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To build or not to build?

Making a case for 5G: Challenges for Australian mobile network operators

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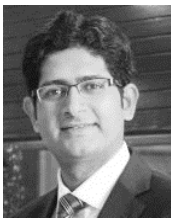

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Executive summary

Commoditisation poses an increasing challenge for the telecommunications sector globally. Australian operators, which have been relatively successful in resisting this trend, have begun to feel its impacts in recent years. Confluence of market trends such as the proposed consolidation of the mobile operator market, the increase in price-based competition and the growth of the budget segment are placing increasing pressure on average revenue per user (ARPU), industry profitability and the sustainability of the traditional operator business model.

The market outlook is further complicated by the emergence of fifth-generation mobile network (5G) technology, which promises to revolutionise telecommunications by providing differentiation options through 'futuristic' digital use cases. While these use cases may ultimately transform the way we use technology, the first set of 5G standards only focuses on 'enhanced mobile broadband', and it is unlikely that operators will be able to offer ultra-reliable, ultra-delay-sensitive and massive machine-type communication products for at least another three to five years. Considering the long investment horizon and competitive dynamics in the supplier market, there is a significant degree of hype contributing to unrealistic expectations across the board.

Given the uncertainty surrounding the technology, operators' perspectives on the future of 5G vary widely, with some being sceptical and others highly optimistic. Most will agree that the opportunities presented by 5G require careful strategic planning in order to capitalise on the potential for greater differentiation and value capture in the future.

As such, this paper reflects our perspective on five of the key concerns facing operators:

a) **Do we really need 5G? What can't we do with 4G?** From a technical perspective, 5G technology is only an incremental change to 4.9G, the latest version of standards for 4G. Adding to this, most 5G use cases can be implemented with 4.9G, and only a handful of the truly 5G-enabled use cases require nationwide coverage. This supports the case to further invest in 4G and sweat existing assets as customer requirements and adoption mature. We expect value from any near term investment in 5G to be derived from marketing claims related to having a 'superior' network and seeding innovation across the sector.

b) **Will 5G help lift consumer and enterprise revenue?** Consumers demand differentiated services when paying premium prices, and historically have been unwilling to pay more simply for better broadband. New 'experience -based' consumer value propositions (e.g. gaming packs) will need to be developed by leveraging network slicing and mobile edge computing features in 5G. In addition to differentiated services, 5G's efficiency and capacity could allow operators to develop viable consumer offers for fixed-mobile substitution and unlimited data plans to price sensitive segments. In the enterprise segment, operator success depends on understanding where and how to play, and choosing verticals that align with business strengths. In Australia, we can see that the construction, mining, healthcare, agriculture and manufacturing sectors are set to benefit most from the Internet of Things (IoT) and 5G.

c) **Can 5G help us bring down the cost per MB?** 5G is expected to drive material efficiency gains due to its higher data capacity, allowing operators to reduce the relative cost base and increase competitiveness in the market. However, these gains depend on a compatible device ecosystem, which will require higher 5G device penetration and timely product launches by handset vendors, especially

Apple for the Australian market, and this will not happen until late 2020.

d) Do we have the right size and type of spectrum for 5G? Operators should ideally have 80–100 MHz in the Mid Band, which is most popular since it can be deployed directly onto their current mobile tower sites to replicate 4G coverage at a higher capacity. In the High Band, which will be predominantly used for small cell, hotspot and industrial 5G deployment due to its limited propagation characteristics, operators should ideally have 800–1,000 MHz. Timely access to the appropriate spectrum is expected to be key to success for 5G, as a robust spectrum strategy becomes increasingly critical.

e) 5G will blow up our capital expenditure (capex) envelope! Can we really afford it? Analysis suggests the capex ratio of operators should not materially change with the introduction of 5G, based on the likely deployment models. Upgrading mobile tower sites, deploying small cells in high-density areas and eventually rolling out 5G nationwide could potentially be done within the existing capex envelope if staged carefully over the next five to seven years.

5G may provide considerable opportunities by revolutionising services, products and experiences – and eventually the whole ecosystem. However, the 'right to win' in the brave new world of 5G will be taken by operators that are proactive and develop a holistic approach to:

- Creating a 5G strategy by assessing the implications of 5G on their market position, and aligning their 5G business case and roadmap.
- Crafting a product and pricing approach backed by identification, prioritisation and staging of use cases.
- Revolutionising customer experience by identifying, visualising, prototyping and showcasing end-user experiences and applications powered by 5G.
- Mapping out new business models and leveraging the 5G ecosystem to deliver it efficiently, and developing coherent organisational architecture and constructs.
- Designing optimum network deployment models, service orchestration plans and spectrum strategies to model network cost and return-on-investment (ROI) implications.

We recommend a pragmatic four-step approach to deliver on the above objectives:

i. Operators need to start early by looking at how their current 4G technology could allow them to deliver most use cases, building momentum and being ready to scale with 5G.

ii. The key here is not going after the whole market but for operators to pick the segments or verticals where they have the strongest internal capabilities, external ecosystem and customer relationships.

iii. Operators need to design innovative business models that reflect the changing nature of value created and delivered to customer segments through 5G.

iv. Finally, operators should select the right partnership model to extend beyond connectivity in the 5G value chain and access new and greater value pools.

5G represents a significant opportunity for innovation and differentiation. It is key for operators to plot their path forward in a sustainable way that optimises their ROI and builds on capabilities they will need in the future.

1. A market under intense pressure

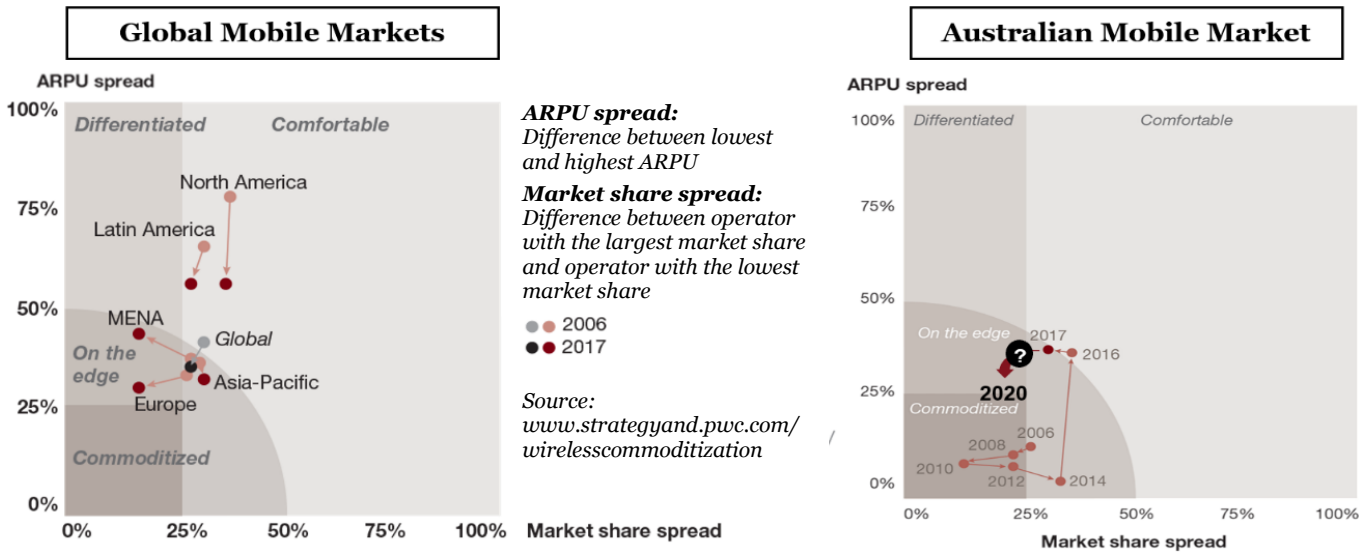
A lack of differentiation and price-based competition is shifting mobile markets towards commoditisation globally. While consumers have reaped the benefits of cheaper service and greater choice, operators and service providers are fighting for market share while facing continued downward pressure on average revenue per user (ARPU) and industry profitability.

To better understand and monitor this trend, PwC Strategy& conducts a global study every year on the state of commoditisation in the mobile market, comparing ARPU spread and market share spread to categorise country markets as either comfortable, differentiated, on the edge or commoditised.

The study (on the left of Figure 1) shows there has been a fairly consistent trend toward commoditisation in most mobile market across the globe. A closer look at the Australian mobile market (on the right of Figure 1) highlights that Australia was moving away from the global trend of commoditisation between 2010 and 2016. During this period, the market leader, Telstra, invested in network leadership (mainly in its 4G network) and product innovation, leading to a sizeable increase in ARPU spread and a slight increase in market share spread. In the last two years, however, the Australian market has once again moved towards commoditisation, with a slight decrease in market share spread and a minor increase in ARPU spread observed from 2016–17. This is a result of challenger operators in the market investing to offer a competitive customer and network experience, and at the same time lowering prices. Until recently, it was anticipated that a fourth mobile operator would enter the market, which contributed to these trends as operators sought to protect their customer base.

Lack of differentiation is driving commoditisation in the telecommunications market with further risks emerging from recent market trends

Figure 1: Mobile commoditisation trends 2006–17



The outlook for the next few years is continued intense competition as a number of market trends converge to drive greater commoditisation:

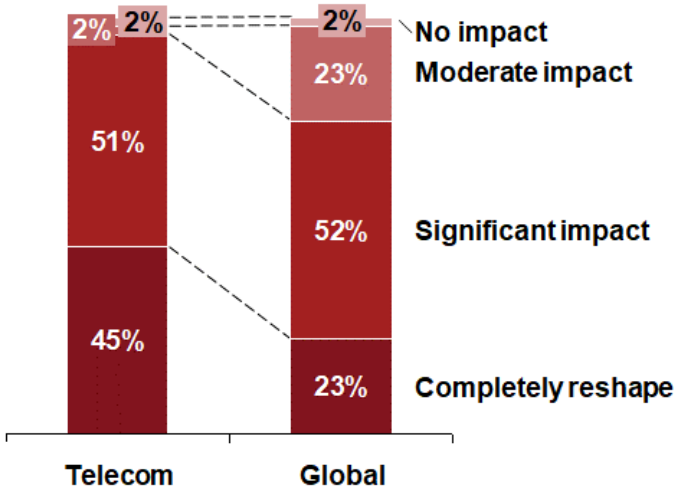
- **Market consolidation:** the planned merger of TPG and Vodafone will increase competition in the market by creating a stronger third player. This could potentially drive down overall market ARPU and reduce market share for the premium players like Telstra and Optus.
- **Price-based competition:** the number of homogenous unlimited consumer plans in the market is rising. This suggests that there is limited product innovation, which is pushing the market towards price-based competition.
- **Rise of mobile virtual network operators (MVNOs) and multi-brands:** the budget segment is forecast to grow from 22 per cent in 2017 to 33 per cent in 2020. This, along with the increase in MVNO brands paired with incumbent operators, will reduce the size of the potential market for key players like Telstra and Optus.
- **Reduction in coverage and quality differentiation:** the market is reaching the end of the technology cycle for 4G, while investment plans for 5G at scale are still a couple of years away. This is resulting in a cautious approach to further investment in 4G, contributing to accelerated commoditisation from reduced network differentiation.

Adapting to the next wave of technology change is key to competing effectively in the future

As these market trends threaten to reshape the mobile landscape, PwC's recent survey of chief executive officers (CEOs) highlighted that CEOs in telecommunications companies have greater concerns about the impact of technological changes compared to their peers in other industries. The survey responses suggest the majority of these CEOs believe technology could completely reshape industry competition in the next five years, compared to only a quarter of CEOs from all industries.

The concerns of CEOs in telecommunications companies are derived from a number of emerging technologies in the sector in addition to 5G. These include software defined networking (SDN), network function virtualisation (NFV) and electronic SIM (eSIM), which have the potential to truly disrupt the market. Telecommunications players that effectively harness these technologies could realise significant cost savings and revenue growth advantages, potentially shifting the sector landscape and pools of value as we know them.

Figure 2: To what extent do CEOs think technology will change competition in their industry over the next five years?



Source: https://www.pwc.com/gx/en/ceo-agenda/ceosurvey/2018/gx.html

2. 5G – The next frontier?

5G is regarded as the next big leap in mobile, promising to revolutionise customer experience. From a technology perspective, 5G will enable enhanced throughput capacity, very low delay in two-way communication and the ability to connect a massive number of devices with very long battery life (up to 10 years). These features have created a high level of excitement for both telecommunications and non-telecommunications players about the potential ways the technology could deliver futuristic digital use cases across different customer segments and industry verticals.

This has led to the development of three distinct families of use cases, each targeted at exploiting one of the three major dimensions of 5G's technical capability. The first family of use cases is categorised as 'enhanced mobile broadband' (eMBB), which focuses on leveraging 5G's enhanced throughput capacity to provide ultra-fast mobile broadband, augmented reality (AR) and virtual reality (VR) services. The second family of use cases is 'ultra-reliable and low latency communication' (uRLLC), which will enable delay-sensitive communication such as in tactile Internet, mission-critical drones and autonomous transport. The final family of use cases is 'massive machine-type communication' (mMTC), which focuses on fully automated and remote production control in factories, smart homes and cities where a large number of devices will be connected at the same time.

Figure 3: 5G technology characteristics and application categories

	Data rates	Latency	Connections
5G characteristics	Enhanced throughput capacity • 700–1,000 Mbps reliably • >10 Gbps peak	Reduced radio delay • <1 ms radio latency • 10-9 error rate	Large number of connections, low power, low cost • 10-year battery • 10–100x devices
Use case families	Enhanced mobile broadband	Ultra-reliable low latency communication	Massive machine-type communications
Use case examples	*Enhanced user experience*	*Critical communications*	*Mass-machine communications*

Source: 3GPP, PwC Strategy& analysis

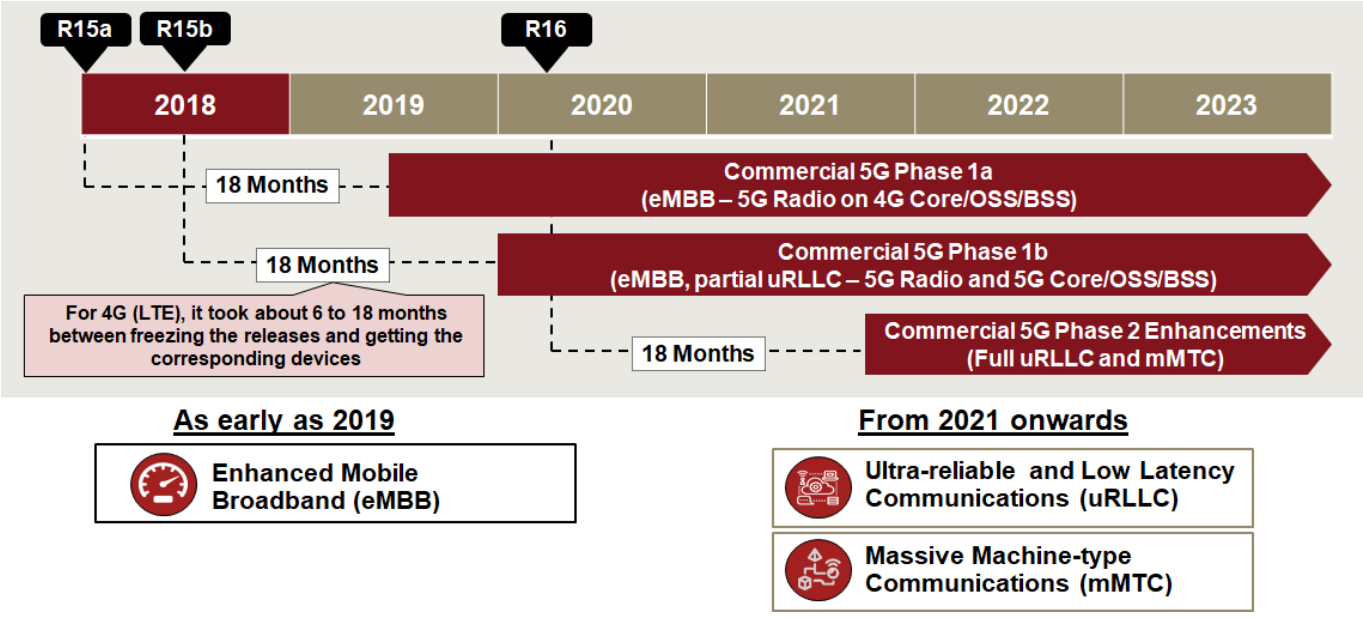
Of note are two other 5G network architecture features – network slicing and mobile edge computing – that are critical to delivering the above use cases cost-efficiently. Network slicing will allow operators to create multiple virtual end-to-end layers (slices) of their physical network and configure key 'quality of service' parameters such as data throughput, communication delay and connection limits for each layer, based on use. For example, one slice can have low throughput capacity, moderate low latency and a very high connections limit to deliver mMTC use cases for smart cities. Mobile edge computing allows operators to deploy cloud computing capabilities and IT service environments at the edge of a network and closer to the end customer. This enables them to deliver delay-sensitive use cases more efficiently as the customer data is computed at the edge and results are either transmitted back to the customer immediately or only a small number of processed parameters travel back into the network for further use, reducing the load on a transport and switching network.

The first set of 5G standards that were announced in 2018 (3GPP Release 15a and 15b) mainly focus on eMBB. The comprehensive commercial 5G enhancements that will cover specifications, from a standards perspective, for uRLLC (for example, those that are required for autonomous cars and remote surgeries) and mMTC (remote production control and integrated industrial manufacturing) are expected to be finalised in early 2020.

When 4G LTE (fourth-generation long-term evolution) first became available, it took about six to 18 months between freezing a standard release and the commercial availability of corresponding devices. Assuming a similar lag time for 5G, customers should start to benefit from the eMBB family of use cases (AR and VR, for instance) by mid to late 2019, while the more hyped and exciting use cases such as remote surgeries, driverless cars and integrated industrial manufacturing are not likely to be available until 2021. There may also be further delays in adopting such use cases if the market players are unable to fully develop a viable business model.

5G promises to revolutionise experiences but the first set of 5G standards only focuses on faster broadband –more time is required to finalise the standards for remaining use cases

Figure 4: 5G standards roadmap and anticipated availability of devices and adoption of use cases



Source: 3GPP, PwC Strategy& analysis

3. The industry in confusion

The level of optimism among global telecommunications operators over the business case for 5G remains mixed, with a range of perspectives on the potential return on investment (ROI) and monetisation opportunities it may create. This is directly impacting their urgency to invest in the required network enhancements and product roadmaps. At the '5G World' conference in London in 2018, operators' views could be broadly categorised into three groups:

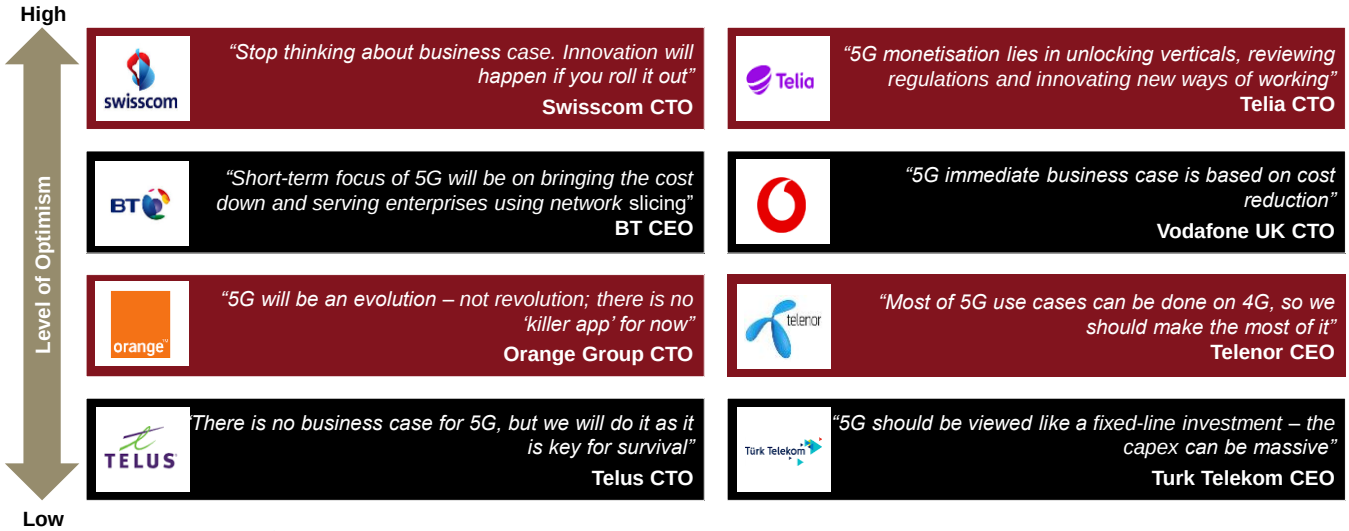
- **Innovation catalysers:** less concerned about the immediate gains of 5G, and investing in 5G to protect or establish a premium market position and catalyse innovation.
- **Efficiency seekers:** focused on the need to upgrade network capacity for 5G and meet the ever-increasing demand for data while reducing their network cost in an ARPU stagnant environment.
- **Non-believers:** sceptical operators who are not confident about the readiness of the technology offering, relative to the level of investment that may be required. They want to sweat their existing 4G assets while waiting for evidence on the ROI from the related use cases before considering 5G.

5G will be an evolution, not a revolution – there is no 'killer app' for now

Irrespective of the various individual views, a commonality across the operators was that 5G would be an evolution, not a revolution, with no perfect use case or application at present.

Locally, the Australian market is similar. Telstra is betting on early investment in 5G and has moved to quickly upgrade 200 mobile sites by the end of 2018 to accelerate innovation through trial and testing in the field. Optus, TPG and Vodafone are taking a view more consistent with the 'efficiency-seeker' and have announced plans to deploy 5G in line with increases in data demands, device availability and use case evolution.[1]

Figure 5: Update – 5G World – London, June 2018



Source: PwC Strategy& analysis

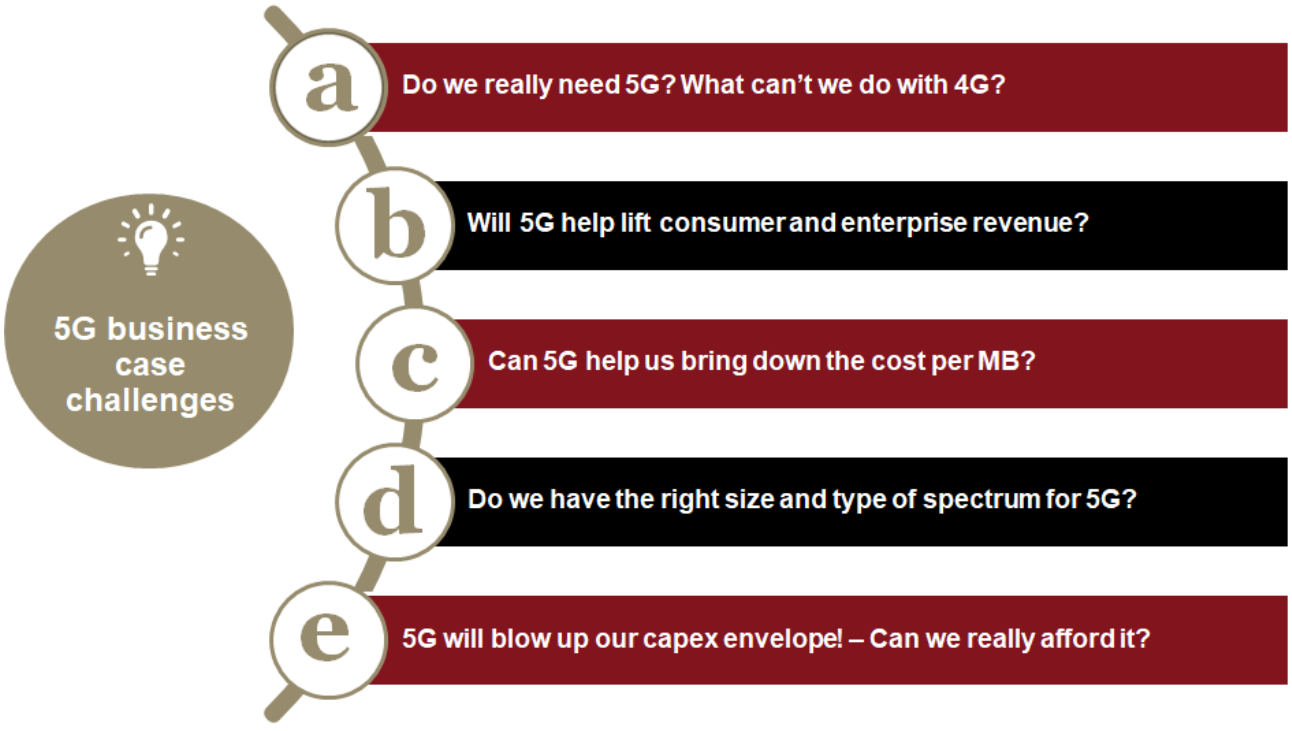
1. Australian Financial Review, company announcements, Strategy& analysis

4. 5G business case challenges

PwC Strategy& has been involved in a number of local and global engagements on the topic of 5G, and we have observed a number of common challenges operators across the globe face in developing a viable business case for 5G. One challenge is walking the line between potential over-investment and under-investment. Concerns stem from early over-investment in the 3G network on the promise of high revenue, which pushed many operators to the brink of bankruptcy. Later, the over-cautious approach many operators took towards upgrading their network to 4G impacted their ARPU and market premiums due to delayed launches.

We have framed these common challenges into five strategic questions for operators to address, as shown in Figure 6. The remainder of this section reflects our perspective on these key concerns facing operators.

Figure 6: Critical strategic questions for 5G business case



a. Do we really need 5G? What can't we do with 4G?

When comparing 5G specifications to base 4G specifications, there are significant improvements across most dimensions. The 4G technology, however, has evolved over the past decade, and a fairer comparison would be to 4.9G (LTE Evolution Pro). For example, Telstra's current 4GX network rollout is in fact an upgrade of their network to 4.9G.

A performance comparison of 5G to 4.9G indicates that 5G is 1.5 times more spectrally efficient, could have ~1.5–2.0 times higher actual average cell throughput and will bring down the latency (delay) from ~2 ms to 1 ms compared to 4.9G. By the same measures, 4.9G is ~3.5–7.0 times more spectrally efficient, has ~15–30 times higher actual average cell throughput and brings down the latency from ~10 ms to 2 ms compared to the original release of 4.0G. So, from a technical perspective, the specifications of 4.9G more closely resemble 5G.[2]

Furthermore, the majority of identified use cases to date, such as telepresence (virtual and augmented reality), ultraHD+ and 3D video, industrial Internet of Things (IoT), smart homes and cities, remote equipment management and production control can be achieved with 4.9G. There are potentially a small number of use cases that fully depend on a 5G network, such as gaming, VR services, ultra-high-speed fixed wireless access, full-scale smart cities with more than 1 million devices per square kilometre, tactile Internet and driverless cars. More realistically, only a handful of these use cases, such as mission-critical drones or autonomous cars, require a wider or nationwide rollout of a 5G network. This remains five to seven years away purely from a technology ecosystem perspective, and the business models are also yet to evolve.

In the short term, evaluation of potential use cases suggests that the actual value of 5G lies, for now, more in protecting price premiums through marketing claims, catalysing innovation or managing the capacity demand.

2. For 100 MHz spectrum, mobile use cases. Source: 3GPP, PwC Strategy& analysis

Most commonly cited 5G use cases can be implemented with 4.9G – only some use cases will be fully dependent on 5G and wider or nationwide rollout

b. *Will 5G help lift consumer and enterprise revenue?*

The most critical concern operators have is the monetisation challenge of 5G, and how it could impact revenues from their consumer and enterprise customer segments.

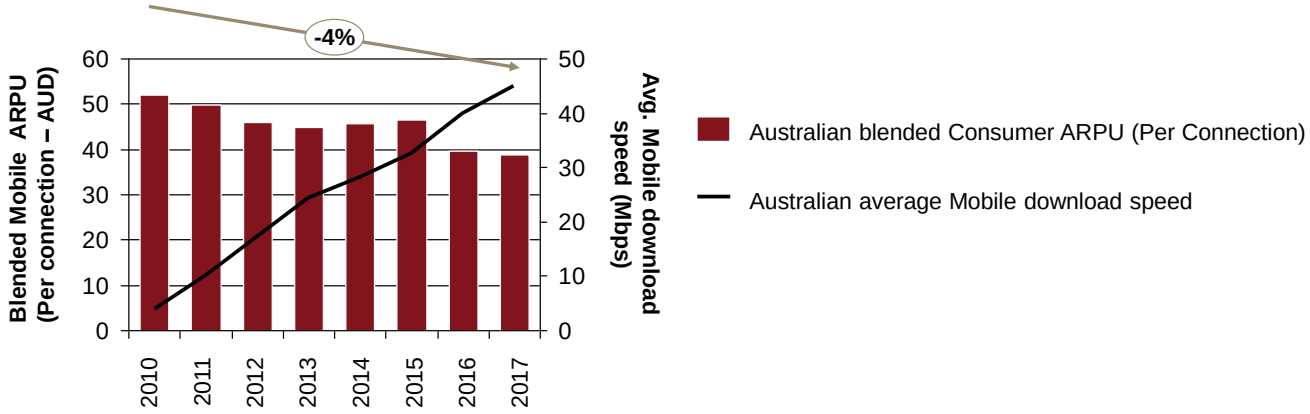
Consumer segment

The average mobile download speed in Australia increased 7–9 times from 2010 to 2017, due to the rollout and upgrade of the 4G network. However, over the same period blended ARPU fell by 4 per cent on average year-on-year. This indicates consumers are unwilling to pay for faster mobile broadband and is indicative of the pressure on operators to sell more for less to protect their market share.

In our view, the revenue potential from 5G in the medium term lies primarily in monetising differentiated services, and using technology features to provide a differentiated experience to the segments that have higher disposable incomes and a willingness to pay, while providing basic broadband service to the remaining consumer base. Experience chasers, punters and gamers are examples of potential high-value segments, where operators can use network slicing and mobile edge computing to allow them to virtually access a premium network with lower latency and higher capacity. It is conceivable that operators will be able to charge for these services by developing add-on packs such as immersive media and gaming experiences, similar to the international calling and roaming add-on packs of today.

Consumers will not pay for simply better broadband through 5G – operators need to monetise through differentiated services and target new market segments

Figure 7: Comparison ARPU (per connection) and average mobile download speed



Source: GSMA Intelligence, OpenSignal, Ookla Speedtest Intelligence, PwC Strategy& analysis

In addition to differentiated services, 5G's efficiency and capacity could allow operators to develop viable consumer offers for fixed-mobile substitution and unlimited data plans to price sensitive segments. Our estimate shows that the target cohort for fixed-mobile substitution in Australia will increase from ~15 per cent today to ~20–25 per cent of the total home broadband market by 2020. It will be primarily composed of consumers who use 50–100 GB of data per month and are looking for a lower-priced entry product than current National Broadband Network (NBN) offerings. The price sensitive segment is also expected to increase from its current level of ~20 per cent to ~30–35 per cent of the market over the same period.

It is unlikely that 5G-based offers from carriers, using fixed wireless access (FWA), will fully substitute for NBN in the Australian market due to the economics of providing fibre-like capacity. The case for 5G (using FWA) as a substitute for NBN may hold in other markets with lower existing fibre penetration, higher cost per kilometre to lay the fibre, higher density of houses per square kilometre, substantial fixed broadband ARPU and a non-monopoly market structure for fixed access. While some of these parameters may hold true in parts of the North American or European markets, the Australian market has differed significantly since the NBN was established.

The NBN, however, can face competition from operators armed with 5G in select consumer segments and geographic areas. This may hold true for the earlier mentioned price-sensitive segment or in the areas serviced by NBN on legacy technologies where wireless access by operators may have superior throughput speed and capacity. The latter will include some inner-city and dense urban areas that are being serviced by hybrid fibre coaxial (HFC) and copper-based vectored digital subscriber lines (VDSL) as part of NBN's mixed-mode deployment.

Enterprise segment

Despite the limited opportunity provided by 5G in the short term, where the technology is showing the greatest promise in the long term is in enabling operators to capitalise on Industry 4.0 and 'connected life' trends. In our recently published report – *Australia's IoT Opportunity: Driving Future Growth* – we analysed potential economic benefits to Australia as a result of a broad uptake of IoT technology in five industries that currently appear to have the most to gain: construction, mining, healthcare, agriculture and manufacturing. Across these industries, which represent 25 per cent of Australian gross domestic product (GDP), IoT can potentially deliver annual benefits of A$60–80 billion by 2023. 5G is clearly one of the technologies that will enable these benefits.

5G will create a large opportunity for operators to become the industry digitisation partner

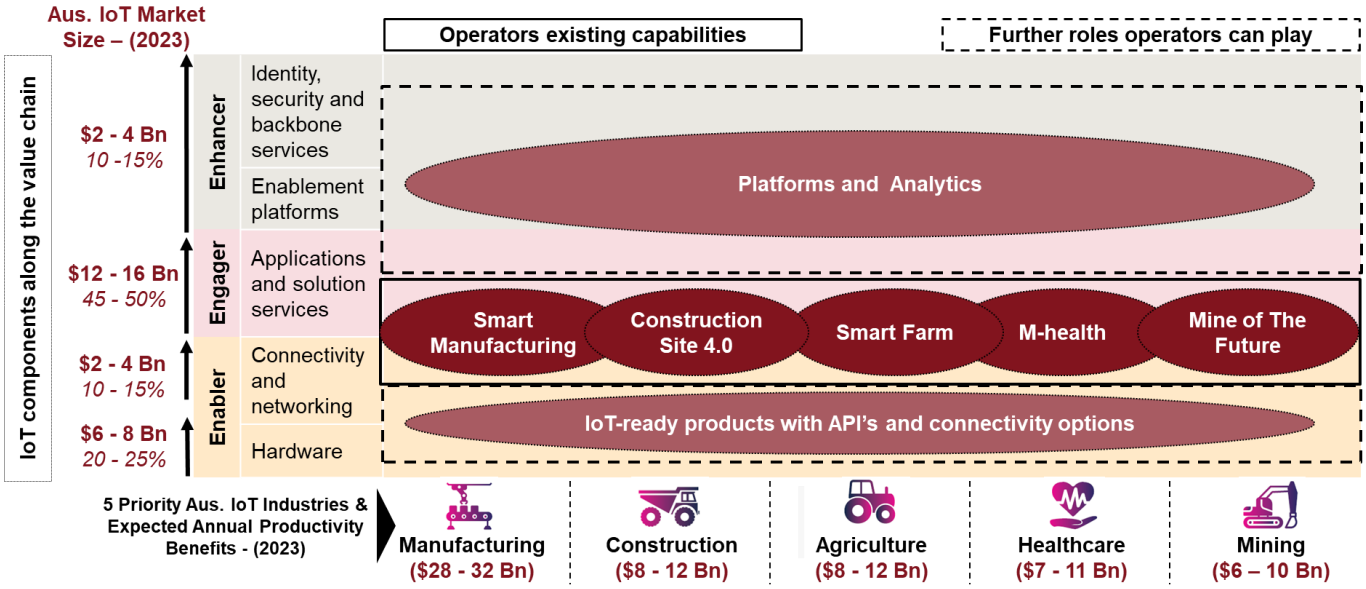
We have also analysed the IoT market value chain. The market comprises three key activities, which are:

- **Enabling:** providing hardware (including sensors and actuators) and connectivity services
- **Engaging:** developing and implementing solutions
- **Enhancing:** reselling solutions along with value-added services, and providing cloud, data and analytics platforms.

Our estimates indicate that the current IoT market has reached A$19 billion, representing 22 per cent of the current information and communications technology (ICT) market in Australia. But unlike the overall ICT sector, which is only increasing slightly faster than GDP, IoT-related products and services are growing significantly. They are expected to be worth close to A$30 billion in five years' time, representing almost 30 per cent of Australia's ICT spend.

For operators to truly capitalise on IoT by leveraging 5G technology, they must rethink their role in the value chain. At present, their prevailing role is that of an *enabler*, but this only represents 10–15 per cent of the total opportunity. There is greater value in simultaneously playing as an *engager* or *enhancer* in selected industry sectors in both business-to-business (B2B) and business-to-business-to-consumer (B2B2C) commercial models. For example, an operator could deliver application programming interface (API) - enabled platforms with analytics engines to allow health device manufacturers to provide value-added services to their customers.

Figure 8: IoT value chain and Australian market size



Source: PwC Strategy& analysis, https://www.acs.org.au/content/dam/acs/acs-publications/ACS-PwC-IoT-report-web.pdf

c. *Can 5G help us bring down the cost per MB?*

A major talking point in the 5G debate is that of efficiency. We have modelled the number of radio sites required and the impact on free cash flow for an operator in the US from 2020 to 2030 under different data demand growth scenarios. The analysis was conducted for an area in the US with similar attributes to Australia, and the insights clearly indicated significant efficiency potential through 5G.

The key takeaways from this study included:

- 5G macro sites could support a **doubling of data growth** with comparable economics.
- 5G macro sites could sustain data demand with **15–20 per cent fewer** sites compared to 4G LTE.
- 5G small cells could deliver **20 times higher** capacity per site compared to 4G LTE sites by supporting 10 times (100 MHz) greater channel size and two times higher spectral efficiency.

The analysis clearly illustrates 5G's efficiency advantages; however, these benefits may not be realised in earlier years due to the prevalence of the 4.9G and 5G device adoption and penetration rate. Specifically, the device adoption rate is an important variable that will define how soon any potential efficiency gains from a 5G upgrade will start to flow to an operator's bottom line. We expect 5G device penetration will take much longer than 4G – approximately six to seven years, reaching the sweet spot of 50 per cent penetration by 2025.

Our modelling for the US shows that 5G's efficiency potential may allow operators to reduce their relative cost base and increase competitiveness in the market

d. Do we have the right size and type of spectrum for 5G?

The spectrum bands for 5G are segmented into three groups, depending on the frequency ranges, namely Low Band, Mid Band and High Band (Figure 9). The geographic coverage characteristics of these bands differ as lower frequencies in the Low Band allow it to cover a massive area (>20-kilometre radius) while higher frequencies in the High Band have very limited coverage (<100 metres).

Figure 9: Australian 5G spectrum bands and deployment models

	Low Band	Mid Band	High Band
Frequency range	**<1 GHz**	**1–6 GHz**	**>6 GHz**
Australian 5G spectrum	850–900 Mhz (planned)	1.5 GHz (planned) 3.4–3.7 MHz	26 GHz (planned)
Geographic coverage	**Massive coverage:** Low Band usage provides widest coverage	**Main coverage:** traditional mobile services. Reuse of existing LTE site	**Limited coverage:** The High Band enables ultra-high throughput with limited coverage
Deployment scenario for use cases	Supports **nationwide services** with high requirements of latency and reliability (for example, full-scale transport system support) and **massive machine-type communications.**	Supports most use cases for **enhanced mobile broadband** and **ultra-reliable low latency communications** scenarios in urban and suburban areas.	Used for **hotspot coverage** and to support scenarios that require **high-speed and massive number of connections** on limited territory: some VR services, wireless last mile, areas with high user density (stadiums, shopping malls and so on).

Source: 3GPP, PwC Strategy& analysis

The Low Band (<1 GHz) will be most popular for larger-scale rollout and will support nationwide services with high requirements for latency and reliability (for example, full-scale transport system support), and machine-type communications. The Mid Band (1-6 GHz) will be used for the main coverage layer, in addition to the current 4G sites for traditional mobile services, and will support most use cases for enhanced mobile broadband and ultra-reliable low latency communication scenarios. The High Band (>6 GHz) will be used for hotspot deployment in dense urban areas. It will also support scenarios that require high speed and massive connection numbers within a limited area, such as some VR services, wireless last mile (FWA) and areas with high user density (stadiums, shopping malls and so on).

At the moment, the 3.5 GHz spectrum in the Mid Band is most popular across the globe, and we believe that an operator should ideally have 80–100 MHz of spectrum. The 26 GHz spectrum in the High Band is equally popular for fixed-wireless deployment in North America, with the ideal size for operators being in the 80–100 MHz range. The less-than-ideal spectrum allocation to operators can increase their capex profile, since they will get less out of each site they deploy on 5G.

Timely access to the right type and size of spectrum is key to success in 5G – 3.5 GHz is most popular for initial macro deployment

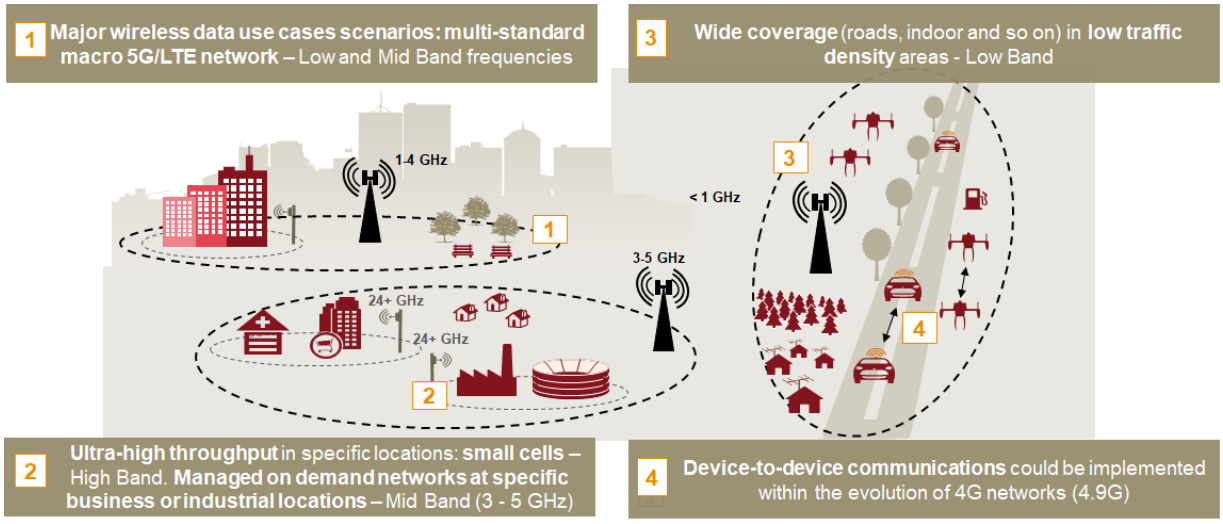
e. 5G will blow up our capex envelope! Can we really afford it?

The final question of 5G capex directly relates to deployment strategy, which depends on three key factors: the operator's position within the technology cycle, prevailing market use cases and spectrum availability from the regulator.

Our analysis indicates the first deployment will most likely be in the Mid Band, where operators will upgrade their current macro networks – leading to no additional sites and starting from 2019. We will then see some small cell deployment in High Band scenarios, such as stadiums or hospitals, to provide ultra-high capacity and low latency. This will be coupled with deployment of the Mid Band (3.5 GHz) for industrial IoT use cases in specific locations from 2022 onwards. The wider coverage on 5G in the Low Band (such as 900 MHz) will happen post-2023 when operators start to switch off their 3G networks and will have more maturity for use cases for rural coverage and intelligent health. Device-to-device communication will remain in 4G for the foreseeable future and will move over to 5G post-2025.

There would be no capex burst to challenge existing telecommunications business models, based on the most likely deployment scenarios

Figure 10: 5G network deployment model for use case



Source: 3GPP, PwC Strategy& analysis

From a financial perspective, our modelling of the most likely deployment scenarios for a large European country shows operators can maintain their capex profile, which is in line with historic averages in that country. This assessment considers upgrading or deploying new sites in the Mid Band, hotspots in urban areas in the High Band and rural coverage in the Low Band to achieve 90–95 per cent population coverage by 2027. In our analysis, it was the combination of newer antennae and base station technologies, high throughput on 5G Low Bands and low cost per bit that enabled operators to maintain capex ratios.

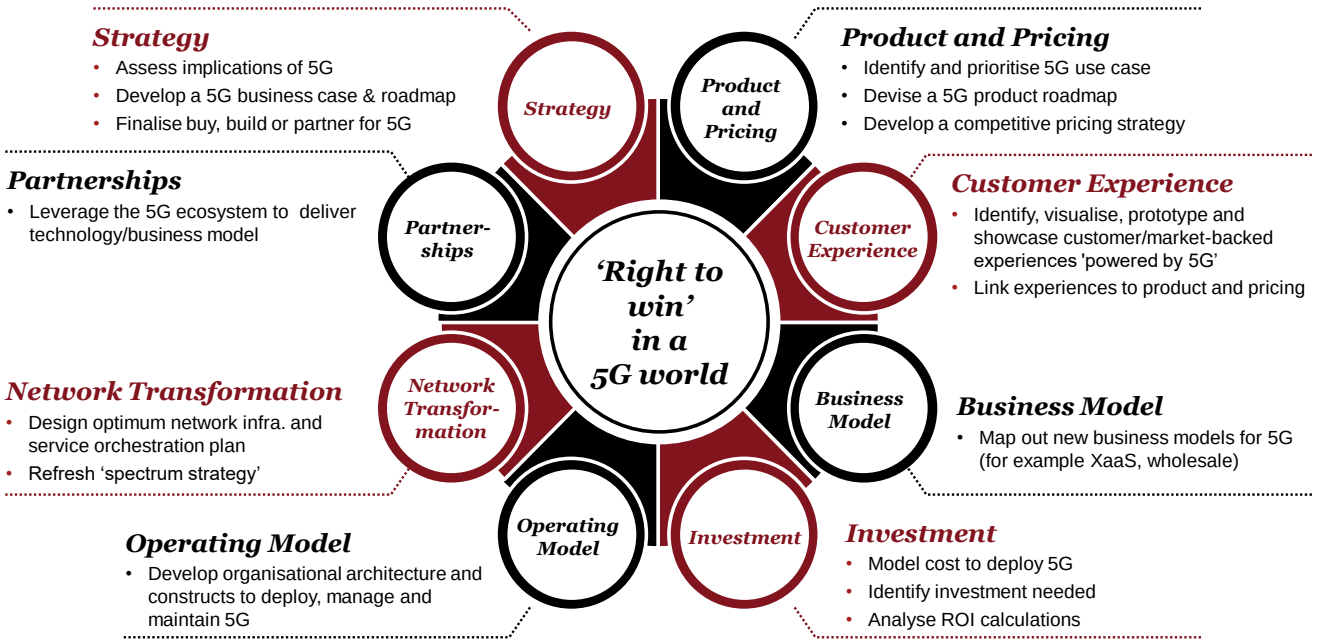
We acknowledge that 5G deployment models will vary based on geographies and use cases. This is particularly relevant for autonomous cars, where emphasis is on kilometres rather than population covered. This presents a case for public–private partnerships, as 80 per cent of the cost for a network for autonomous cars will be in the sensors along the road, rather than connectivity, and governments are much better placed to own and manage such a network, considering the security and social infrastructure that will be required.

5. Creating the 'right to win' in a 5G world

To truly establish a right to win in the new 5G world, operators will need to take a holistic view across multiple elements of their organisation. In part, this will involve recognising 5G's monetisation opportunities, and also its impact on experience, services, products and whole ecosystems.

Operators that are proactively working to develop new products and pricing propositions, business and operating models, network transformations and partnership approaches will be most successful in the market.

Figure 11: How to create a sustainable competitive advantage in a 5G world



Success from 5G will depend on a number of factors. Our suggested approach consisted of four steps to address these factors. Firstly, operators need to start early, making full use of their current 4G network capabilities. This will allow them to deliver most use cases, and in doing so, build momentum and readiness for scaling with 5G.

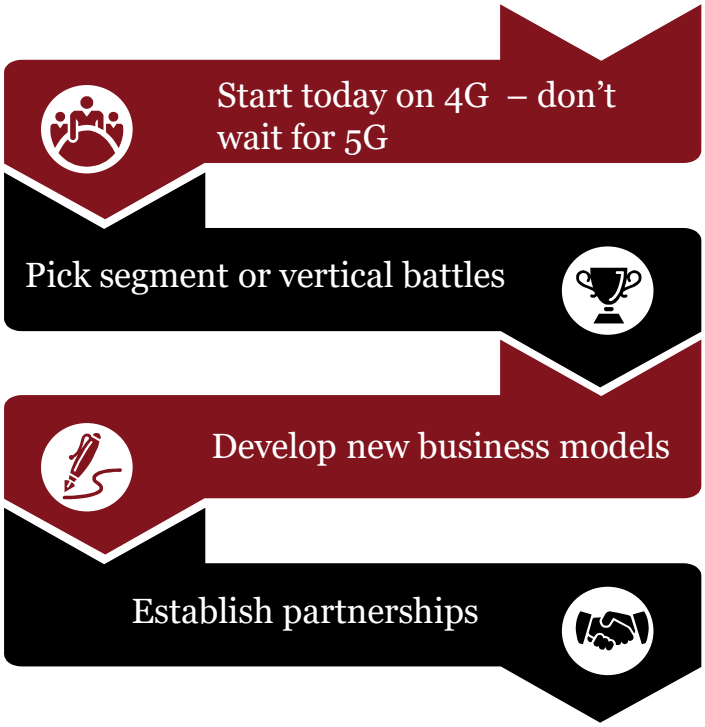
Secondly, it is vital that operators pick consumer segments and industry verticals to focus on, rather than chasing the whole market. The selection of these segments and verticals should be clearly based on their current ability to compete and the relative attractiveness of the segment or vertical for the operator.

Thirdly, operators should proactively focus on ironing out business models to monetise their opportunities. The traditional access- and capacity-based charging model may not yield the required boost to revenue, so new approaches need to be worked out to effectively generate returns on the effort and investment made to support consumers and enterprises. Selecting the right partnership models and investing in that internal capabilities that will deliver truly differentiated customer experiences will be key.

Finally, operators should leverage the 5G ecosystem through building partnerships and a collaborative ecosystem that will help them move beyond their comfort area being the connectivity enabler – which represents only 10–15 per cent of the market – towards becoming the engager (delivering services) and enhancer (involved in sales, customer management and analytics) in the value chain. It will be vital to develop trusted partnerships and value-driven alliances with industry players, solution providers and regulators. Otherwise, there is a significant risk that enterprises will build their own private 5G networks by partnering with equipment vendors and directly securing the spectrum from regulators.

Success depends on picking a select set of verticals, moving beyond connectivity and developing collaborative ecosystems

Figure 12: Way forward for operators to succeed through 5G



6. Conclusion

While the future of 5G technology is uncertain, it also provides an immense opportunity. Operators should seize the promise to revolutionise experiences and open up new differentiation options through 'futuristic' digital use cases.

Success is not guaranteed, and operators will need to be proactive, realistic, holistic and balanced in their approach. The focus should remain on creating clear 5G strategies and roadmaps aligned with market positioning, prioritising use cases through market-backed analysis and developing products and internal capabilities that deliver on target customer experiences. New business models will need to be developed and success will be determined by the ability to leverage ecosystems and develop the right partnerships. The deployment model, service orchestration plan and spectrum strategy should consider a staged approach to manage the investment yet be agile enough to adapt as 5G applications evolve.

Operators can adopt a number of no-regret moves in such an uncertain future, including:

i. Leverage the 4G network to deliver most use cases and build market understanding for 5G readiness.

ii. Focus on the strongest segments and verticals and enhance customer relationships and understanding of their needs.

iii. Test new business models and capabilities that reflect the changing nature of value created and delivered to consumers and enterprises.

iv. Engage with the ecosystem and select the right partnership model to extend beyond a connectivity enabler role.

v. Develop a clear strategy and plan to stage future investments in 5G capabilities in a way that will support future differentiation and an achievable ROI.

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