



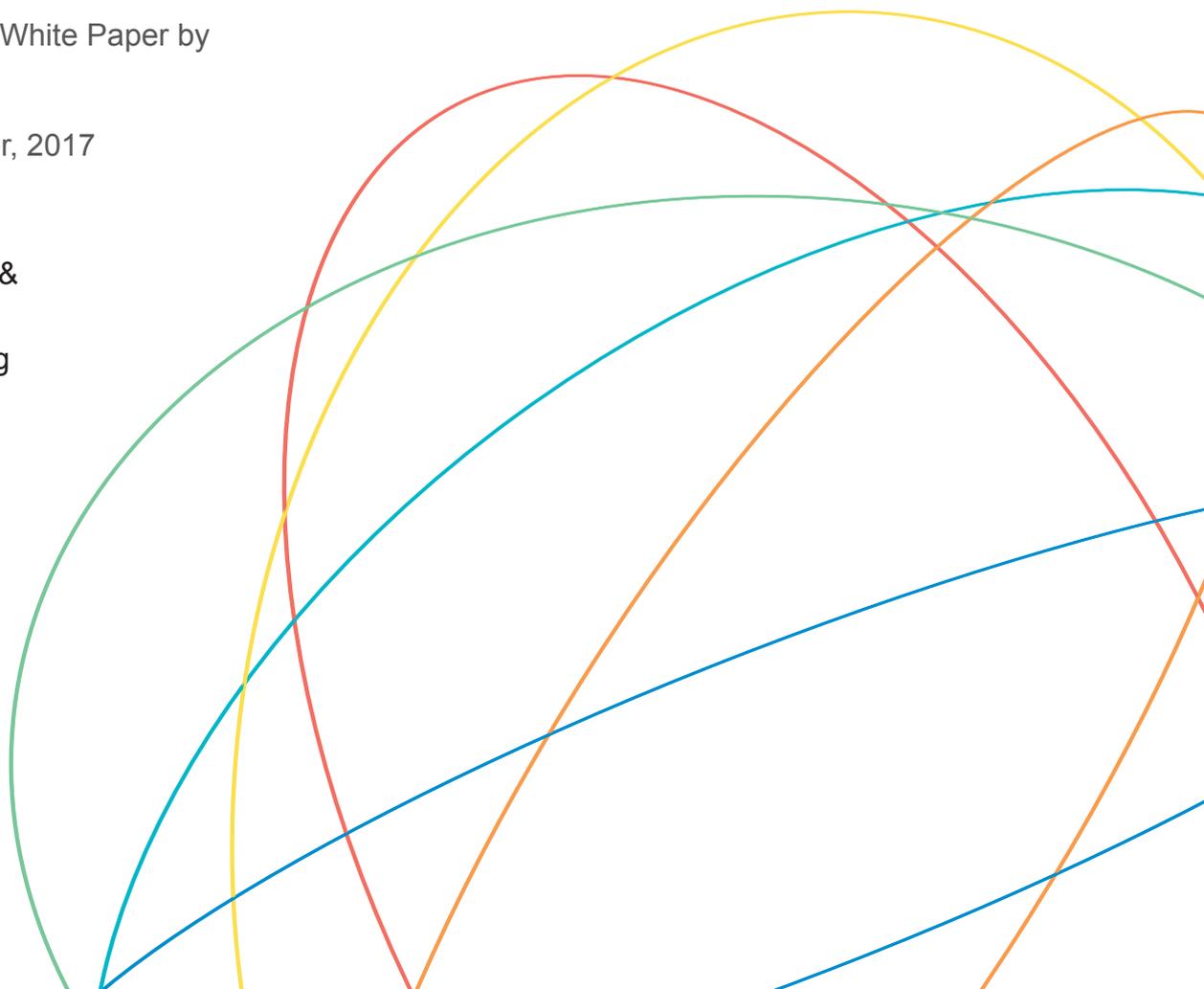
Business Value Assessment of Use Cases

For Next Generation Mobile Network

A Huawei White Paper by
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Business &
Network
Consulting



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1 Introduction

The past few years have seen tremendous progress in 5G technologies. The direction of 5G development has become increasingly clear. 5G is gradually being recognized as more than merely lab innovations, and has entered a stage of commercial deployment. Key roles in the industry chain, including governments, industrial organizations, operators, and equipment providers, are engaging in specific measures to formulate a complete set of policies for the acceleration of 5G network investment and construction. 5G is not simply a step forward from 4G, but can be considered a revolutionary launch of an entirely new network architecture, which incorporates fixed and mobile networks to usher in a new era of all-connectivity.

Up to now, besides the innovations and incentive policies introduced in 5G technology, the industry is currently more concerned about 5G services and inherent business value. The recognition of 5G business value is a critical factor that has significant implications and contributes heavily to influence the path of 5G development and investment pace.

First, 5G enables the following technological innovations:

1. 5G significantly improves user experience compared with 4G.

- Achieves a 10-fold improvement in peak data rate, targeting the highest data rate of over 10 Gbps, compared with 1Gbps of 4G.
- Allows a massive number of terminal accesses with 100K connection in one 5G cell, 100 times more than 4G.
- Decreases latency to 1 ms, 1/50 compared to that of 4G.

5G improves service experience and provides a diverse range of innovative services such as 4K/8K video, virtual reality (VR), and ultra wireless broadband (Ultra WBB) networks.

2. 5G adopts a cloud-based and software-defined network architecture, more suitable for fragmented vertical industry markets.

- Enables network slicing to provide flexible and low-cost networks, improve the service level agreement (SLA) for IoT service expansion, and significantly reduce operating expenses (OPEX) of IoT mobile virtual network



operators (MVNOs).

- Allows on-demand bandwidth acquisition and application-specific bandwidth allocation, producing a sharp increase in network usage efficiency.
- Offers an increasingly flat network architecture based on Mobile Edge Computing (MEC), greatly reducing network latency for better adaptation to latency-sensitive services such as autonomous driving and artificial intelligence (AI).

3. 5G utilizes a new O&M mode that features the following benefits:

- Self-healing for 99% of network faults in a cloud-based, software-defined, and virtualized network.
- Self-optimization to meet diverse business requirements. For example, a virtual content delivery network (vCDN) can be relocated to a base station to further improve video service experience or provide real-time big data analysis or AI analysis.
- Automated regular network checks, eliminating the need of manual operations.
- Real-time and on-demand network scale-in and scale-out, such as that for 5G micro base station commoditization.

2 5G Use Cases

Powerful 5G technologies will enable an increasing number of use cases, as shown in the following figure.

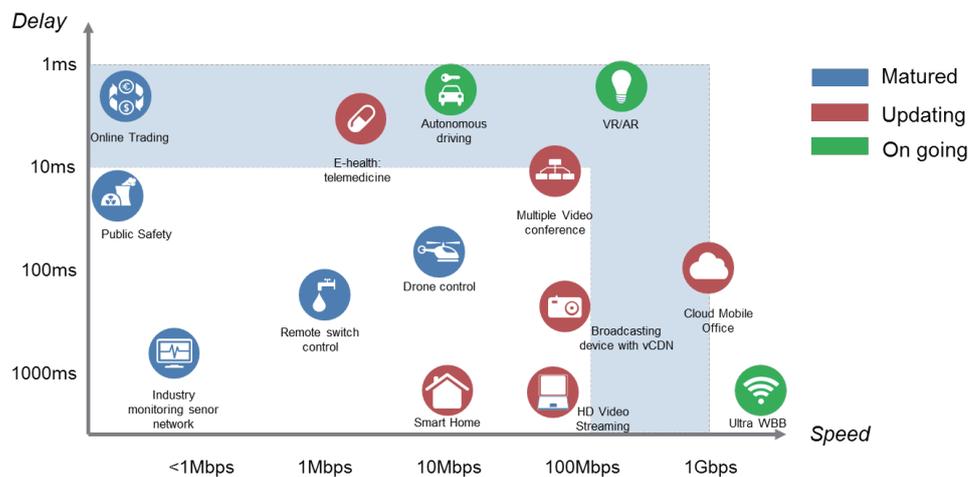


Figure 1

5G use cases are generally classified into the following business scenarios:

- Ultra high rate: VR/AR (live video streaming and gaming), 4K/8K video, and e-health (such as e-surgery).
- Ultra-low latency: autonomous driving, drone control, and industrial monitoring.
- Massive connection: intelligent robotics, smart home, and smart city. Hotspot coverage compensation: mobile offices, mobile telepresence, and hotspot coverage.
- Flexible networking: public security, commoditization of base stations, virtual campus operation, and virtual IoT operation.
- Ultra WBB: wireless to the x (WTTx).

The following lists specific examples of the most anticipated 5G use cases in the industry:

1. VR creates an unparalleled service experience through an immersion into virtual content such as gaming and panoramic video. This technology has strict requirements for perspective viewing (traffic and bandwidth) and

latency. An average video viewing experience requires a transmission rate of 400 Mbps and latency of under 17 ms. In comparison, interactive video must ensure physiological comfort that requires a transmission rate of 3.2 Gbps and latency of under 7 ms. The flat 5G network architecture is an optimal platform for VR due to its high rates and low latency. The business success of VR is also heavily dependent on terminal prices (under USD300) and availability of VR content.

2. Autonomous driving includes vehicle to vehicle (V2V), vehicle to infrastructure (V2I), vehicle-to-network (V2N), and vehicle-to-pedestrian (V2P). Autonomous driving requires latency under 3 ms, multipoint access, as well as MEC-based distributed big data analysis. 5G proves to be the most suitable network platform to accommodate the necessary requirements of this technology. Autonomous driving must address multiple technological challenges and requires the discovery of clear market segmentation and business models to achieve commercial success.
3. WTTx Ultra WBB is likely to be a 5G use case closest associated to business maturity due to relatively low terminal complexity and well-established business models. Given sufficient spectrum resources, WTTx is able to provide high-rate connection of over 10 Gbps. Operators are more concerned to highlight the difference between 5G WTTx and 4G user experience, and maintain cooperative competition with the use of fiber optic cables in fixed networks. This effectively ensures the adoption of increasingly flexible business models to generate additional revenue and profit.

3 5G Business Value Assessment

In-depth research, analysis, and forecast help to evaluate the potential business value of 5G use cases from the following key business factors:

- **Market value:** This is an important factor in terms of business value and brand value. 5G is set to create a large number of innovative services, requiring an extensive understanding to fully assess the scale of each market segment. Different market scales will have a decisive impact on revenue, cost, and various industry chains. For example, VR for regular consumers and telemedicine for professional scenarios have divergent marketing strategies. If the majority of 5G use cases are targeted at small-scale and segmented markets, operators are advised to consider building a universal service platform to reduce cost. The purpose of the market value assessment is to evaluate a 5G service in terms of clear market target as well as its capability to promote an operators' market presence through the development of all or specific users.
- **Competitive advantage:** According to the previous 3G and 4G development, a large amount of network construction and commercial service deployment is implemented out of consideration for competitive advantage during the initial stages. It is implied that the establishment of 5G service competitiveness will inevitably enhance the overall competitiveness of communication services. This will remain the case during the early stage of deployment. Specific 5G use cases will demonstrate overwhelming cutting edge innovations of the wireless industry and enable new services to include improvements over traditional services provided by competitors. These new services include such examples as HD mobile video (4K/8K), robotics, and Ultra WBB. In terms of rational 5G investment, determining whether a 5G use case is able to improve operator competitiveness and whether a competition threshold is required is of immense value.
- **Brand effect:** Advantages introduced by new technologies must be comprehensively researched and recognized by technical experts, as well as



mass consumers, investors, and other key shareholders (such as governments). 5G will not simply promote the progress of wireless technologies, but also increase network performance. 5G use cases must be evaluated in terms of brand value and user experience improvement compared with 4G and fixed broadband (FBB) networks. Due to different understandings about technological progress of diverse roles, it is critical to highlight key performance improvement of 5G use cases.

- **Operation & Finance:** The future commercial performance is one of the most important criteria for investment in new services. 5G use cases must be evaluated from the perspective of key operation factors (revenues, costs, and returns) for the overall commercial 5G deployment plan and return on investment (ROI) analysis. 5G significantly improves broadband and narrowband network performance and enables the adoption of a brand new network architecture. The impact of 5G on network operation must be comprehensively evaluated. For example, the vCDN enables VR and HD video and offers a superior user experience, which may attract a large number of users but may also increase traffic cost. Network slicing can provide better support for virtual operators and increase traffic volume, but may require higher ICT skills of operation personnel. A comprehensive consideration of procedures and operation helps operators to form a clear forecast and set of reasonable key performance indicators (KPIs) for 5G use cases.
- **Technology maturity:** 5G is not a simply a step forward from 4G, but a development of a new end-to-end (E2E) network architecture. Technology maturity of 5G use cases must be determined from multiple key technology factors, such as terminals, spectrum, networks, and cloud computing. For example, connected cars require ultra-low latency in the radio access network (RAN) and core network. The core network involves cloud computing and big data analysis implemented at the edge of a data center as well as the SDN-based bear network. In addition, the maturity of 5G communication modules built into vehicles must be considered in terms of form, size, and power consumption. Except traditional technologies such as WTTx and hotspot network coverage, new technologies have multi-di-

dimensional requirements for technology maturity. The evaluation of technology maturity helps operators forecast the time of commercial use and trial commercial deployment.

- **Business environment:** A large number of innovative 5G services will pose new challenges for business models, laws, and regulations. For example, 5G enables multiple inventive application scenarios for drone control (such as grid inspection and temporary base station deployment). However, different countries and regions have divergent management regulations on drone control, leading to a big challenge for promotion. In addition, new technologies can change consumption habits and are effectively employed to stimulate consumption. Operators must evaluate the total cost of ownership (TCO) to design marketing strategies for future commercial deployment. A small number of innovative services (such as commoditized 5G micro base stations), will revolutionize existing business models and propose new challenges. Operators must evaluate potential risks and benefits in each business model. These factors, collectively known as business maturity, provide reference for operators about 5G use case deployment, as well as maturity and any other key issues to be addressed.



4 Case study

As an example VR is evaluated based on the preceding factors. The result of the assessment is shown in the following figure.

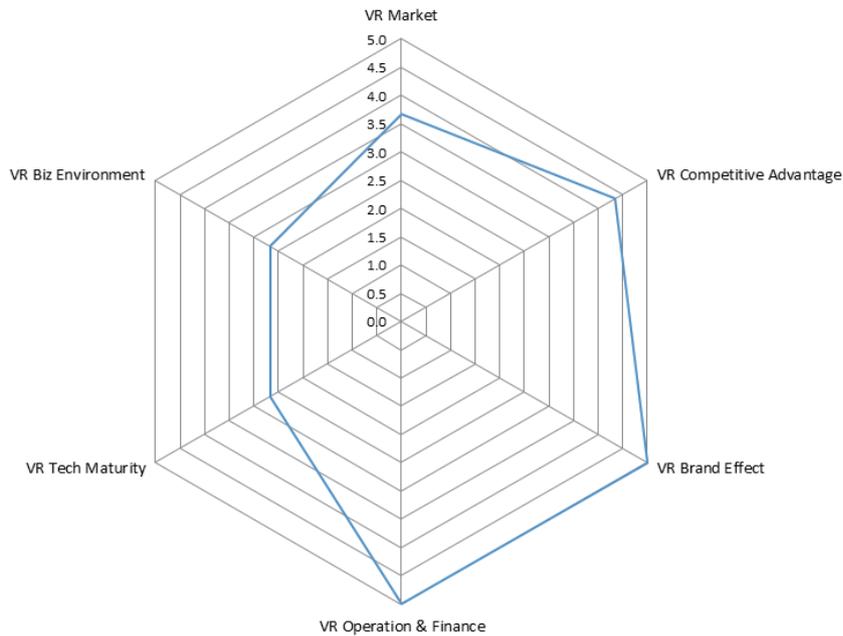


Figure 2

Market	3.7	VR maintains favorable market prospects in the huge consumer market, but has hidden impacts on both the industry and home markets.
Competitive advantage	4.3	VR initiators will help maintain a competitive cutting edge in 5G services.
Brand effect	5.0	5G VR has evident brand advantages compared with 4G and FBB, helping operators to significantly expand upon the influence of the brand.
Operation & Finance	5.0	VR is expected to produce excellent achievements in operation, producing sharp increases in traffic volume, revenue, and profit.
Technology maturity	2.7	Integrated terminals will restrict the development of 5G VR, but well-established E2E 5G networks will promote development.
Business environment	2.7	VR has a complete set of laws and regulations, but an abundance of VR content and business models will pose challenges to VR development.

5 Conclusion

An assessment is conducted based on the preceding factors. The ranking of brand value and business value is shown in the following figure.

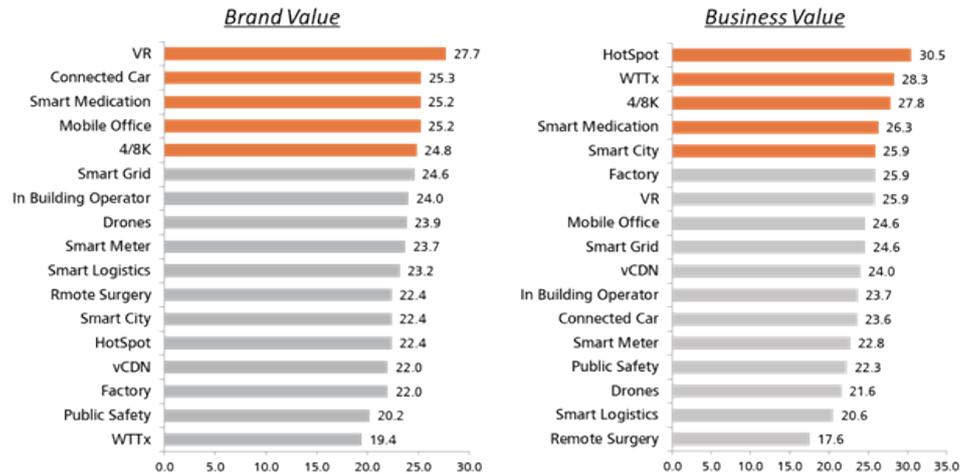


Figure 3

1. **Brand effect:** This ranking mainly depicts brand effects on the industry chain. This is applicable to strategic investment of key roles on the industry chain, and provides reference for key actions (such as marketing campaigns, testing, and user experience).
2. **Business maturity:** This ranking is representative of the actual commercialization of 5G use cases. This is applicable to strategic planning of key roles on the industry chain, and provides an important reference for key actions (such as product design, testing, and ecosystem nurturing).
3. It is noted that the forecast of the preceding ranking for the next five years is implemented in 2017 and the ranking result may be different if the forecast is introduced at a different time. For example, the brand effects of the 5G use cases may fluctuate throughout the five year period as shown in the following figure.

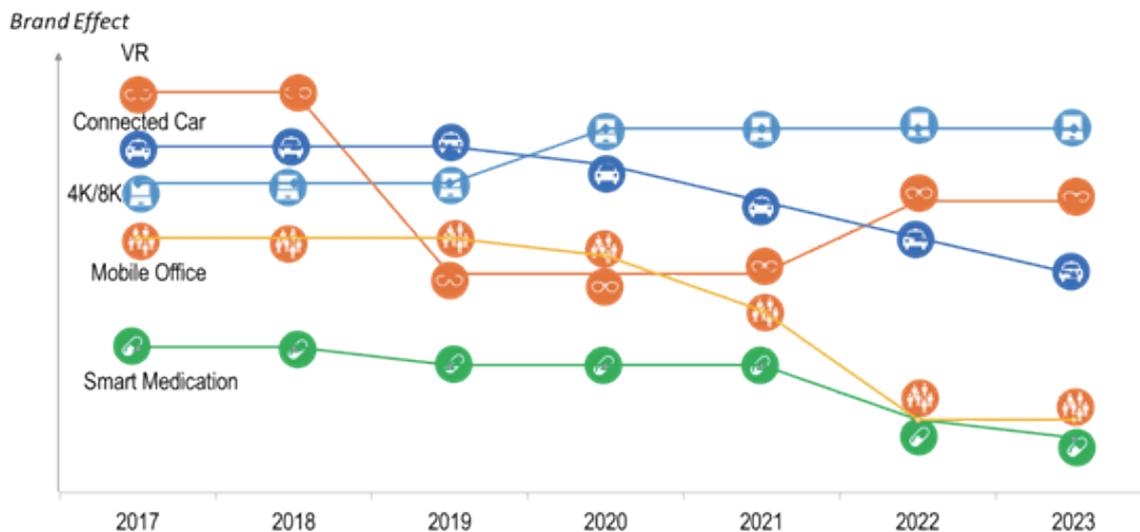


Figure 4

The Huawei Business and Network Consulting (BNC) Team will continuously update our evaluation of 5G use cases and provide valuable reference for the industry.

6 Author



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Extensive working experiences in telecommunication for over 18 years in Europe, Japan, India, MENA, and South Africa, with 11 years' experience in marketing and business consulting.

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