

Huawei Customer Support Services Value Quantification White Paper

Quantify Business Value of Customer Support
Services from a Financial Perspective

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Executive Summary

The telecommunications industry is growing fast with expanding network scales and large-scale deployment of new technology and new business. Overall, operators maintain consistent investments in telecommunications equipment to remain competitive in their market. But the increasingly complex networks bring great risks and challenges for the stable business operation of operators. Customer support services is one of the important ways to secure the stable and efficient operation of network equipment, helping operators cope with complicated network maintenance work and ensure continuous operation stability. After several critical network faults, operators should reconsider the ways to ensure network stability and to measure the contribution of customer support services to their value.

In this context, Huawei conducts value quantification research on its Customer Support Services. This study focuses on potential return on investment (ROI) realised by operators using Huawei Customer Support Services. The main purpose of this study is to provide a framework and method to quantify the value of customer support services, and to help readers to better estimate the potential financial value and evaluate the role of customer support services in operators' business.

This study gathers multiple inputs in order to fully demonstrate the value of customer support services to operators. The model is built based on internal and external inputs to make the study in line with the real situation of the operators' business.

Service Users:

- Several representative operators of different sizes and characteristics were selected from a global scale. The interviewed operators have cooperated with Huawei for over 10 years. Each year they re-evaluate different options, including Huawei Customer Support Services, third-party support and self-operation.
- The interviewees were mainly core members and supervisors of operations and maintenance, and some of the senior executives of operators.
- The study obtained the actual effect evaluation of Customer Support Services from service users.

Service Vendor:

- Multiple interviews were conducted with Huawei's frontline support engineers, (G)TAC engineers and R&D maintenance experts.
- A large number of cases provided by Huawei were studied and analysed to clarify the value of Customer Support Services to operators.
- Research into technical service value quantification has been a persistent industry practice for decades. Some technical service vendors and consulting organisations have attempted technical service value quantification at various levels. These attempts are widely recognised by the industry. Based on the previous outstanding studies, this research has found some key points worth optimising and innovating:
- Quantitative research focusing on Customer Support Services: Compared with current quantitative research on technical services, this research focuses on Customer Support Services in the

telecommunications industry. Therefore, this research considers the product characteristics and business logic of the telecommunications industry and optimises accordingly.

- **Research granularity:** This study conducts detailed value quantification analysis for each service offering, and summarises based on the value lever and service package, so as to demonstrate the value of different combinations.
- **Long-term financial value research included:** This study includes research on long-term financial value, which is studied and calculated mainly based on the impact of NPS on subscribers.
- **Actual Verification:** This study carries out pilot and verification across many operators globally and optimises the calculation model based on the results of multiple pilots. The final verification results are recognised by both operators and Huawei.

This study uses a pilot operator as a case for analysis and research. In this case, the operator purchased the Enhanced Package, which currently is the most comprehensive service package. Huawei provided preventive and reactive services for network devices (including hardware and software). Based on the four value propositions of “Secure Business, Advance Efficiency, Foster Innovation, Enhance Competitiveness”, Huawei helped the operator achieve network stability, cost reductions, efficiency improvements, and supported the growth of both direct value and long-term financial value. After quantitative analysis, the basic information of the case operator and the financial return from using Huawei Customer Support Services are summarised as below:



Annual Revenue
1.7 billion USD



Total Subscribers
20 million



Monthly ARPU
7 USD



Direct Value -
Revenue Protected
195.7 thousand USD



Direct Value -
Operating Cost Saved
11.04 million USD



Direct Value -
Capital Expenditure
Saved 3 million USD



Long-term Brand
Value Protected
44.54 million USD



ROI
1697%

Company Overview	
Annual Revenue	1.7 billion USD
Total Subscribers	20 million
Average Revenue Per User (ARPU)	7 USD
Profit Overview	
Direct Value – Revenue Protected	195.7 thousand USD
Direct Value – Operating Cost Saved	11.04 million USD
Direct Value – Capital Expense Saved	3 million USD
Long-term Brand Value Protected	44.54 million USD
Total Financial Value	58.78 million USD
Total Financial ROI	1697%

Huawei Customer Support Services provides three service packages with different service levels: the Enhanced Package, the Standard Package and the Basic Package. Although the value of Customer Support Services varies significantly with different sizes and service levels of operators, the ROI of Enhanced Package is more than 160% greater than Standard Package, according to the pilot case. Still, the data of several operators in current pilots shows that Huawei Customer Support Services can bring positive financial value no matter which service level is selected, and the return rate increases along with the increasing service level.

Situation Review

Industry Trend

In today's business world, a new wave of industrial and technological revolution is getting into full swing around the world. New technologies such as the Internet of Things, artificial intelligence and 5G are constantly emerging. Innovative technologies are changing the world at an unprecedented speed. The boundaries of all things, whether people, things or organisations, are constantly connected and integrated. This connection enables the interaction, perception, measurement and tracking capability to develop rapidly, and further accelerates the entire society to enter a new era of Internet of Everything.

The Internet of Everything raises higher requirements for safe, fast and stable information transmission. As the key players in this wave of transformation, telecommunications operators face three key challenges in this new era:



Network Stability:

- The coexistence of new and old technologies, the increasingly complex network structure, and the growing number of installed bases all bring greater risks of instability to the network
- As the connection increases geometrically and digital services become more abundant, the scale of network faults is increasing, making network issue locating and repair more difficult.
- Mobile internet has been fully integrated into everyone's daily lives, and as a result, individual consumers are more sensitive to network stability.
- Operators are facing massive requirements of new scenarios of 5G technology application and digital transformation from the enterprise users. Network stability affects users' business stability to some extent.



Profitability:

- The telecommunications industry is facing challenges in profitability growth. As demographic dividend decreases, the revenue growth is slowing down, while costs are rising year by year. With the widespread use of new technologies and expansion of networks, it can be predicted that the pressure on operating costs will increase in the short-term.



Subscriber Acquisition and Retention:

- As competition in the telecommunications service market intensifies, subscribers' stickiness and loyalty to operators are getting lower, so the cost of acquiring subscribers increases significantly.
- Network quality remains a key differentiator for operators. In order to gain more network subscribers, telecommunications companies must prove that they can provide high-quality, advanced and reliable telecommunications services.
- Network service experience has become one of the key factors determining subscriber satisfaction. Improving subscriber experience, gaining long-term financial value and enhancing competitiveness with high-quality and stable network services has become one of the directions for operators to improve their future operations.



Transformation Direction

With the increasingly complex telecommunications network and fierce competition in the telecommunications market, one major issue for operators is how to deal with current challenges and building a safe, reliable and efficiently operating network. In response to these major challenges, the following transformation directions should be taken seriously:



Network Stability Challenge → Proactive Prevention:

Network maintenance is evolving from the traditional responsive way to a proactive way, aiming to eliminate network risks in advance, reduce the impact on a user's business with a reliable network, and ensure their continuous and stable growth.



Profitability Challenge → Efficiency Improvement:

Optimise the existing operating model, securing business continuous stability under an existing framework, and reducing operating expenses accordingly.



Profitability Challenge → Continuous Innovation:

Optimise and enhance profitability with business and operating model innovation, broadening sources of income and reduction of cost.



Subscriber Acquisition and Retention Challenge → Brand Value Improvement:

In the digital age, the voice of consumers spreads more easily, and word-of-mouth is increasingly influencing brand competitiveness. Subscriber experience will affect revenue in the long run, and a more stable network environment is an important means to improve subscriber experience and engagement. Therefore, the brand value brought by an excellent subscriber experience is an important factor for operators to maintain invincible positions.

Requirements for Customer Support Services

As an indispensable role in the business of operators, customer support services are facing new requirements. Compared with traditional customer support services, customer support services should focus on the following four aspects in order to cope with the new direction of transformation:



Network Stability Challenge → Business Stability Assurance:

Advanced technology and quality services are used to ensure rapid response and recovery after emergencies. In addition, risks on the network need to be prevented in advance to improve the stability of the entire network and business operation.



Profitability Challenge → Cost Reduction and Efficiency Improvement:

Provide customer support services that can help operators achieve cost reduction and efficiency improvements. Customer support services can relatively reduce the operators' operating costs and capital expenditure, thus securing the existing business revenue, helping operators achieve higher business value.



Profitability Challenge → Innovation and Optimisation:

Use the capability of customer support services to create new service offerings, supporting the innovation of operators' business and operating model to realise new opportunities of efficiency improvement and business growth.

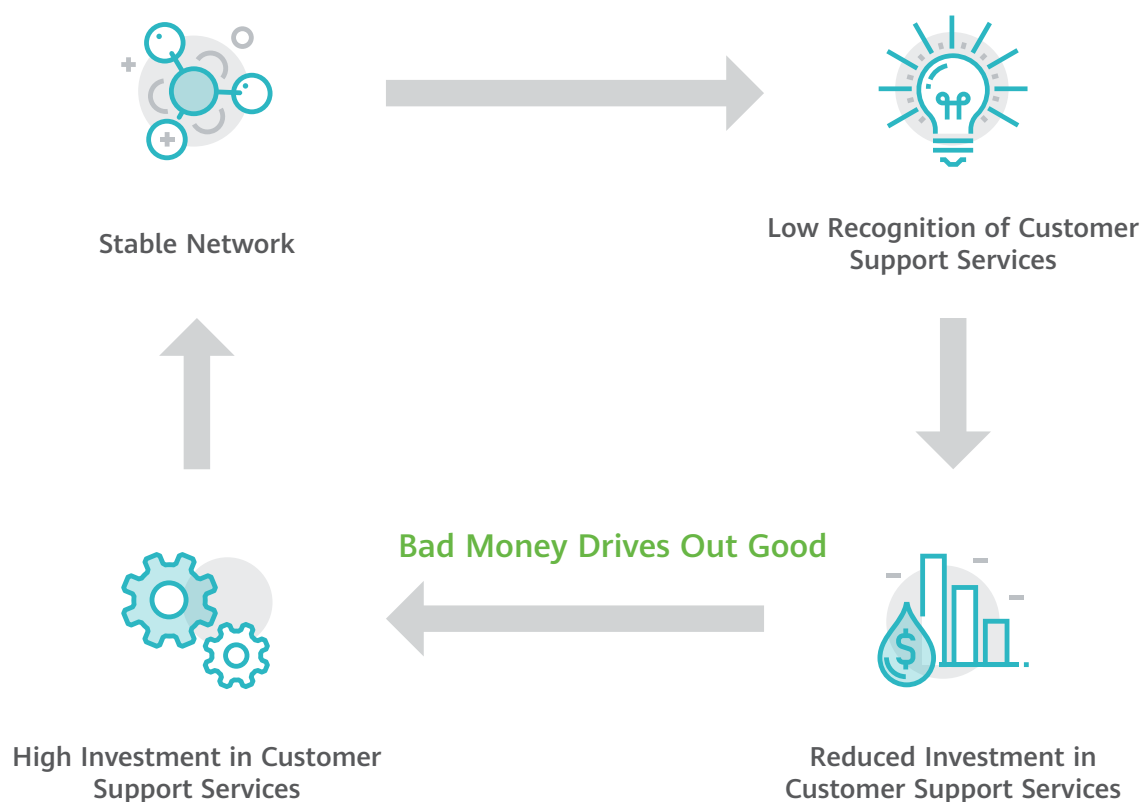


Increase Brand Value → Increase of Brand Competitiveness:

Customer support services should focus on not only the solution to the existing network issues, but also the subscriber experience and entire subscriber life cycle. Consumer network experience in the long-term should be protected to help operators to achieve the goal of enhancing brand value and become much more competitive in subscriber acquisition and retention.

Value Assessment Issues of Customer Support Services in the Current Telecommunications Industry

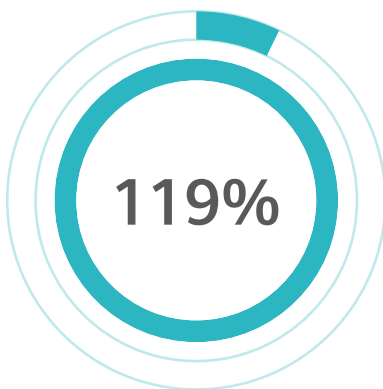
Operators are undergoing transformation and have new requirements on customer support services. Therefore, the evaluation method of customer support services must be changed accordingly, otherwise the value of O&M will be seriously underestimated. Traditionally, operators have their own evaluation methods. According to the interviews, most operators' traditional evaluation methods focus on reactive services. The value evaluation is performed through problem response, meaning the customer support services deliver value only when problems and emergencies occur. By using this assessment approach, the key indicators are often the absolute values of the workload, the invested resources, the handled problems and resolved emergencies etc. This approach is reasonable under some circumstances, but the evaluation dimensions are not comprehensive enough and exclude values brought by proactive and preventive customer support services and innovation. This approach easily misleads operators to a concept - the more problems or O&M investment, the higher value delivered. The approach may also lead to a deviation of value understanding, and further lead to a form of Gresham's law, which states that "bad money drives out good", in the market. In fact, the purpose of customer support services is to help operators ensure network security, reliability and efficiency. Therefore, if business interruptions are reduced under the protection of customer support services, the value to operators maximises.



In summary, the traditional evaluation approach cannot comprehensively analyse the value of customer support services, especially its impact on business. Therefore, this paper suggests to analyse the issue from three aspects: insufficient value protection recognition, insufficient value creation recognition and value communication barrier.

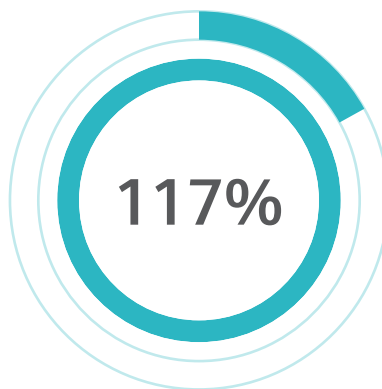
Insufficient Awareness of Value Protection

Insufficient awareness of value protection refers to the fact that the value contributed by customer support services in protecting network stability is limitedly recognised. At present, networks of some operators run stably and seldom encounter major incidents. Additionally, many people have an inherent stereotype that the sole purpose of customer support services is to solve issues and restore services. As a result, some operators consider that the value of customer support services are decreasing in the current stable network environment. But that is not the case. In fact, the current network risks remains at a high level. According to ENISA statistics of 28 EU member states and two EFTA countries^[1], the number of telecommunications incidents increased from 77 in 2012 to the highest of 169 in 2017 with a 119% increase, and remained approximately at 160 each year between 2016 and 2018. The overall number of affected subscribers tends to rise. The amount of user hours lost increased from 893 million in 2012 to the highest of 1943 million in 2017, increasing by about 117%. The number of network incidents is ascending overall, and the scale of impacts is expanding. By analysing the root causes, hardware faults, software change/upgrade problems, and other software-related problems are the three main problems which cause around 63% of incidents. These three happen to be the key items in the proactive services. It is easy to be ignored that the health and stability of networks are enabled by the “silent efforts” of the customer support services. The security of every single network requires the coordination of multiple capabilities and levels on top of the support from the frontline support engineers. In addition to quick responses and problem handling, the proactive services avoid most equipment faults through equipment health checks, timely fix software vulnerability through software update patches, and avoid most operational faults through services such as network risk handling, software upgrades and implementation. It is the proactive prevention that guarantees the stability of the current network.



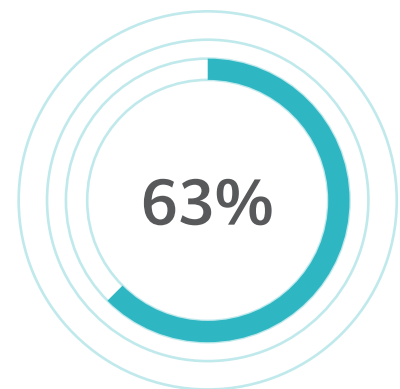
119%
INCREASE

Growth rate of number of faults from 2012 to 2017



117%
INCREASE

Growth rate of user hours lost from 2012 to 2017



63%
PROPORTION

Proportion of problems related to hardware, software and software updates/change

Insufficient Awareness of Value Creation

Insufficient value creation recognition refers to the fact that the potential of value creation is limitedly recognised. Telecommunication equipment manufacturers are continuously investing in new technologies to build the latest capabilities, and integrating services based on customer requirements and pain points to ensure that the latest capabilities can be opened to operators in the future and to cultivate and support operators' innovation capabilities. The new services are expected to support operators on both new operating model and new services. From the perspective of new operating model, leading telecommunication equipment manufacturers are using artificial intelligence and big data to build the maintenance platforms and new tools to enable the O&M team of operators, to reshape operating processes, tools, organisations and personnel, and to realise the innovation of operating model and the optimisation of operating cost structure. From the perspective of new services, operators continue to increase investment in 5G technologies. The development of 5G O&M by equipment vendors can effectively guarantee the commercial use of 5G network infrastructure. It is expected that this service can help operators ensure network stability and service continuity at the early stage of 5G commercial use, and increase subscriber satisfaction and brand image to increase revenue during the window of 5G development. While quickly constructing their own innovation capability, leading telecommunications equipment manufacturers can support operators on their operating models and service innovations to create new business value.

Value Communication Barrier

Value communication barrier refers to the lack of effective ways to measure and communicate value. The above discussion states the value recognition of customer support services, but how to effectively convey and communicate value is a key step in the process of service value management. In many cases, the value of customer support services is communicated in technical language, making operator executives difficult to visualise and perceive the positive impact of customer support services on business operation. To some extent, the inconsistency between technical language and business language impedes the exhibition of customer support services value in supporting the operator's business. Such communication barriers in fact have a negative impact on the recognition of value protection and creation.

In summary, the customer support services industry is in urgent need to construct an integrated value quantification system. To address it, Huawei has conducted a quantitative study on the value of customer support services. Based on the value management methodology and a large number of survey inputs, this study extracts value prepositions, analyses value levers, matches value points, builds calculation model, and eventually generates value reports to meet the requirements for value recognition from both the supply and demand, and form an effective input for the deepening value research of customer support services.

Value Analysis of Huawei Customer Support Services

Introduction of the Value Quantification Model

The study on customer support value quantification takes Huawei as an example and comprehensively assessed the financial impact of Huawei Customer Support Services on operators. The research includes the following items:



Research Principle

- The study is conducted in accordance with guiding principles, including factualism, comprehensive coverage, independence and orderly implementation.



Research Inputs

- Key academic research and industry reports related to the value delivered by customer support services are researched and analysed.
- Technical description and key delivery data of Huawei Customer Support Services are collected from global engineers, technical experts, service managers and domain experts.
- Delivery information and key cost/return data are collected from key stakeholders (core technical engineers, O&M supervisors, etc) of selected typical operators who are using Huawei Customer Support Services in major markets around the world.



Model Construction

- The value points with input from both supply and demand sides are identified, the value tree for value analysis is built, and the value lever and key effect indicators of each service are clarified.
- An overall basic hypothesis and a financial model are constructed, a comparative study with or without Huawei Customer Support Services is adopted as a design logic, and the value of Huawei Customer Support Services is deduced. All financial data and assumptions are derived from the obtained feedback, processed with comprehensive analyses and generalised to suit multiple scenarios.



Basic Assumptions

- Specific assumptions and calculation logic are designed based on different network types in the telecommunications industry to accommodate different types of Customer Support Services and operator needs.
- The overall model is built based on the current input data and the assumptions made under an ideal condition.
- All input data come from local operational data, Huawei global use cases, public reports and industry benchmarking data. The selection of data sources is to ensure data authenticity.

This study has been piloted on several operators around the world. During the pilot practices, the Customer Support Services managers and related leaders in operators provided positive feedbacks on the research results. Pilot operators recognised the rationality and credibility of the study methods, and agreed that it was possible to conduct a further in-depth financial analysis, which could be used as a research basis for future investment in Customer Support Services.

Analysis of Huawei Customer Support Services

Value Proposition

Huawei always adheres to the concept of “Secure Your Network, Value Your Business” to provide customers with high-quality services. Based on operators’ challenges and requirements on customer support services, Huawei provides customers with standard service packages and customised solution, which can ensure high network availability and stable system operations, reduce network operation risks, avoid economic and brand value losses, improve O&M efficiency, maximises ROI, and focus on core services. This study reviews and refines the value of Customer Support Services, sublimates the value proposition of S.A.F.E., and attempts to analyse the created business values from the four perspectives of S.A.F.E, including:

- **Secure Business:** to minimise unexpected outage duration and business loss through reduced business interruption and network risks.
- **Advance Efficiency:** to reduce maintenance workload and increase maintenance efficiency by proactively identifying and preventing risks and quickly handling problems.
- **Foster Innovation:** to leverage new technologies and new business and operating models to enable operators’ business innovation.
- **Enhance Competitiveness:** to establish a responsible brand awareness of corporate citizenship, improve talent competitiveness, enhance customer satisfaction, and meet compliance requirements.



S

Secure
Business



A

Advance
Efficiency



F

Foster
Innovation



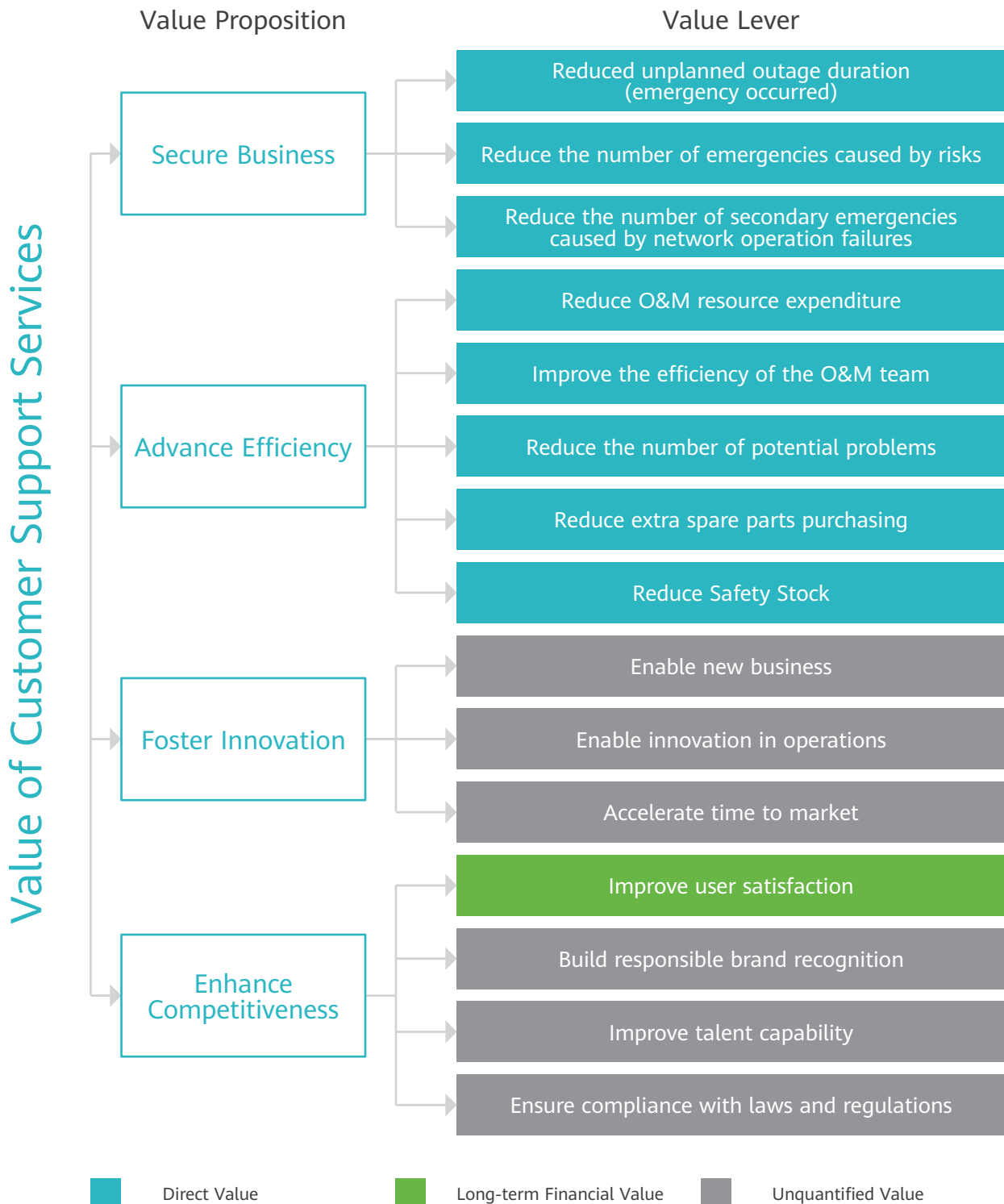
E

Enhance
Competitiveness

Huawei hopes to become the most committed S.A.F.E. partner of operators, and continuously brings more value to operators than expected and helps partners develop stably.

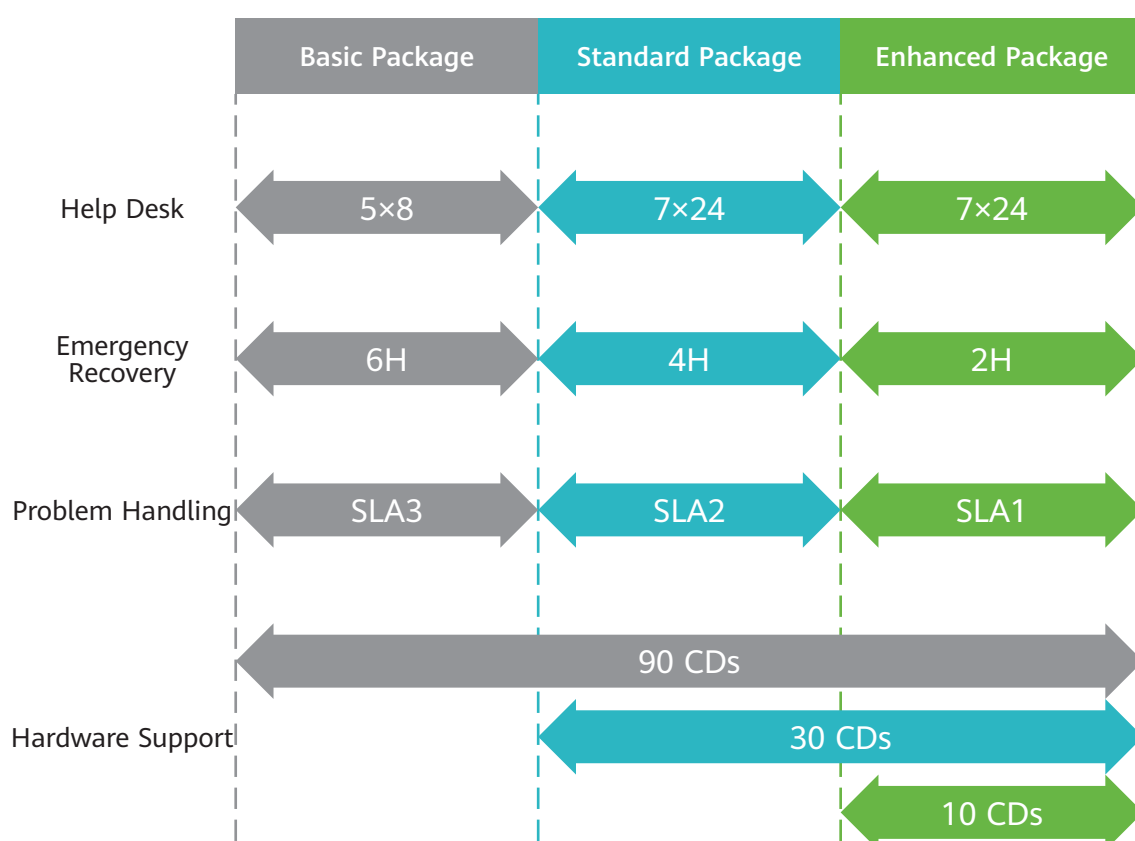
Value Levers

This research analyses Huawei's Customer Support Services from two aspects: the direct value and the long-term financial value. The direct value consists of three modules: revenue, operating cost and CAPEX. The long-term financial value mainly studies the contributed revenue of subscribers in their life cycle. Based on the value tree analysis, the value levers from the financial perspective are designed. And for those who are quantifiable (highlighted parts), corresponding calculation logics and models are developed. However, the financial quantification methods for some value levers have not been fully justified (or the research samples and data collected are not sufficient), and are not presented in this white paper.



Value Points Matching

Huawei takes S.A.F.E. as the service purpose and matches all value points based on the value levels. Based on the analysis of operators' requirements, after fully considering the combination of all value points, Huawei designs three levels of service packages: the Enhanced Package, the Standard Package and the Basic Package. This design is oriented to the final delivery result and value, targeting at ensuring operators' overall network stability.



Information of the Case Operator

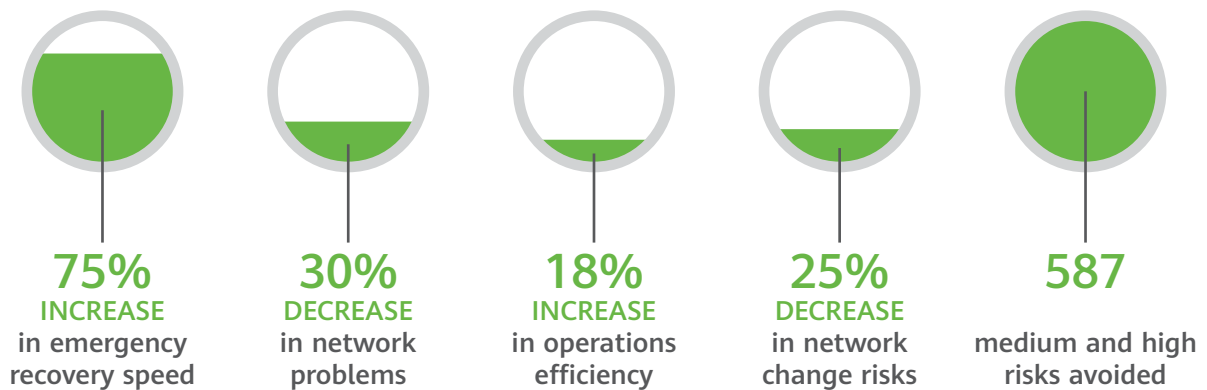
The high-level calculation logics of business value were analysed based on the mapping between value points and value levers, and the value metrics in the calculation logics were designed based on global use cases and expert interviews to construct the value quantification model. The model has been pilot tested globally. The financial values obtained from three typical operators are presented at the end of this white paper. In this chapter, one of the operators is selected as a typical case for analysis.

Basic information about the operator in this case:

- Annual revenue is about \$1.7 billion
- Number of subscribers is approximately 20 million
- Subscriber monthly ARPU is about \$7
- Maintains the cooperation with Huawei for many years and achieves excellent cooperation results

The operator in this case chose the Enhanced Package Service of Huawei Customer Support Services last year. The main service content includes Proactive and Reactive Services.

By using the services above, the O&M of the operator has been significantly improved. The major improvements are as follows:



- Emergency recovery speed increased by 75%
- Network problems reduced by 30%
- Operations efficiency increased by 18%
- Network change risk reduced by 25%
- 587 medium and high risks avoided throughout the year

In addition to the quantifiable values, there are still many values that are hard to quantify. For example, the interviewed operator engineers mentioned multiple times that the comfort brought by the company of Huawei engineers as Huawei Customer Support Services were reliable at all times, which is essential for engineers to keep good experience and performance in maintenance. Moreover, some services, such as key event assurance, cannot be generalised in quantification and should be analysed case by case. Therefore, they are not included in the white paper.

Business Value Analysis Overview

Based on the case operator information, this report quantifies the value of Huawei Customer Support Services items that are currently quantifiable. Business value brought by each service are identified through the value lever positioning, and are summarised according to the four aspects of the value proposition S.A.F.E. In short, the operator in this case gained a total financial value of about \$58,776,500 in the year of using Huawei Customer Support Services, including \$195,700 in business revenue security, about \$11,039,100 in operating cost savings, about \$3,000,000 in CAPEX savings, and about \$44,541,700 in long-term financial value protection.

Secure Business

Reduce Unplanned Outage Duration (Emergency Occurred)

In this case, Huawei provided a 24/7 emergency recovery service, which helped the operator recover business to a pre-outage and acceptable state as soon as possible. During the recovery process, the operator could quickly access Huawei's war room, which was formed by frontline support engineers, (G)TAC engineers and R&D maintenance experts. With supports from multiple platforms, the frontline support engineers gathered relevant information of network issues, and cooperated with (G)TAC engineers and R&D maintenance experts in analysing and locating problems. After that, the (G)TAC engineers provided the corresponding contingency and recovery solutions, for which frontline support engineers will help to provide guidance in implementation. The systematic service runs the entire emergency handling process with the highest efficiency.

Interviewees said that without the cooperation from Huawei frontline support engineers, (G)TAC engineers and R&D maintenance experts, the operator's O&M engineers would have spent more time browsing reference information and trying to locate the problems. Failure to locate the problem would result in an expansion of the reference range or a need to seek help from experts on issue location until a recovery solution is developed and implemented. A large amount of labour and time would be required for the operator. Generally, the recovery time without Huawei, depending on the technical ability of operator's O&M engineers, the completeness of fault recovery system and the level of knowledge accumulation, is 1-5 times longer than that with Huawei services.



Revenue Protected
through Reducing Unplanned
Outage Duration

\$14.6k

From the interviews, Huawei can improve about 75% in emergency recovery speed compared to the operator's speed. In this case, it took about 4 hours on average for the operator to recover from an emergency, and it took only 1 hour for Huawei to complete the same task, so the unplanned outage duration for each emergency is reduced by 3 hours on average. According to the delivery data, 20 emergencies happened last year, each of which affected about 25,000 people on average. Based on the current monthly operator's ARPU of \$7, in total the emergencies caused about \$19,400 in revenue loss. The 75% reduction in unplanned outage duration by Huawei Customer Support Services is equivalent to a 75% decrease in emergency losses, so the operator's business revenue of \$14,600 was protected.

Code	Parameter Name	Unit	Parameter Value
A1	Number of actual happened emergencies	—	20.00
A2	Average unplanned outage duration	Hour	4.00
A3	Average number of subscribers affected by the emergencies	—	25,000.00
A4	Operators monthly ARPU	USD	7.00
A5	The reduced proportion of outage duration of Huawei Customer Support Services	%	75.00%
Calculation Logic: $A0 = A1 \times A2 \times A3 \times (A4 \div 30 \div 24) \times A5$			
A0	Value contributed by Huawei Customer Support Services through reducing unplanned outage duration	Thousand USD	14.6

Reduce the Number of Emergencies Caused by Risks

Huawei Customer Support Services protects business revenue not only by means of the corrective response to emergencies, but also by means of the proactive avoidance of emergencies. In this case, Huawei helps the operator check and analyse equipment data, operation status, performance data and others. Huawei Customer Support Services has evolved from single product-focus to network security-focused, adopting a service and network perspective. Service flow and signalling flow are decomposed layer by layer, and cross-product network risks are identified from service, network and connection layers. In this way, network security is checked from the perspective of end-to-end service flows from the entire network. In addition, Huawei offers software update-related services for operators to fix bugs and improve performance in order to reduce risks. Huawei develops new patches to optimise software in order to tackle the potential threats from global network changes and to meet the needs of network optimisation. The risk avoidance that combines software and hardware measures can help operators reduce network problems and emergencies, reduce losses, and improve user satisfaction and brand effect.

Several operator engineers in this case indicated that the risk and vulnerability checks were usually backed by a large case library and cost a massive amount of time. If the operator engineers performed the work independently, some potential risks were likely omitted. Huawei provides direct solutions to most risks. For other risks that are overly complex or will incur high costs, Huawei also provides contingency solutions to avoid losses. These efforts are crucial for preventing emergencies.

Another noteworthy issue is that the Hardware Support Services also has a mitigating effect on risks. Some equipment or spare parts in the case operator's network are in EOM phase. Due to certain restrictions in supply chain, channel, etc, there will be risks in the acquisition and repair of these spare parts. And the stable running of related equipment and the continuity of support services may be impacted. Huawei provides Hardware Support Services for such spare parts to prevent the situation from happening. According to an analysis of all the EOM spare parts by Huawei engineers, Huawei global experience shows that EOM spare parts running on the live network may generate high risk, which might affect business continuity if there is no effective hardware support service.



Revenue Protected
through Reducing Emergencies
Caused by Risks

\$104.1k

According to the case input, Huawei identified 587 medium and high risks from hardware and software services. By a research conducted by Huawei, it can be assumed that a medium or a high unclosed risk has a probability of 0.51% to lead to a severe emergency. By using this probability number, it can be derived that Huawei Customer Support Services avoids about 2.97 potential severe emergencies. Based on Huawei's sample analysis of global typical severe emergencies in the past five years, the assumption that the emergency model of a network scale similar to the case operator results in 0.6 million subscribers being effected by 6 hours, and the operator current monthly ARPU is \$7, it can be calculated that all potential emergencies caused about \$104,100 in revenue loss. Huawei Customer Support Services can avoid these emergencies, namely, Huawei helps the operator proactively secure about \$104,100 revenue.

Code	Parameter Name	Unit	Parameter Value
B1	The medium and high risks identified and closed by Huawei Customer Support Services	—	587.00
B2	Assumed probability of typical severe emergencies caused by unclosed medium and high risks	%	0.51%
B3	Assumed number of subscribers impacted by a typical severe emergency	Thousand	600
B4	Assumed average unplanned outage duration of a typical severe emergency	Hour	6.00
B5	Operator's monthly ARPU	USD	7.00
Calculation Logic: B0 = B1 × B2 × B3 × B4 × (B5 ÷ 30 ÷ 24)			
B0	Value contributed by Huawei Customer Support Services through reducing the number of emergencies caused by risks	Thousand USD	104.10

Reduced the Number of Secondary Emergencies Caused by Operation Failure

Among all emergencies, the secondary risks that causes emergencies due to operational errors are one of the most common risks. Common network operations include software updates and network risk handling. Operator network operations are usually complicated. Therefore, comprehensive solution design, technical review, verification and implementation are required. Huawei can minimise implementation risks with the help of comprehensive, accumulated network operation technologies, processes and tools. According to the interview, in the case of the network risk handling solution templates are provided by Huawei, there are still roughly 15-35% of solutions which need a secondary optimisation and adjustment. With the help of a two-step solution review by Huawei (G)TAC engineers and R&D maintenance experts, a high-quality network risk handling solution can be assured to improve the success rate and the change security. The operator's engineers said that the network risk handling provided by Huawei can guarantee the excellent implementation success rate.



Revenue Protected through
Reducing Secondary
Emergencies Caused by
Operation Failure

\$77k

According to an assumption made by Huawei's operation research, among all the network risk handling and update implementation tasks of the case operator last year, about 25% of solutions needed a secondary optimisation, and these solutions were considered to cause the network risk handling failures. Based on the global statistics of network risk handling operation rollback and relevant critical emergencies last year, the emergency probability caused by network risk handling requested rollback is assumed to be 0.70%. According to the input from the operator, Huawei implemented a total of 1255 network risk handling and software update operations last year. Based on the previous analysis of solution rejection rate and emergency probability, 1255 network changes and software update operations will cause about 2.20 typical severe emergencies, which implies 2.20 typical severe emergencies in network operation were avoided by Huawei Customer Support Services. Assume the emergency model of a network scale similar to the case operator results in 0.6 million people being affected for 6 hours according to Huawei's sampling analysis of global emergencies in the past five years, it can be calculated that all potential emergencies caused about \$77,000 in revenue loss by using \$7 as the operator's current monthly ARPU.

Code	Parameter Name	Unit	Parameter Value
C1	Number of network implementation by Huawei Customer Support Services	—	1,255.00
C2	Assumed probability that an implementation solution which needs a secondary optimisation	%	25.00%
C3	Assumed probability that a network handling failure turns into an emergency	%	0.70%
C4	Assumed number of subscribers impacted by a typical severe emergency	Thousand	600
C5	Assumed average unplanned outage duration of a typical severe emergency	Hour	6.00
C6	Operator's monthly ARPU	USD	7.00
Calculation Logic: $C0 = C1 \times C2 \times C3 \times C4 \times C5 \times (C6 \div 30 \div 24)$			
C0	Value contributed by Huawei Customer Support Services through reducing number of secondary emergencies caused by operational failure	Thousand USD	77.00

Advance Efficiency

Reduce O&M Resource Expenditure

Huawei Customer Support Services can reduce resource expenditure on O&M work by a variety of ways, including problem handling and implementation. Huawei completes these works with high levels of quality and saves resource investments from operators. According to the interviews with O&M engineers of operators around the world, under the existing distribution of problem types, it takes about 16 – 64 man-hours to handle a non-critical problem on average, and more than 400 man-hours to handle a critical problem. Operators can replace this resource investment by Huawei Customer Support Services to handle problems which have been occurred.

Based on the interview, the case operator currently needs to invest 16 man-hours, or 2 man-days, to deal with a non-critical subscriber service request on average. According to delivery data, Huawei handled approximately 4,500 non-critical service requests and required a resource input of 72,000 man-hours for the operator last year. Critical service requests require a prompt response and a 24/7 standby, so frontline support engineers are directly dispatched to solve the critical service requests. Meanwhile, (G)TAC engineers and R&D maintenance experts are integrated to form a special team for solving critical service requests. Altogether, critical service requests require higher resources investment. According to the input from the case operator, one critical service request generally needs seven engineers and about 64 hours. Huawei processed about five critical service requests for the operator last year, which required 2,240 man-hours of resources. According to the input from research and interviews, assuming that at present the average cost of an operator O&M engineer was about \$25 per hour, all the problem handlings cost the operator about \$1,856,000. Huawei Customer Support Services covered this part of the work and bore these resource expenditures. Thus, Huawei Customer Support Services reduced the labour cost, which was equivalent to an operating cost saving of \$1,856,000.

During the implementation, Huawei provided the case operator multiple implementation services, which not only guaranteed an ultra-high success rate of implementation, but also reduced the handling and deployment workload of the O&M team to enhance their efficiency.



Operating Cost Saved through
Reducing O&M Resource
Expenditure

\$3.67m

Based on the interview, the operator currently needs to invest 48 man-hours, or 6 man-days, to conduct one network risk handling. According to the delivery data last year, Huawei completed around 1000 network risk handlings, meaning that the operator would have invested 48,000 man-hours. For the operator in this case, a whole network software update implementation (including first node implementation) needs an average of around 96 man-hours, or 12 man-days. Last year, Huawei helped the operator implement 255 upgrades, which would have required the operators 24,500 man-hours. As previously illustrated, assuming that at present the average cost of an operator O&M engineer was about \$25 per hour, all the implementations cost the operator about \$1,812,500. These investments can be covered by Huawei Customer Support Services, which reduces the labour cost of O&M department, and saves \$1,812,500 operating cost. In terms of the value lever of reducing O&M resource expenditure, Huawei Customer Support Services saved the operator about \$3,668,50 operating cost in total.

Code	Parameter Name	Unit	Parameter Value
D1	Average resource to handle a non-critical subscriber service request by the operator	Man-hour	16.00
D2	Number of subscriber service requests handled by Huawei for the operator	—	4500.00
D3	Average resource to handle a critical subscriber service request by the operator	Man-hour	448.00
D4	Number of critical subscriber service requests handled by Huawei for the operator	—	5.00
D5	Average resource to handle a network risk by the operator	Man-hour	48.00
D6	Number of network risks handled by Huawei for the operator	—	1000.00
D7	Average resource to software update by the operator	Man-hour	96.00
D8	Number of software updates handled by Huawei for the operator	—	255.00
D9	Average cost per hour of an operator O&M engineer	USD	25.00
Calculation Logic: D0 = (D1 × D2 + D3 × D4 + D5 × D6 + D7 × D8) × D9			
D0	Value contributed by Huawei Customer Support Services through reducing resource investment of operation and maintenance work (has incurred)	Million USD	3.67

Improve the Work Efficiency of O&M Department

Huawei enabled and assisted the O&M department of the case operator to deal with problems and improved the overall work efficiency. On the one hand, Huawei sent frontline support engineers to operator's sites for technical support services. The frontline support engineers transfer the techniques of information collection and issue location, quickly locate and solve simple problems with the operator, and answer technical questions on the site. These actions improved the problem-solving speed of the entire O&M department. On the other hand, Huawei releases the latest technical information, comprehensive after-sales technical materials and technical cases, and share Huawei's global maintenance experience. All of these helped the operator obtain Huawei's product information and master the latest maintenance experience and skills in a timely manner. When operator engineers have access to the global technical information, they can learn new technical cases and experiences across global networks and guide the practical problem-solving process. Technical information sharing not only brings more case experience to O&M engineers. but also helps other members to learn and use the prompt response solutions, organised from common questions. According to the data from interviews, Huawei Customer Support Services can improve the efficiency of the entire O&M department by about 10-30%.



Problem Handling Cost Saved
through Improving the
Efficiency of O&M Department

\$1.36m

According to the case input, the call centres of the operator receive around 850 thousand problem reports from subscribers each year, while one handling costs about \$10. NOC processes about 1.46 million service requests every year, and one handling costs about \$15 on average. An on-site team processes about 3 million work orders each year, and one handling costs about \$20 on average. That is, the operator's O&M department spent a total cost of \$90,400,000 in handling service requests last year. According to multiple expert interviews, Huawei equipment accounts for 75% of the operator's overall equipment. Assuming that equipment problem accounts for 13% of all problems, the handling costs of Huawei equipment problems were about \$8,814,000. Data from interview show that Huawei can provide multiple supports for different teams in the O&M department. It can be assumed that Huawei can help the call centres improve efficiency by 10% and help the NOC and the on-site support team improve efficiency by 16%, after considering the percentage of service requests that escalated from the NOC front office to the back office. Huawei Customer Support Services helped the operator save problem handling cost of around \$1,360,500.

Code	Parameter Name	Unit	Parameter Value
E1	Number of problem reports from subscribers received by the operator's call centres	Thousand	850
E2	Average cost of a problem report handled by the operator's call centres	USD	10.00
E3	Number of service requests handled by the operator's NOC	Million	1.46
E4	Average cost of a service request handled by the operator's NOC	USD	15.00
E5	Number of maintenance work order handled by the operator's on-site team	Million	3.00
E6	Average cost of a maintenance work order handled by the operator's on-site team	USD	20.00
E7	Assumed proportion of Huawei equipment	%	75.00%
E8	Assumed proportion of problems related to equipment	%	13.00%
E9	Assumed proportion of call centre efficiency improved by Huawei Customer Support Services	%	10.00%
E10	Assumed proportion of NOC team efficiency improved by Huawei Customer Support Services	%	16.00%
E11	Assumed proportion of on-site support team efficiency improved by Huawei Customer Support Services	%	16.00%
Calculation Logic: $E0 = (E1 \times E2 \times E9 + E3 \times E4 \times E10 + E5 \times E6 \times E11) \times E7 \times E8$			
E0	Value contributed by Huawei Customer Support Services through improving the work efficiency of O&M department	Million USD	1.36

Reduce the Number of Potential Problems

The O&M department of the operator in this case is running at full capacity to meet the internal maintenance requirements. As the network scale is growing, the solutions to prevent and eliminate more network problems becomes particularly essential. As mentioned above, the case operator adopted Huawei services to examine and eliminate risks at both the hardware and the software levels. The services reduced the risks from the whole network, so the operator did not need to invest extra resources to solve the network problems which were caused by potential risks. Huawei helped the operator to eliminate potential problems at the equipment and network level, identified possible causes that lead to potential problems, explored root causes, and provided reports with corresponding measures. In other words, Huawei Customer Support Services reduced the workload of the operator's O&M team in advance and improved their work efficiency. In terms of software, Huawei provided the software patches that resolved existing bugs in the software, and optimised and enhanced the performance of the software. These services also effectively prevented problems caused by software, thus complaints from subscribers were reduced and pressure on the O&M department was relieved. In interviews with multiple operators, O&M engineers indicated that 20% - 40% of potential problems could be effectively avoided in advance by examining and eliminating risks.



Operating Cost Saved through Reducing Potential Problems

\$2.64m

According to the case input, the call centres of the operator receives around 850,000 problem reports from subscribers each year, with an average handling cost of around \$10. The NOC processes about 1.46 million service requests every year, with an average handling cost of around \$15. The on-site team processes about 3 million work orders each year, with an average handling cost of around \$20. In other words, the operator's O&M department spent a total of \$90,400,000 in dealing with problems last year. According to the expert interviews, Huawei equipment accounted for 75% of the operator's overall equipment. Assuming that equipment problems account for 13% of all problems, the handling costs of Huawei equipment related problems were about \$8,814,000. Making a conservative calculation based on last year's delivery data, Huawei Customer Support Services helped the case operator identify and avoid 587 medium and high risks. Based on the input from the operator's O&M engineers, it is assumed that the potential problems, accounts for 30% of the current total problems, could be avoided. In this case, the O&M team did not need to invest extra resources to handle these problems, and save an operating cost of \$2,644,200.

Code	Parameter name	Unit	Parameter value
F1	Number of problem reports from subscribers received by operator's call centres	Thousand	850
F2	Average cost of a problem report handled by the operator's call centres	USD	10.00
F3	Number of service requests handled by the operator's NOC	Million	1.46
F4	Average cost of a service request handled by the operator's NOC	USD	15.00
F5	Number of maintenance work orders handled by the operator's on-site team	Million	300.00
F6	Average cost of a maintenance work order handled by the operator's on-site team	USD	20.00
F7	Assumed proportion of Huawei equipment	%	75.00%
F8	Assumed proportion of problems related to equipment	%	13.00%
F9	Assumed proportion of potential problems avoided in advance by Huawei Customer Support Services	%	30.00%
Calculation logic: F0 = (F1 × F2 + F3 × F4 + F5 × F6) × F7 × F8 × F9			
F0	Value contributed by Huawei Customer Support Services through reducing the number of potential problems (have not occurred)	Million USD	2.64

Reduce Extra Spare Parts Purchasing

Every year, the operator in this case must repair and replace a large number of spare parts, requiring the operator to invest massive capital. Huawei Hardware Support service provides the operator with a repair or a replacement service for faulty parts within an agreed timeframe, helping the operator save in CAPEX. The hardware services include the hardware repair and the hardware replacement. Hardware repair means that Huawei receives faulty parts from the operator at the designated location and sends back to the factory. After repairing, the repaired parts are returned to the operator's designated location. Hardware replacement means that Huawei receives the faulty parts from the operator at the designated location and then sends the replacement part to the agreed location. The operator does not need to buy new spare parts to replenishing their safety stock by using either service. Each service can save a significant amount of CAPEX for the operator every year.



CAPEX and Operating Cost
Saved through Reducing Extra
Spare Parts Purchasing

\$3.24m

The delivery data of the operator in this case shows that a total of 3,000 spare parts were supported by different levels of the Hardware Support service last year. Based on the price survey for the market buyable spare parts and the assumption that the distribution of current replaced or repaired parts across product lines maintained, the weighted average market transaction price for a spare part is about \$1,000. As a result, Huawei Hardware Support service helped the operator save \$3,000,000 in CAPEX. Moreover, in consideration of the cost that relates to fund raising and spending, if the capital cost rate is assumed to be 8%, the Huawei Hardware Support service helped save an extra \$240,000 in capital cost, which belongs to operating costs for the operator.

Code	Parameter name	Unit	Parameter value
G1	Number of spare parts in the Hardware Support service provided by Huawei Customer Support Services	—	3000.00
G2	Average transaction price of a spare part in Hardware Support provided by Huawei Customer Support Services	USD	1000.00
G3	Capital cost rate	%	8%

Calculation logic: $G0a = G1 \times G2$

G0a	Value of CAPEX saving contributed by Huawei Customer Support Services through reducing extra spare parts purchasing	Million USD	3.00
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Calculation logic: $G0b = G0a \times G3$

G0b	Value of operation cost saving contributed by Huawei Customer Support Services through reducing extra spare parts purchasing	Thousand USD	240.00
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Reduce Safety Stock

In fact, the help provided by the Hardware Support service goes further than discussed above. Compared to the buyout mode, the hardware repair and replacement is able to complete the delivery process in a shorter time. The delivery speed directly affects the number of spare parts and the corresponding operating costs. According to interviews with multiple operator's engineers, it takes about 90 days to deliver hardware in the current buyout mode, after considering the procurement and production time of the supply chain. However, with the Huawei Hardware Support, the hardware can be delivered in as fast as 10 days.



Operating Cost Saved through
Reducing Safety Stock

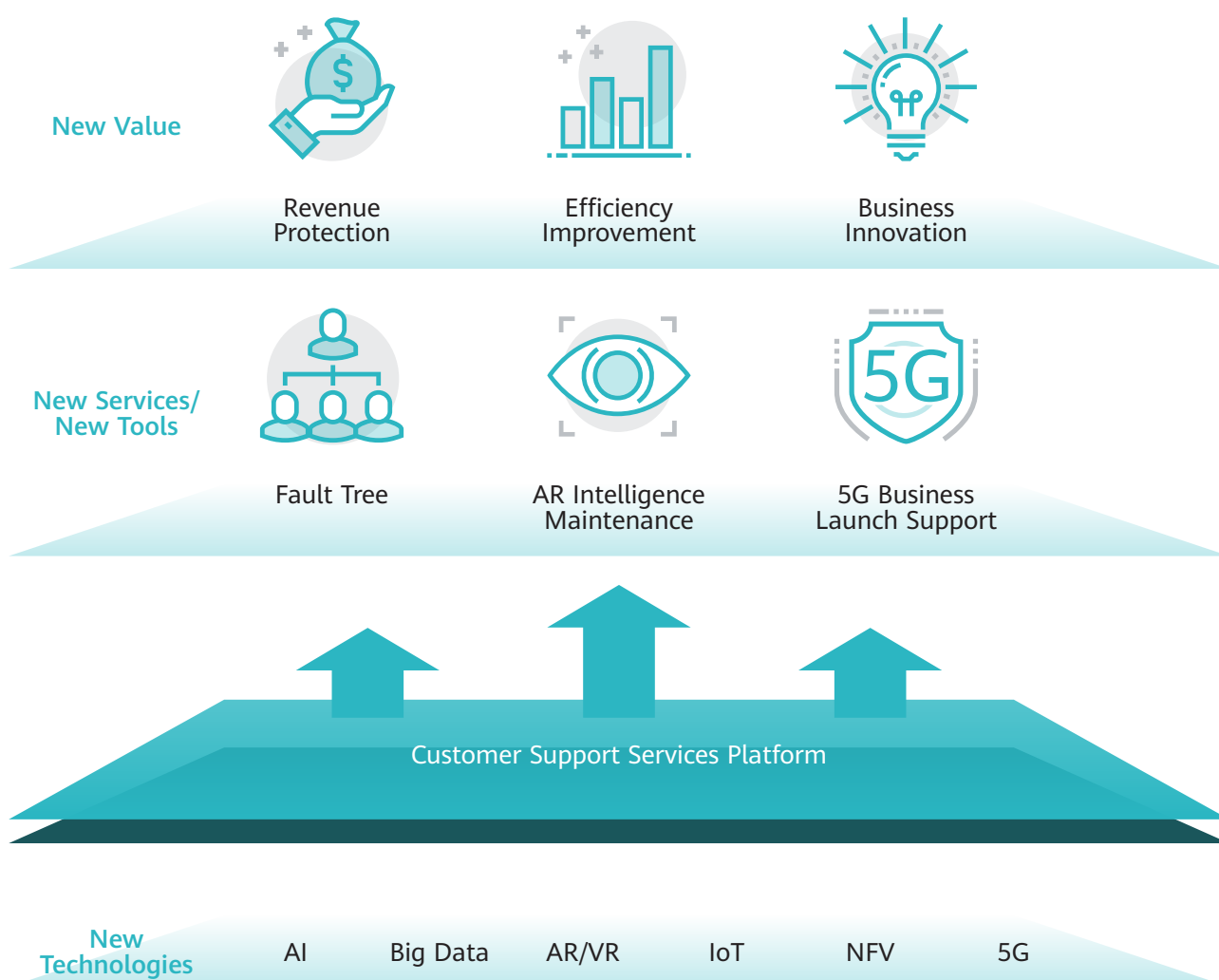
\$3.13m

According to the distribution of network devices and the recommended spare parts purchase ratio from the case operator, the spare part safety stock was 37,188 last year, calculated by Poisson distribution when the hardware procurement cycle was 90 days. The operator in this case chose the hardware replacement service and, according to the agreed hardware delivery SLA, the safety stock was 21,556, calculated by the same method. Therefore, 15,622 spare parts were saved from the safety stock last year by the hardware replacement service. The current replaced or repaired part distribution across operators' product lines was assumed to stay the same, and the weighted average market transaction price for each spare part is \$1000. For these high-value spare parts which need to work with the related fixed assets, depreciation should be calculated based on the fixed assets. It is conservatively estimated that the spare parts depreciate at a rate of 20% every year. As a result, the Huawei Customer Support Services helped the operator save a safety stock operating cost of \$3,126,400.

Code	Parameter name	Unit	Parameter value
H1	Safety stock without Huawei Hardware Support service	—	37,188
H2	Safety stock with Huawei Hardware Support service	—	21,556
H3	Average transaction price of a spare part in Hardware Support provided by Huawei Customer Support Services	USD	1000.00
H4	Depreciation rate of spare parts	%	20.00%
Calculation logic: $H0 = (H1 - H2) \times H3 \times H4$			
H0	Value contributed by Huawei Customer Support Services through reducing safety stock	Million USD	3.13

Foster Innovation

Huawei is committed to the development and application of new technologies and capabilities, and so are the Customer Support Services. Huawei is constantly investing in new technologies, such as artificial intelligence, machine learning, 5G, etc. Based on the in-depth understanding of new technologies, Huawei develops specialised and innovative services that will help support operators in their business and operations innovation in the future.



In terms of new business support, Huawei has developed the capability of 5G business launch support which is expected to help operators realise a smooth transition to 5G networks. Huawei will ensure the stable and efficient operation of 5G infrastructure networks and a high-quality subscriber experience at the initial stage of commercial use. Operators may face a series of challenges during the initial stage of 5G deployment:

- Challenges of 5G ultimate rate, including fixed-point demonstration peak rate and guaranteed rate for commercial terminals anytime and anywhere.
- Challenges in the stable running of network equipment, including the impact of 5G on 4G traffic, impact on bearer channels, impact on NSA signalling and user traffic overload risks.

- Risks of immature terminals and compatibility of terminals and network
- Challenges to fault demarcation and locating due to non-typical networking models, inter-RAT networking and multi-vendor networking in the initial stage of 5G deployment.
- Challenges regarding equipment parameter settings, network capacity evaluation and assurance monitoring during the initial stage of 5G network operation.

Based on the operators' needs, Huawei provides the E2E process and solution for 5G infrastructure network commercialization assurance, from the perspectives of risk identification, problem prevention and security assurance. This ensures stable and smooth networks during the initial stage of 5G commercial use, and improves subscriber loyalty and the operator's brand image. By replicating mature the network assurance capability of the operators' O&M teams can also be improved. Huawei help operators maximise the ROI by supporting business growth with a limited input at the initial stage of the new business.

Additionally, Huawei continuously optimises its operations platform capabilities, which help operators use the Huawei back-office operation tools to improve their overall O&M efficiency. These operations platform capabilities enable omni-channel, one-stop access to self-service and collaboration functions, and aim to allow operators to resolve problems, improve problem-solving efficiency and provide online and remote supports without time or location constraints.

Using the intelligent scheduling capability as an example, the platform can match the optimal engineer intelligently based on service history and engineer profile. The traditional way is that engineers are randomly selected in turn by time. Operators' engineers often meet new "faces" and are unable to find the engineer that cooperates the most or best meets the requirement, causing problems such as increased communication costs and wasted resources. Through intelligent scheduling capability, service resources are allocated on demand according to product skills, positions, satisfaction and other indicators in order to help operators' engineers find the "right people" as quickly as possible. This action can reduce communication costs and improve the satisfaction of O&M engineers, thus improving overall problem handling efficiency.

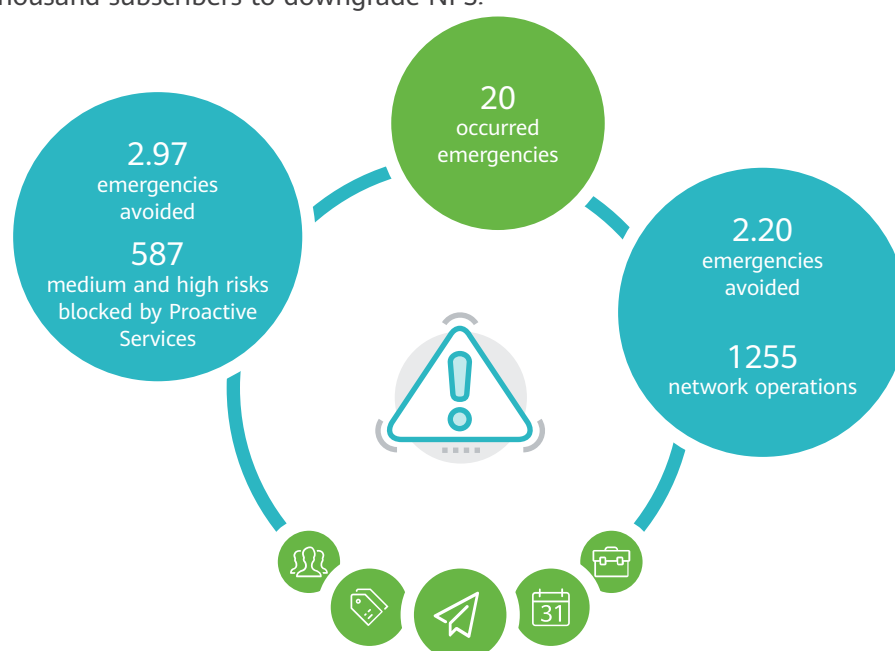
Admittedly, most of the services related to fostering innovation are still under development or in pilot tests, so there is not enough time or samples to verify the value hypothesis. Therefore, this study focuses on qualitative analysis rather than quantitative research for the services related to fostering innovation.

Enhance Competitiveness

As the voice of the consumer is stronger than ever, brand value has become crucial for operators. We should adopt a dynamic perspective when looking at consumers. Every behaviour that affects consumer experiences will not only affect the current business, but also have a huge impact on the consumption throughout the consumer life cycle. In the process of providing Customer Support Services, Huawei can secure consumer experiences through emergency prevention and emergency response. In this study, the influence model of Customer Support Services on NPS is built on certain assumptions to calculate the long-term financial value of Customer Support Services. The model assumes that the unplanned network outage impacts the user experience, and so has a negative impact on NPS. Huawei Customer Support Services can prevent or reduce the negative impact to some extent by emergency avoidance and emergency response.

For emergency prevention, the operator in this case has blocked 587 medium and high risks through Proactive Services. Based on the probability of severe emergencies caused by risks which has been explained in the previous sections, approximately 2.97 emergencies were avoided. Huawei conducted 1255 times of network operations for the operator to avoid any secondary risks resulted from the network operations. Based on the previously discussed probability of an emergency caused by a network operation failure, about 2.20 emergencies were avoided. According to Huawei's sampling analysis of global typical emergencies in the past five years, it can be assumed that 600,000 subscribers will be impacted for 6 hours in a typical emergency situation for a network with size similar to the case operator. Therefore, Huawei helped the operator avoid emergencies that could impact about 3.10 million subscribers. As these subscribers had not been affected by the outages, NPS did not decrease.

For emergency response, the operator in this case successfully shortened the unplanned outage duration and reduced the impact on consumer NPS through Huawei Customer Support Services. As discussed before, Huawei helped the operator handle 20 unplanned outages, each of which generally affects 25,000 subscribers for more than 4 hours. Based on interviews with telecommunications industry experts and typical case studies, the model assumes that once the unplanned outage duration is more than 4 hours, the NPS rating of a subscriber who is directly impacted by the emergency downgrades. Huawei services can reduce the unplanned outage duration to less than 1 hour, so the outages do not cause a significant impact on subscriber NPS. Without Huawei Customer Support Services, these emergencies will cause about 500 thousand subscribers to downgrade NPS.



Code	Parameter name	Unit	Parameter value
I1	Number of medium and high risks identified and closed by Huawei Customer Support Services	—	587.00
I2	Assumed probability of typical severe emergencies caused by unclosed medium and high risks	%	0.51%
I3	Number of network operations implemented by Huawei Customer Support Services	—	1,255.00
I4	Assumed probability that an implementation solution which needs a secondary optimisation	%	25.00%
I5	Probability of emergencies caused by network operation failure	%	0.70%
I6	Assumed number of subscribers affected by a typical severe emergency	Thousand	600.00
I7	Actual number of emergencies	—	20.00
I8	Average number of subscribers affected by an emergency	Thousand	25.00

Calculation logic: I0 = (I1 × I2 + I3 × I4 × I5) × I6 + I7 × I8

I0	Number of subscribers protected from network emergency impacts through Huawei Customer Support Services	Million	3.60
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According to the analysis above, Huawei help the operator prevent about 3.6 million subscribers from downgrading NPS due to emergencies last year. These subscribers account for about 18.02% of the operator's total subscribers. According to the case operator, its current NPS is 10.5. Assuming that about 25.25% of subscribers are promoters, 60% are passives and 14.75% are detractors, then there are 5,050,000 promoters, 12,000,000 passives and 2,950,000 detractors. Assuming that the potentially impacted subscribers are evenly distributed among the above three types of subscribers, then there are 910,000 promoters, 2,162,400 passive subscribers and 531,600 detractors who will be affected. These subscribers will downgrade NPS progressively, i.e. the promoters will become the passives and the original passives will change to the detractors. Therefore, without Huawei Customer Support Services, the number of promoters will change from 5,050,000 to 4,140,000 by deducting the impacted 910,000 promoters. Similarly, the number of passives will change from 12,000,000 to 10,747,600 people by deducting the impacted 2,162,400 passives and adding the 910,000 downgraded promoters. The number of detractors will change from 2,950,000 to 5,112,400 by adding 2,162,400 downgraded passives.

Therefore, without Huawei Customer Support Services, the NPS may change, with the proportion of promoters reducing to 20.70% and the proportion of detractors increasing to 25.56%. As shown in the following figure, it can be deduced that the NPS will be reduced from the 10.5 to -4.86%. In other words, the NPS value protected by Huawei Customer Support Services is 15.36%.

	Unit	Code	Promoter	Code	Passive	Code	Derogator
Subscriber distribution - without Customer Support Services	Thousand	J1	4,140.0	J2	10,747.6	J3	5,112.4
Subscriber distribution - with Customer Support Services	Thousand	J4	910.0	J5	2,162.4	J6	531.6
Actual Subscriber distribution	Thousand	J7	5,050.0	J8	12,000.0	J9	2,950.0

Calculation logic: J1 = J7 - J4

Calculation logic: J2 = J8 - J5 + J4

Calculation logic: J3 = J9 + J5

Based on telecommunications industry expert interviews and typical case studies, NPS have impacts on churn rate and new subscriber acquisition rate. The influence coefficient is set that for every 1% increase in NPS, the churn rate decreases by 0.25% and the new subscriber acquisition rate increases by 0.25%. The NPS value protected by Huawei Customer Support Services is about 15.36%, which impacts the churn rate and the new acquisition rate by 3.84%. The number of telecommunications service subscribers of the operators in the study is approximately 20 million, and the current annual churn rate and new acquisition rate are 2.0% and 2.5% respectively. Therefore, the number of subscribers retained and newly acquired by Huawei Customer Support Services is about 35,000. Since the current monthly ARPU of the operator in this case is \$7, the annual revenue secured for this year is \$2,938,000. The subscriber life cycle is calculated as follows: Subscriber life cycle = 1 / Churn rate. And the maximum subscriber life cycle is set at 20 years. The average subscriber life cycle of the operator in this case is about 20 years. The secured income over the 20-year period should be accumulated, taking into account the impact of the 3.1% discount rate (calculated at the inflation rate). In this case, the protected subscribers can contribute about \$44,541,700 to the revenue of the operator over the entire subscriber life cycle.

Code	Parameter Name	Unit	Parameter Value
K1	Number of subscribers	Million	20.00
K2	Churn rate of the operator	%	2.00%
K3	New subscriber acquisition rate of the operator	%	2.50%
K4	NPS value protected by Huawei for the operator	%	15.36%
K5	Influence coefficient of NPS change on the churn rate and new subscriber acquisition rate	%	25.00%
K6	Operator's monthly ARPU	USD	7.00
K7	Average subscriber life cycle of the operator	Year	20.00
K8	Discount rate (calculated at the inflation rate)	%	3.10%
Calculation logic: $K0 = \{K1 \times (K2 + K3) \times K4 \times K5 \times K6 \times 12\} \times \sum_{t=1}^{K7} \frac{1}{(1+K8)^{K7-t}}$			
K0	Long-term brand value contributed by Huawei Customer Support Services	Million USD	44.54

To sum up, Huawei Customer Support Services secure the long-term revenue within the subscriber life cycle. These benefits can be split into specific value levers:

- Contributed \$6,179,400 by reducing unplanned outage duration
- Contributed \$22,047,200 by reducing number of emergencies caused by risks
- Contributed \$16,315,100 by reducing number of secondary emergencies caused by network operation failure

External Factors and Underlying Assumptions

Huawei Customer Support Services are not a mechanical service. Instead, it needs to form an organic whole with the operator's O&M department to achieve the optimal status and provide full support for the operator's operation and maintenance. In this report, there are mainly two kinds of external impact factors: facility impact and personnel impact. The facility impact mainly refers to the fact that service access, data quality and adaptive procedure should meet Huawei's requirements in the process of providing services to operators. Personnel impact means that the engineers who communicate and cooperate with Huawei should have sufficient skills and experience level, follow the standard work process, have a positive attitude to work and cooperate, and so on. All these external factors will impact the final effect of Huawei Customer Support Services. The calculation is therefore based on ideal situations and the specific requirements are clearly stated in the "Customer Support Services Proposals". It is worth noting that this research is a deduction based on probability and does not mean that the situation without Huawei Customer Support Services will inevitably happen.

It should also be noted that, due to confidential requirements from pilot operators, all the operations and delivery data has been fuzzified with small-range proportional adjustment, so as to make the results as close to the real case as possible under an unchanged total workload. Any resemblances to any operator's actual operational data is purely coincidental. In this paper, all calculations parameters are displayed with two decimal places, but the actual calculation does not perform the rounding. Therefore, the results calculated using the parameters shown above may be slightly different from the results shown above.

During the overall process of value quantification, some basic assumptions need to be clarified here to facilitate understanding of the computational logic.

Parameter	Value
Working time of each weekday	8 hours
Total consumption time of a subscriber in a month	720 hours
Total duration of weekdays per week	40 hours
The number of subscribers impacted by a typical emergency, with the network scale as for the operator in this case	600,000 people
The duration of a typical emergency with network scale as for the operator in this case	6 hours

The impact of subscriber package and payment type are not taken into account and the business value brought by subscribers is distributed evenly over each hour, in order to estimate the value of securing business.

Subscribers affected by each emergency do not overlap

The secondary handling cost caused by problem-solving errors is not considered

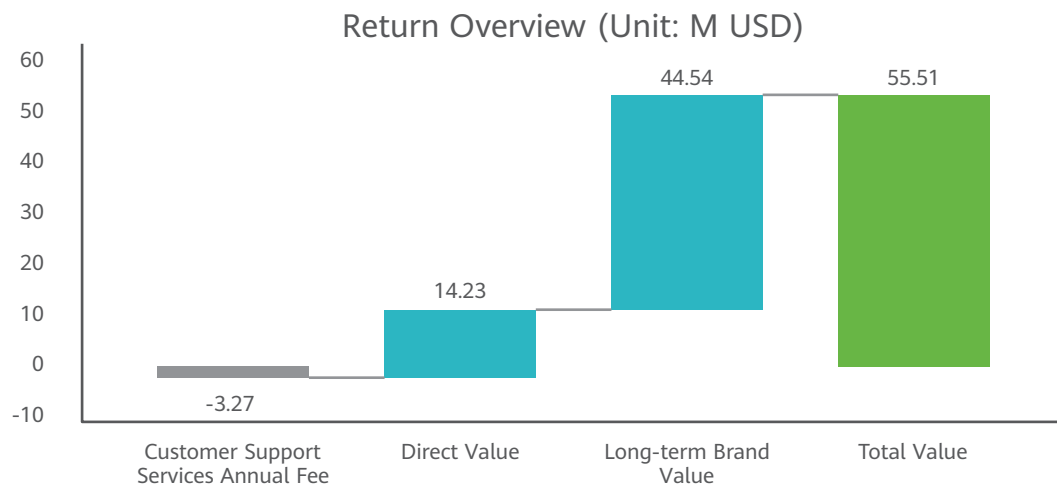
The equipment fault rate is assumed to be the same for all vendors

ROI analysis of Huawei Customer Support Services

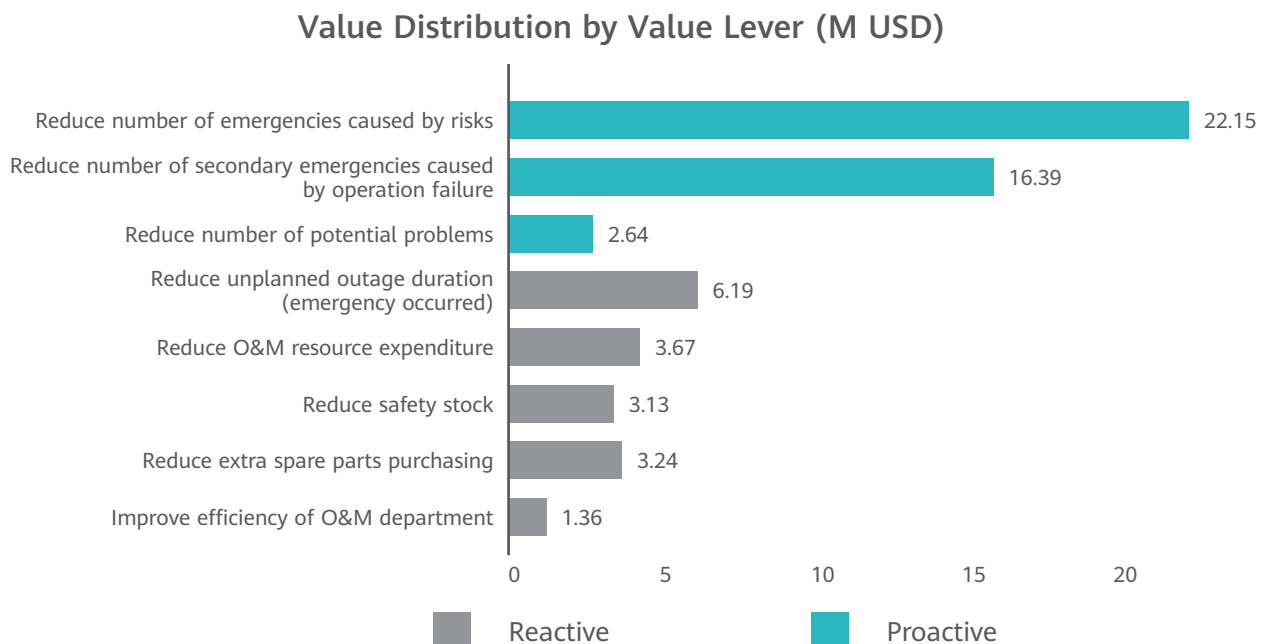
Return Analysis

According to the financial results in the previous case study, the financial impact of Huawei Customer Support Services on the operator in this case includes the overall return analysis and service item combination analysis. In this way, the real value of Customer Support Services can be reviewed in a more logical and systematic way.

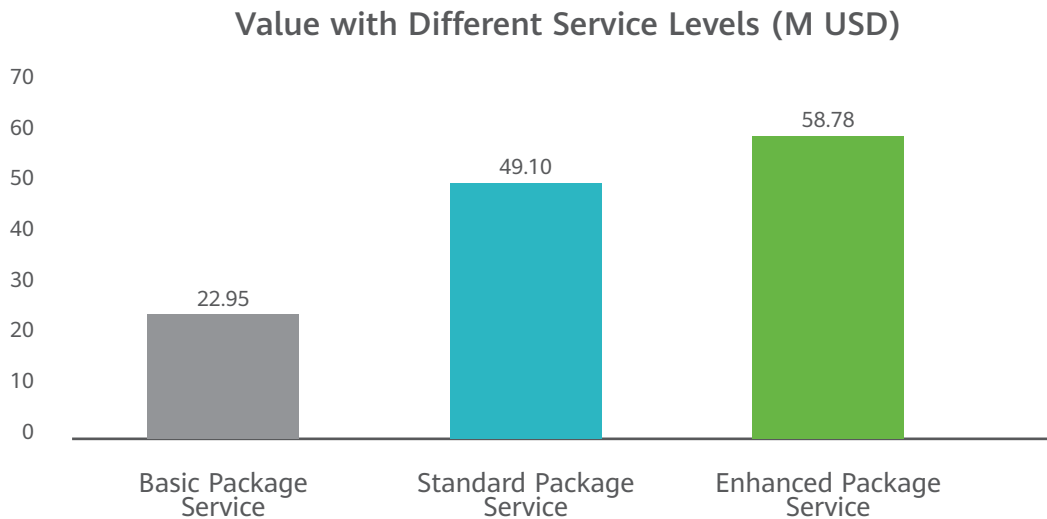
Firstly, although the Customer Support Services can bring obvious immediate value, as the direct ROI is 335.31%, the long-term financial value brought by maintaining the network stability is even more significant, with the long-term comprehensive ROI of 1697.45%. The value can be broken down into the financial items as shown in the figure below:



Secondly, as shown in the figure below, when the value of the Customer Support Services is split based on the value levers, taking into account the value of the entire subscriber life cycle, the data shows that the value from proactive work is significantly higher. Therefore, the value of proactive work can be fully reflected when we view network stability from a subscribe lifecycle perspective.



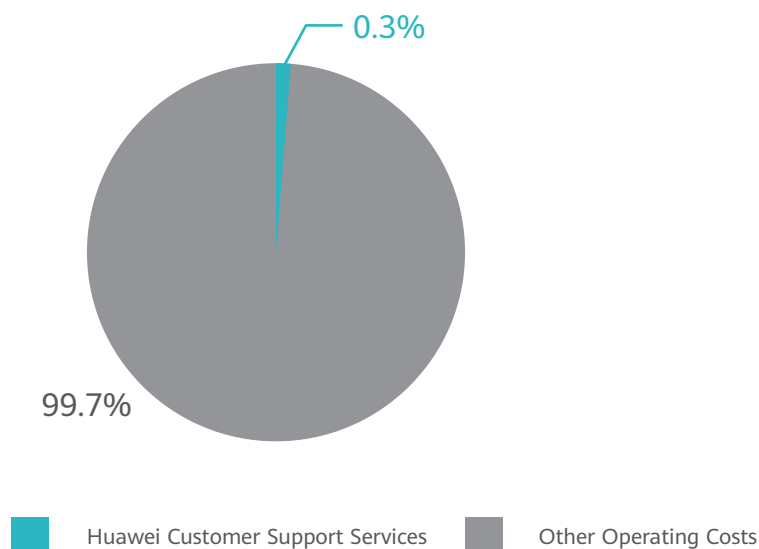
Finally, assuming that all workloads remain unchanged, the value of the three service packages are calculated according to the delivery level of the operator in this case. The data shows that the total value increases with the improvement of the service level, as shown in the figure below. The reason for this obvious change is that the service package differences bring changes to value levers and parameters, which are more pronounced from a long-term subscriber life cycle perspective.



Cost Analysis

Huawei equipment accounts for about 75% of the operator network in this case, and the Customer Support Services fee paid to Huawei accounts for about 0.3% of the total operating cost. However, this expense generates a total financial value of \$58,776,500 for the operator in this case. Moreover, the service level difference significantly affects the value contribution, while the corresponding proportion of Customer Support Services costs to the total operating cost is not much different. At present, Customer Support Services costs only make up a small proportion of the operating cost, far lower than energy costs, rental costs, labour costs, etc. The operating cost can be reduced through a variety of ways such as network modernisation, O&M automation, intelligent customer service representative, and so on. Reducing the scope and level of Customer Support Services will have a negative impact on the financial value, which is inefficient and overweighs the gains.

Huawei Customer Support Services costs in operator's operating cost



Other Case Studies

As mentioned above, the model has been piloted in several regions of the world and has received positive feedback. In order to clearly reflect the value of Huawei Customer Support Services obtained by different types of operators, the basic information of pilot operators and their financial return are shown below. But the calculation logic will not be repeated.

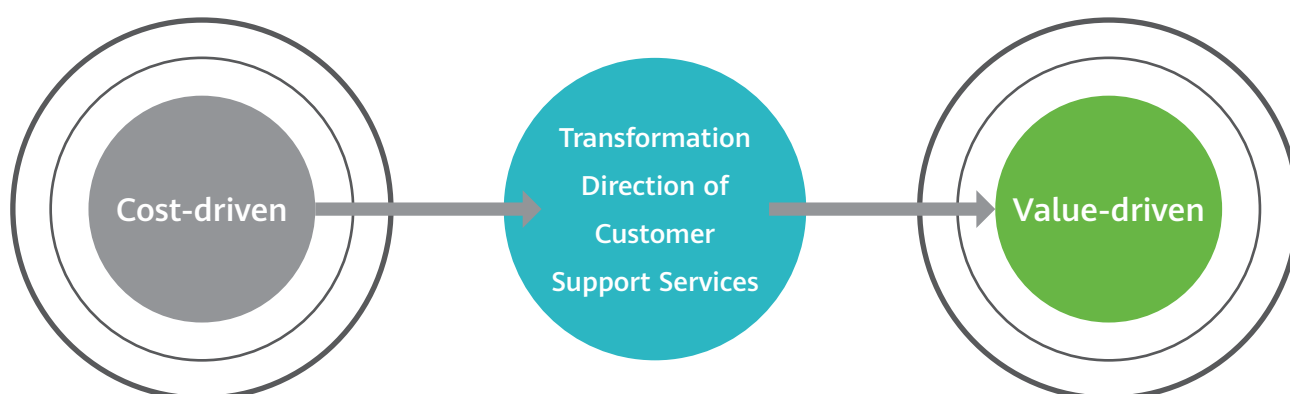
	Operator A (case study)	Operator B	Operator C
Number of subscribers (million)	20	33	43
Revenue Scale (billion USD)	1.7	3.32	8.18
ARPU (USD)	7.0	6.3	9.8
Proportion of Huawei equipment	75%	70%	50%
Service level	Enhanced Package	Enhanced Package	Standard Package
ROI	1697%	1213%	508%

Based on the figure above, it can be clearly seen that ROI increases as the service level increases. On average, the return on investment of the enhanced package service is higher than that of the standard package service by more than 168%. In cases of other regions, the return on investment of the enhanced package service is also significantly higher than that of other service levels.

For operator A and B, which are both using the enhanced package service, ROI is significantly affected by the number of subscribers and ARPU when the service is primarily the same. Since there are a large number of proactive services in the extended package service, this service can avoid or eliminate emergencies and effectively prevent subscribers from being affected by network instability, thereby having a great impact on long-term financial value. Therefore, when the number of subscribers becomes large, the economic value of maintaining network stability is enormous.

Conclusion

Under the new market requirements, customer support services are becoming more vital for operators in maintaining a long-term and stable return on network investment. With the establishment of the logic and system for value quantification, the bridge for business value communication from a financial perspective has been constructed. Based on this model, operators can try and explore further the ways to rethink customer support services and to use the system to measure the value of customer support services in an all-round manner. Undoubtedly, the customer support services not only provide the technical support, but also supports the business operation of operators. Expanding the scope and depth of customer support services helps obtain higher business returns. Operators should gradually change their perception of customer support services from cost-driven to value-driven, and re-evaluate and understand the customer support services in a quantitative manner to support the achievement of their business goals.



On this basis, operators can further try to use the concept of value quantification to analyse and assess the value of their operations and maintenance department. The value quantification system can effectively help the O&M department to bridge technical support with financial value. Through quantification, the O&M department can re-evaluate the value of O&M work and rethink how to better support the business objectives of operators. The O&M department must re-examine its positioning and consider the transformation from a cost centre to a value centre. The value quantification analysis above has shown that customer support services protect the direct and long-term business value, putting customer support services in a value protection position instead of the traditional cost position. This provides a reference for the transformation of the positioning of the operator's O&M department.

For operators' O&M departments, the transformation from cost centre to value centre is in line with the trend of digital transformation in the digital era. Customer Support Services work is only a part of routine work for the O&M department, and the rest of the work also have the possibility to conduct value quantification, through which the O&M department should re-examine its traditional cost centre positioning. We need to not only understand the existing benefits, but also explore the potential to create more value. This concept will help the whole department to design and transform to a value centre with more support for the operator's business. For instance, the O&M department has realised revenue protection and cost control by improving network stability. Meanwhile, in the digital age, the department can provide more helpful insights to the marketing, sales and procurement departments based on their O&M data analysis. The O&M department shall rediscover and change itself to create more business value.

Outlook

In this era of convergence and transformation towards the Internet of Everything, the cost of network instability has become very high. From a micro perspective, it is necessary to redefine the standards of network stability in this era. Network stability should not be a passive, static requirement. Network problems and troubleshooting, regardless of the speed and quality, will have negative impacts on subscribers. Therefore, a quick response to problems is only the basic requirement for network stability. Operators should start evolving towards the new generation of proactively maintaining the network stability, taking into account the experience of the subscribers' entire life cycle and evolve To redefine standards, operators need to change the entire organisational system around the new standards. The change in O&M department is one of the most important. The O&M department should allocate resources to ensure the stability of the new network and shift the focus of resource investment from traditional problem solving to problem prevention in advance. Customer support services vendors should adhere to the same concept and focus on effectively supporting the stability of operator networks by investing in capabilities, developing new services and optimising existing services to provide 24/7 multi-dimensional assurance for the stability of telecommunications networks. With a mutual understanding of network stability and the comprehensive O&M system upgrade, the realisation of operators' strategy in the new era can be fully supported.

From a macro perspective, the entire telecommunications industry should make efforts to ensure the healthy development of the O&M industry. Operators are not a single entity, but a part of the entire industry. The key components are subscribers, operators and operators' service vendors. Undoubtedly, subscribers are the core. The operators need to provide satisfactory services for subscribers, and service vendors need to provide comprehensive support for operators to achieve high-quality services for subscribers. Operators and service vendors should share the goal of network assurance, support each other, avoid the effect from the Greham's law, and build a healthy and mutually beneficial collaboration system to develop a stable network and high-quality user experience.

Appendix

About Huawei Customer Support Services

Huawei is a leading global information and communications technology (ICT) solution provider. As a responsible and stable business operator, innovative enabler for the information society and collaborative industry contributor, Huawei is committed to building a better-connected world. Huawei adheres to customer-centric innovation and open cooperation with partners to build end-to-end solution advantages in telecommunications networks, enterprise networks, terminals and cloud computing. 180,000 Huawei employees worldwide are committed to creating the maximum value for operators, enterprises and consumers, and providing competitive ICT solutions, products and services.

Huawei Global Technical Service is a Huawei operator business. It aims to help global telecommunications operators achieve business success in business, operation and ICT infrastructure through consulting, planning, design, integration and assurance. Currently, Huawei provides services for over 170 countries and regions, serving more than one-third of the world's population and 1500 networks.

Huawei Customer Support Services combines proactive and reactive support in software and hardware, providing various standard solutions. In addition, operators can flexibly select and combine solutions based on different requirements to ensure high availability of the network and stable running of the system. Based on the industry-leading three-level technical support service system (TAC/GTAC/R&D), complete Issue to Resolution (ITR) process and IT support platform, the operator support service solution provides comprehensive assurance services for global operators and helps operators ensure secure, reliable and efficient network operation. In order to establish competitive strengths for operators, the solution provides a contractual service that is oriented on improving network operation efficiency and reducing operating expense, so as to ensure the high quality of operator's network operation and protect their network investment.

To ensure network stability, Huawei adopts the "Follow the Sun" model (the concept that the support follows the sun) to provide 24/7 uninterrupted services and global deployment:

- 2 Global Technical Support Centres (GTAC)
- 10 Regional Technology Support Centres (TAC)
- 5 Global Spare Parts Supply Centres
- 12 Global Spare Parts Repair Centres
- 5000+ professional technical engineers
- 700+ service project managers and technical directors

In addition, in order to continuously improve operator experience and new demands, Huawei has developed dozens of patented technologies for Customer Support Services optimisation and improvement, including advanced technical applications such as machine learning-based fault root cause identification system, intelligent signalling analysis method, semantic analysis fault diagnosis method, etc. These innovative patents originate from solving the actual issues of operators, constantly upgrading

technologies and achieving the continuous enhancement of Customer Support Services.

Based on customer requirements, Huawei continuously adjusts and optimises the Customer Support Services and provides excellent services for operators. In recent years, Huawei has been fully implementing the value proposition of the Customer Support Services and winning high praise from customers.

- In terms of Securing Business, the CTO of an African operator sent a letter of thanks to Huawei, saying that Huawei had provided high-quality services and accomplished many remarkable achievements, including “ranking no. 1 in both voice and data in R&S 2019 benchmark.”
- In terms of Advancing Efficiency, an operator service team in China said that Huawei Customer Support Services team realised “an improvement in both network asset and O&M efficiencies.”
- In terms of Fostering Innovation, Huawei secured the 5G live broadcast of the 20th anniversary of Macao’s return to China. According to broadcast partners, “the completion of the longest 5G live broadcast in the world fully demonstrates Huawei’s strong technical capability and professionalism.”
- In terms of Enhancing Competitiveness, Huawei implemented assurance for the 2016 Olympic Games. The customer operator said, “Huawei has not only the capability to support infrastructure, but also the capability to ensure the best customer experience. Together with Huawei, we have achieved zero emergency, zero complaints, zero interruption, and 100% customer satisfaction.”

Glossary

- ROI: Return on Investment. It is the economic return from an investment activity by an enterprise. It covers the profit target of the enterprise. Profit relates to the assets necessary to put into business, because the management team achieves a profit with investment and existing assets.
- NPS: Net Promoter Score is an index that measures the probability that a certain client will promote a certain enterprise or service to others. It is the most popular analysis index of client loyalty level, focusing on how customer word-of-mouth impacts business growth. By tracking NPS closely, an enterprise can achieve greater success.
- O&M: Operations and Maintenance is responsible for monitoring and managing the equipment in the communications network.
- CAPEX: Capital Expenditure normally refers to the investment of capital, fixed assets, intangible assets and deferred assets. For telecommunications operators, network equipment, computers, appliances and other one-off expenses all belong to CAPEX.
- ARPU: Average Revenue Per User. It means the average revenue of a telecommunications operator contributed by one subscriber for communications service during a specific period (usually one month or one year), with a unit of dollars/person.
- EOM: End of Marketing. The date when orders (new orders and expansion orders) are no longer accepted.
- (G)TAC engineer: (Global)Technical Assistance Centre, providing 24/7 all-round support to the client.

- R&D maintenance expert: Research and Development expert who provides all-round support to (G)TAC. When necessary, R&D experts at Huawei headquarter can be reached to provide in-depth solution analysis to issues.
- Problem: Problems are related to the equipment-related service requests that are submitted by operators to Huawei during network O&M. Problems can be classified into critical, major, minor and non-fault inquiries, according to severity.
- Emergency: Emergencies means the widespread service restriction and management restriction caused by critical problems which must be rectified without delay.
- Capital cost rate: The ratio of the cost of raising and using funds to the total amount raised, including dividends to shareholders, interest on loans to banks, and various interest charges to other creditors.
- Safety stock: Safety stock refers to the minimum guaranteed inventory that is reserved to resist fluctuations in “demand and supply”.

Reference

[1] ENISA (European Union Agency for Network and Information Security): “Annual Report Telecom Security Incidents 2018”

Notice

When reading and using this paper, readers should note:

This paper makes no assumption about the potential ROI that any organisations will receive. It is strongly recommended that readers use their own data and assumptions leveraging the framework provided in this paper to assess the adequacy of investing in Huawei Customer Support Services.



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About Huawei

Huawei is a leading global provider of information and communications technology (ICT) infrastructure and smart devices. With integrated solutions across four key domains – telecom networks, IT, smart devices, and cloud services – we are committed to bringing digital to every person, home and organization for a fully connected, intelligent world.

Huawei's end-to-end portfolio of products, solutions and services are both competitive and secure. Through open collaboration with ecosystem partners, we create lasting value for our customers, working to empower people, enrich home life, and inspire innovation in organizations of all shapes and sizes.

At Huawei, innovation focuses on customer needs. We invest heavily in basic research, concentrating on technological breakthroughs that drive the world forward. We have more than 194,000 employees, and we operate in more than 170 countries and regions. Founded in 1987, Huawei is a private company wholly owned by its employees. For more information, please visit Huawei online at www.huawei.com.

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