for digital customer experience will accelerate telcos' digital transformation projects. There will be a strong push for fully automated, digital support for consumer and enterprise services increasingly supported by SaaS-based OSS and BSS.

OpenRAN will experience a reality check about cost and timescales, but operators will seize the opportunity to shake up vendor relationships. Fully integrated, single vendor solutions will start to give way to virtualised and disaggregated RANs, but in the near term, we expect most supply chain disruption to happen in greenfield and private networks. In the macro 5G network, solutions led by major suppliers with open API interfaces will start to win out as an initial step towards greater openness.

Expansion of fibre and 5G in developed markets will be driven by shared and wholesale models, and we predict these models will account for an unprecedented 20% of new investment in 2022–2023. Increasingly, this new investment will come from non-telco businesses

Questions? Contact us at enquiries@analysysmason.com to find out how these predictions may affect you and your business.

Co-investment carve-outs in France extend infrastructure funding from physical assets to IRUs

Omar Bouhali, Partner

In France, fibre carve-outs (through which infrastructure funds support infrastructure operators to finance their fibre roll-outs) have been closely followed by several co-investment carve-outs, for which infrastructure funds support ISPs to finance their co-investment tranches in these fibre networks. These new carve-outs extend infrastructure funding from physical assets to indefeasible rights of use (IRUs) and create a precedent that could be considered in many other countries.

The French regulatory framework promotes co-investment in fibre networks. In medium- and low-density areas, (which represent more than 80% of premises in France), the regulator and the government have together organised the roll-out of a single network per area. The operator of this local network ('the infrastructure operator') is obliged to provide non-discriminatory access to all ISPs, including in a co-investment mode. This mode involves purchasing IRUs on one or several tranches of 5% of total lines. This means that an ISP no longer pays line rental in this tranche and only pays maintenance fees, which are typically 60% cheaper than line rental. For an ISP, a co-investment therefore corresponds to a virtual fibre asset, that it can capitalise. For a nationwide ISP with double-digit market share, the investment in co-investment tranches in all medium- and low-density areas is typically several billion euros.

In the last 3 years, most of the major infrastructure operators in France have carved out important parts of their physical fibre in entities that enable infrastructure funds to invest in these very low risk assets (for more details, see Analysys Mason's *Fibre carve-out: apparent similarities hide important differences that investors need to understand.* In parallel, Analysys Mason has supported ISPs and infrastructure fund managers on co-investment carve-outs, in which a special purpose vehicle (SPV) purchases IRU tranches and leases lines within these tranches to an anchor tenant ISP, and potentially to other smaller ISPs.

The co-investment carve-out model enables its anchor tenant ISP to lease lines at advantageous prices that reward its long-term commitments

The economic model of a co-investment carve-out is based on the space between IRU one-off costs (that are fixed once each tranche is purchased) and line rental revenue net of maintenance (that are proportional to the number of lines used and therefore, to a wide extent, variable). The following are key drivers of this economic model.

- The fill rate of the IRU tranches (that is, the proportion of the IRU tranches that is leased to an ISP) evolves over time, and as the anchor tenant and other ISPs acquire fibre customers. This fill rate can be optimised by applying an appropriate IRU purchasing policy: it is generally not efficient to purchase an IRU tranche when demand represents only a fraction of the tranche capacity.
- There is space between complete IRU one-off costs (taking into account the detailed pricing structure of each infrastructure operator) and line rental prices net of maintenance to the anchor tenant and to the other smaller ISPs.
- Potential anchor tenant commitments can limit the risk of lower-than-expected fill rates but are then generally compensated by lower per-line rental prices compared to smaller (non-anchor) ISPs.

66 Analysys Mason has supported ISPs and infrastructure fund managers on co-investment carve-outs

Some other drivers could potentially affect the economic model of a co-investment carve-out, but contracts are generally designed to limit their effects by passing them to client operators.

- The maintenance costs on lines used, as well as final drop costs, are (more or less) directly transformed into equivalent revenue. It is nevertheless important to ensure that no significant divergence between revenue and costs materialises for the SPV under reasonable scenarios that differ from the base case.
- As is the case for any long-term contract, indexation clauses can have an important impact over the years. It is therefore important to ensure that no significant divergence between revenue and costs can result from the uncertainty about long-term macroeconomic drivers (in particular, inflation).

Co-investment carve-outs, like fibre carve-outs, present a particularly low-risk profile in France, where there is virtually no risk of overbuild in medium- and low-density areas, and where fibre is clearly identified as the target technology by all retail players. Such models can nevertheless also be considered in many other countries, where reasonable commitments from the anchor tenant may assist to mitigate the intrinsic risks of the model.

Questions? Please feel free to contact Omar Bouhali, Partner at omar.bouhali@analysysmason.comto discuss how Analysys Mason can help operators and investors to analyse and optimise innovative investment models in fibre assets.



Digital transformation can improve gender equality in the bioeconomy, but it will not happen automatically

Maria Tunberg, Principal

The bioeconomy, which includes forestry and agriculture,¹ is a profoundly gender-segregated sector of the economy. Indeed, only about 14% and 29% of the EU workforce for forestry and agriculture, respectively, are women.² Improving the gender balance in the bioeconomy is vital for several reasons, not least because inclusion and diversity are key factors in driving innovation, and missing out on half of the potential workforce impedes the competitiveness of the sector. There is a shift in the skills required within the sector as a whole, and digital technology is increasingly being adopted at several levels. Companies are now looking for AI and data scientists and experts within digital technology, which creates an opportunity to attract more women to the sector.

Analysys Mason recently conducted a study on behalf of three bodies within the Nordic Council of Ministers to assess the gender imbalance in the bioeconomy. In theory, digitalisation and the increased automation of heavy work could improve the gender balance, but this is not happening in practice. Instead, digitalisation seems to be aggravating the prevailing situation because the ICT sector is also currently heavily male-dominated. The Nordics is often considered to be one of the most gender-balanced regions in the word, yet still approximately 75% of graduates from ICT-related university programmes are men.³ In this article, we use our research findings to provide six recommendations of how to create a more gender-equal digital bioeconomy.

Digital transformation could solidify the current gender imbalance in the workforce

The stereotypical image of a forester or farmer is a strong man that is ready to take on hard work in the forest or on the field. However, much of the physical work is now automated, thereby removing the requirement of physical strength. In theory, this could reduce the gender bias and encourage more women to join the workforce. However, this is not happening, largely because workers that have



the new, non-physical skills required as a result of digitalisation come from a (currently) equally heavily male-dominated environment. Hence, we risk worsening an already skewed gender balance by moving towards a more digital bioeconomy.

Gender equality promotes innovation and competition

There is a risk that the digital transformation of the Nordic bioeconomy will worsen the gender balance in the sector, and one may wonder why we should spend resources to try to avoid this possibility. There are at least two arguments for gender equality that are highly relevant for players in both the bioeconomy and the ICT sector. Diversity provides additional perspectives and this stimulates a higher degree of innovation thereby enabling smart and sustainable economic growth. Furthermore, attracting more women to these sectors means that companies have access to a wider pool of potential employees. They cannot afford to miss out on half of the potential workforce if they are to stay competitive.

It is vital that women are involved and considered at all stages of the knowledge chain if we are to reduce the gender inequality in these sectors. This includes ICT-related education and university degrees, the development and implementation of tomorrow's digital technology and strategic decision making that impacts the digital transformation of the sectors.

66 Digital transformation may improve inclusion and diversity, but not without actions being taken

Both industry and academia need to act to drive effective and sustainable change

We can draw two major conclusions from analysing the latest research on the intersection of gender and digitalisation. Firstly, the shift in the skills required caused by digital transformation creates an opportunity to change the current situation and push for a more diversified workforce. Secondly, we need stronger and more visible female leaders, mentors and networks in order to attract more women to the sectors. We therefore suggest three action points for industry players. They should:

- increase the number of female role models in their organisations
- establish mentorship programmes that support young professionals
- create networks for young professionals and students.

We also suggest that academic bodies:

- promote further research on the intersection of digitalisation and gender, and how it affects different sectors
- seek a better gender balance when recruiting students to bioeconomy- and ICT-related courses
- develop and implement tools and methods to facilitate an active discussion within academia.

Regardless of the action, research shows that it is vital to carefully consider the purpose and structure of women-only activities and to actively include men when working with gender issues. A joint effort is the only way to drive efficient and sustainable change.

Questions? Please feel free to contact Maria Tunberg, Principal at maria.tunberg@analysysmason.com



¹ For more information, see Analysys Mason's The digitalisation of the bioeconomy will provide opportunities for operators and ICT providers.

² Eurostat (2020), Agriculture, forestry and fishery statistics – 2020 edition. Available at: https://ec.europa.eu/eurostat/web/ products-statistical-books/-/ks-fk-20-001. ³Nordic Statistics (2020), EDUC09: Graduated students at tertiary level aged 15-74 by reporting country, field of education, sex and time. Available at: https://pxweb.nordicstatistics.org/ pxweb/en/Nordic%20Statistics/Nordic%20Statistics______ Education_Education%20and%20training/EDUC09.px/.

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Digital parcel locker infrastructure is a rapidly growing element of the parcel delivery market in the UK

Ian Streule, Partner, Analysys Mason and Marek Różycki, Last Mile Experts

Digital infrastructure is the foundation upon which smart cities and nations will be built, thereby enabling always-connected consumers to engage with physical and digital services, including the Internet of Things. Parcel lockers, also known as automated parcel machines (APMs), represent an important, nationwide, emerging digital infrastructure of the future, and we predict that the UK is about to become one of Europe's largest parcel locker nations as a result of millions of pounds of investment.

There are numerous types of smart city solutions, including connected dustbins and self-driving shared taxis, but the APM technology that is now emerging serves the immediate and growing user demand for physical item delivery, while providing a solid foundation for important environmental and social improvements to the supply chain. The use of parcel lockers can reduce the emissions from delivery vehicles because it is more efficient to deliver a large number of items to a locker than individually to each door/address, though the effect of recipients travelling to collect items does need to be considered. It is also possible for smart cities to integrate digital parcel locker infrastructure with other smart technologies. For example, the delivery of a vanload of parcels to the same fixed locations on a fixed schedule is arguably the easiest and best application of self-driving vehicles. APM technology can also be used for services such as the delivery of groceries and prescription medicines to a locker, the collection of parcels and the sharing, reuse or recycling of used goods.

Digital infrastructure is a prerequisite for a smart city, and parcel lockers are an important part of this. Parcel lockers are also expected to be deployed outside urban areas, thereby leading to nationwide benefits and additional choice for all senders and recipients.

The deployment of APM infrastructure involves more than just installing visible locker banks in supermarket car parks and on street corners; it extends to the software intermediaries that control the data, the network and therefore the value exchanged between sender, recipient, infrastructure, logistics and customer-facing operatives. In time, traditional postal services may benefit from parcels or other post being delivered to parcel lockers (rather than doorsteps), but this is not a focus of postal systems and policies today (it remains a topic for a future debate).

Locker networks should be open and should serve several carriers to ensure high levels of efficiency and eco-friendliness. Networks can also be supplemented with pick up/drop off (PUDO) locations such as parcel shops; these add density and can be used to test new locations and to allow for peaks of demand without the need for additional locker cells, which may be under-utilised during off-peak periods. 66 Hundreds of millions of pounds will be invested in deploying digital parcel locker infrastructure in the UK

APM infrastructure could address the growing demand for out-of-home delivery in the UK

The UK is one of Europe's largest e-commerce-driven markets and we believe that there is significant potential for the deployment of APM infrastructure. The UK has not yet got any complete out-ofhome (OOH) delivery solutions that offer all of the desired features including good nationwide proximity and a mix of PUDO and APM services, although Amazon has widespread reach for its own parcels.¹ However, more recently, DPD has gained access to the Post Office network (over 10 000 locations), and InPost has restarted its APM deployment in earnest. Consumer distance purchasing behaviour in the UK is evolving too; the use of C2C channels (such as Etsy and eBay) is growing, as is the use of returns services for which APM may be more convenient than traditional methods. Last Mile Experts (LME) is about to release the next edition of its European OOH report, and its latest data suggests that there is significant growth in the demand for OOH delivery in the UK. Indeed, projections from Analysys Mason and LME indicate that this growth in demand will result in the deployment of over 50 000 APMs before 2030, with a cumulative investment of GBP1 billion (Figure 1).



Figure 1: Forecast for the deployment of APMs and associated capex, UK, 2021–2028 [Source: Analysys Mason, 2022]



Parcel locker infrastructure will be a key component of digital development in the delivery sector and is a must-have to serve growing OOH delivery volumes following the COVID-19 pandemic. The major players, challengers and various vertical partnerships and acquisitions will lead this dynamic in the coming years, but not all players will be best-placed to win. Analysys Mason and Last Mile Experts have recently worked together on projects in this space, and combine digital infrastructure investment transaction advice with OOH last-mile expertise.

Questions? Please feel free to contact Ian Streule, Partner, Analysys Mason at ian.streule@analysysmason.com or Marek Różycki, Last Mile Experts.



The COP26 summit presented a stark picture for the world: drastic action must be taken to fight climate change or else we risk irreversible damage to the planet. Amid this backdrop has been the tremendous development of the internet and technology over the past 20 years, which has fuelled the increased use of data centres to support the digital demand from both consumers and enterprises.

Many people do not realise that these data centres are becoming increasingly large consumers of both electricity and water. The continued growth of the digital economy and development of new technologies means that there is a need to balance this unabated demand for digital infrastructure against managing sustainability concerns. Governments and regulators must take a more hands-on role to address these issues, and there is a significant opportunity for innovators within the data centre value chain that can reduce the environmental footprint.

Data centres have a large environmental footprint

Data centres are the backbone of the digital economy because they facilitate the running of servers that process and store the vast quantities of data that are being generated and accessed by users worldwide. As IT workloads have continued to grow to support the increasing digitalisation of consumer and enterprise behaviour, so has the electricity consumption of data centres. Some examples are as follows.

- Ireland. Data centres currently account for 11% of the total demand for electricity in the country; forecasts suggest that this could grow to 25% by 2030.¹
- **Singapore.** Data centres accounted for 7% of the country's total electricity consumption in 2020.²
- China. More electricity was consumed by internet data centres in China in 2018 than in the whole of Malaysia.

Enabling data centre sustainability is a key part of fighting the global climate crisis

Jay Lee, Manager

IT workloads will continue to grow at a rapid pace thanks to the increasing take-up of cloud computing. In addition, new use cases such as cloud gaming and metaverses have the potential to accelerate IT workload growth further due to their heavy compute and storage needs. As renewable energy is not yet widely used by data centres, these massive IT workloads can have a large negative impact in terms of carbon footprint. For example, only 2 out of 22 Chinese tech companies in a particular study reported relying on renewable energy for more than 3% of their needs, and as such, many are therefore indirectly contributing to greenhouse gas emissions.³

The water consumption of data centres is another often-overlooked aspect; water is often used to cool the servers and prevent critical IT equipment from over-heating. For example, Google's water withdrawal in 2019 reached 5.1 billion gallons; this is more than double that in 2016.⁴ Growing IT workloads will lead to increased server cooling requirements and can thus cause water usage to rise further.

Governments are starting to take action

Governments worldwide are now recognising the detrimental impact that data centres can have on environmental sustainability. Indeed, some (such as those in Singapore and the Netherlands) are imposing moratoriums to pause the growth in the number of new data centres. However, such moratoriums are more of a temporary quick fix than a long-term solution to the problem. Additional measures are required to ensure the sustainability of data centres and are starting to be introduced as shown in Figure 1.

| Initiative | Description |
|---|---|
| Power usage effectiveness (PUE) requirements | China's Action Plan for the Development of New Data Centres (2021–2023) states that newly built large-scale data centres must have a PUE of 1.30 or below. ⁵ |
| Renewable energy requirements | The Beijing City government introduced new rules in 2021 that require new data centres to incrementally increase the renewable share of energy used by 10% each year to reach 100% by 2030.6 |
| Use of recycled water | The EU's Code of Conduct for Data Centre Energy Efficiency includes a recommendation that data centres use recycled water (such as rain water) for cooling in order to reduce the consumption of potable water. ⁷ |
| Developing new cooling technologies | The government in Singapore has jointly funded the formation of a Sustainable Tropical Data Centre Testbed (STDCT) together with Facebook (now known as Meta). This will test and develop novel cooling techniques that will be used in Singapore. ⁸ |

Figure 1: Government initiatives to reduce the environmental impact of data centres [Source: Analysys Mason, 2022]

Regulation related to data centres has often focused more on ensuring data privacy and security, but the significant environmental impact that data centres can have means that more hands-on approaches, such as those listed above, are required.

Companies with innovative data centre cooling technology can use this as an opportunity to gain ground

Concerns about the environmental impact of data centres present an opportunity for new innovations in data centre cooling that can reduce electricity and water usage. Some of these technologies are starting to be employed by major hyperscalers, many of which have established 'net zero' aims. Examples of these new technologies include the following.

- Indirect evaporative cooling. Meta's upcoming data centre in Singapore will use indirect evaporative cooling technology. The company claims that this can reduce the peak water usage by over 20% and can enable a PUE of 1.19.⁹
- Immersion cooling. Directly immersing servers in a nonconductive liquid can enable very low PUEs of less than 1.10. This technique is being increasing explored by hyperscalers. For example, Microsoft has identified immersion cooling as a key initiative to support its sustainability goals, and its tests reveal that it can also boost performance and thus facilitate more-advanced workloads.¹⁰
- Direct-to-chip cooling. This involves pumping chilled liquid to a cold plate that cools the server chip directly. Google has used this technology at its data centres that have its advanced Tensor Processing Unit (TPU) chips.¹¹

Players within the data centre value chain that can offer such innovative technologies have a strong opportunity to gain ground by addressing the sustainability concerns of both governments and major users of data centres. These players include data centre co-location providers and hardware providers; those that have advanced proprietary technology are likely to have the greatest potential to benefit from this opportunity and thus improve the environmental sustainability of the industry.

Conclusion

The large environmental footprint that data centres currently have requires action to be taken to support the sustainability of our planet. The reliance on the internet and the digital economy is set to accelerate, so failing to act now will have drastic implications for our future generations. Governments will need to take on a more hands-on approach towards addressing these concerns and this can also present an opportunity for industry players with innovative cooling approaches.

Analysys Mason has conducted multiple projects in the data centre space worldwide, including market studies, due diligence exercises and helping regulators to develop their data centre policies.

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Concerns about the environmental impact of data centres present an opportunity for new innovations in data centre cooling that can reduce electricity and water usage

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Analysys Mason is the world's leading management consultancy focused on telecoms, media and technology (TMT). We give clarity and confidence in answering our clients' biggest commercial questions: What strategy will best enhance value? What implementation plan will be most successful? What is the optimal positioning for five years' time?

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