

Independent market research and competitive analysis of next-generation business and technology solutions for service providers and vendors

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# **The State of the Broadband Service Provider – 2023**

*A custom Heavy Reading survey report produced for Calix*



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# 1. INTRODUCTION AND KEY FINDINGS

In a dynamic and evolving services landscape, broadband service providers (BSPs) rely heavily on the leadership of their C-level executive team members to help them successfully mitigate business and technical risks, as well as to develop and execute strategies crucial for achieving revenue growth.

To understand C-level strategies and priorities, Heavy Reading, in collaboration with Calix in 4Q22, conducted a targeted survey of executives leading BSPs serving 100,000 or fewer subscribers in the US and Canada to gain insights into the state of their businesses. The topics addressed in the survey included the following:

- Network investment priorities
- Revenue growth strategies
- Technology trends and revenue implications
- The impact of a changing, competitive landscape
- Competitive response strategies
- The value of data
- Service/use case implementation priorities
- Operational optimization

## 1.1 Executive key findings

- Although the majority of BSP executives are confident that their companies are on a solid and secure technical and business foundation, the fact that more than 4 out of 10 of these C-levels are only “somewhat confident” or “not confident” in their ability to reduce customer churn is concerning.
- The executives surveyed are focused on several priorities. Of these, the leading focus by a considerable margin is business growth/revenue generation (65%). Rounding out the top four are market strategies/new service introduction (40%), network management (39%), and customer experience management (36%).
- C-levels believe that software disaggregation (62%) at the edge is the leading “extremely impactful” trend that BSPs need to manage in their businesses. In second place is the rollout of 5G networks (52%), which utilizes a disaggregated software architecture.
- Of all C-levels, 57% prefer to grow revenue through market expansion. The largest group of C-levels (43%) advocate expanding outside residential markets, while 17% prefer to expand into new regions. The remaining C-levels are focusing on upselling new differentiated services (25%) or diversifying their regional customer base (15%).
- BSPs’ current network investment top priorities are fiber broadband network expansion (64%), security infrastructure (51%), and regional and core network expansion (39%).
- Almost 6 out of 10 (58%) of the C-levels expect that capex network investment will remain flat within a five-year window. Only 25% expect to increase spending.

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- Most C-levels do not expect to increase capex spending, but many recognize that changes in market requirements may impact their investment priorities. Based on “extremely impactful” inputs, the three leading considerations are changes in consumer service consumption patterns (52%), the decline in traditional service revenue (44%), and changing subscriber demographics (37%).
  - In the next five years, C-levels do not believe their priorities will change that much, with fiber broadband network expansion (62%), security infrastructure (56%), and regional and core network expansion (46%) still leading in their “high priority” rankings.
  - Based on “extremely impactful” inputs, the top three US-based funding and policy initiatives to help fund network expansion are the Broadband Equity, Access, and Deployment (BEAD) program (46%), followed by other federal funding initiatives (e.g., the National Telecommunications and Information Administration [NTIA]) and federal policy on vendor selection (both 35%).
  - BSPs consider similar-sized wireline service providers and 5G mobile service providers (both 51%), and then both Tier 1 fixed service providers and satellite providers (both 35%), as the competitors that have the most potential to negatively impact their ability to grow revenue.
  - C-level executives favor service over speed. In this case, 79% selected introducing new differentiated services, compared to 49% of executives who aligned with providing the fastest internet speeds in serving areas.
  - Most C-levels (67%) believe that consolidation is having a positive impact on their company’s profitability and sustainability.
  - Although C-levels’ “high priority” use cases revolve around a broad range of diverse use cases that encompass parental controls to well-being solutions, the leading two are security-related (home network cybersecurity [64%] and device protection [46%]).
  - Unsurprisingly, home network cybersecurity (60%) is the leading priority for implementation within the next five years. In second place was social media monitoring (50%), which confirms that social-media-based services will continue to impact BSPs’ service delivery strategies in the next five years.
  - Of all C-levels, 95% pragmatically believe that, in order to remain competitive, they must focus on operational efficiency to deliver a reliably consistent subscriber experience. Despite their focus on operational efficiency, 81% also believe that inflation will drive their operational costs higher in 2023.
  - Despite the operational impact, C-levels are split on adopting an outsourced hiring model, with 56% considering a move to an outsourced hiring model and 44% planning to maintain the in-house model. One reason why C-levels are split on whether to adopt an outsourced model is that more than 7 out of 10 (71%) have yet to see labor costs reach a tipping point and negatively impact their overall operational costs.

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- Even though most executives do not believe that labor costs are negatively impacting their operational cost structures, this does not mean that hiring-related issues are not exerting pressure on the execution of their growth strategies and the bottom line. Based on “extremely impactful” input, the leading concerns are labor costs (43%), corporate hiring restrictions (36%), and skills shortage (33%).
  - Skills shortage also attained the highest “impactful” scores (57%), which position it as an “extremely impactful” or “impactful” concern of 90% (33% and 57%) of all respondents. Heavy Reading believes this strong level of consensus on the negative impact of skills shortages is also a factor in why more than half of the respondents (56%) are considering outsourcing hiring.
  - Almost three-quarters of BSP executives (73%) believe that leveraging subscriber data to help them drive new service and revenue opportunities is a strategic imperative.
  - Executives believe application usage data (33%), location data (27%), and bandwidth usage data (24%) are the related subscriber data sources that have the greatest revenue generation potential.
  - Despite the fact that C-levels display a high level of confidence in their companies’ ability to secure the network, more than 6 out of 10 (61%) are “extremely concerned” regarding their ability to secure billing data, while 50% and 37% see security risks associated with the protection of subscriber and location data, respectively.

## 1.2 Methodology

This research report is based on a comprehensive online 25-question survey launched in 4Q22. Only C-level executives, including vice presidents who worked for BSPs serving 100,000 or fewer subscribers in North America and Canada, were invited to take the survey.

These C-level respondents were invited to take the survey on the understanding of anonymity (i.e., that their names, job titles, and employers would not be made available to the study’s sponsors or eventual readers) and that the results will only be presented in aggregate form. Respondents were not told who sponsored the study.

The executives who qualified for this survey performed either vice president or C-level functions (e.g., CEO, CIO, and CMO) within their respective organizations. A complete demographic breakout of respondent demographics is provided in the **Appendix A: Survey demographics** section of this report.

## 2. TRENDS AND STRATEGIES

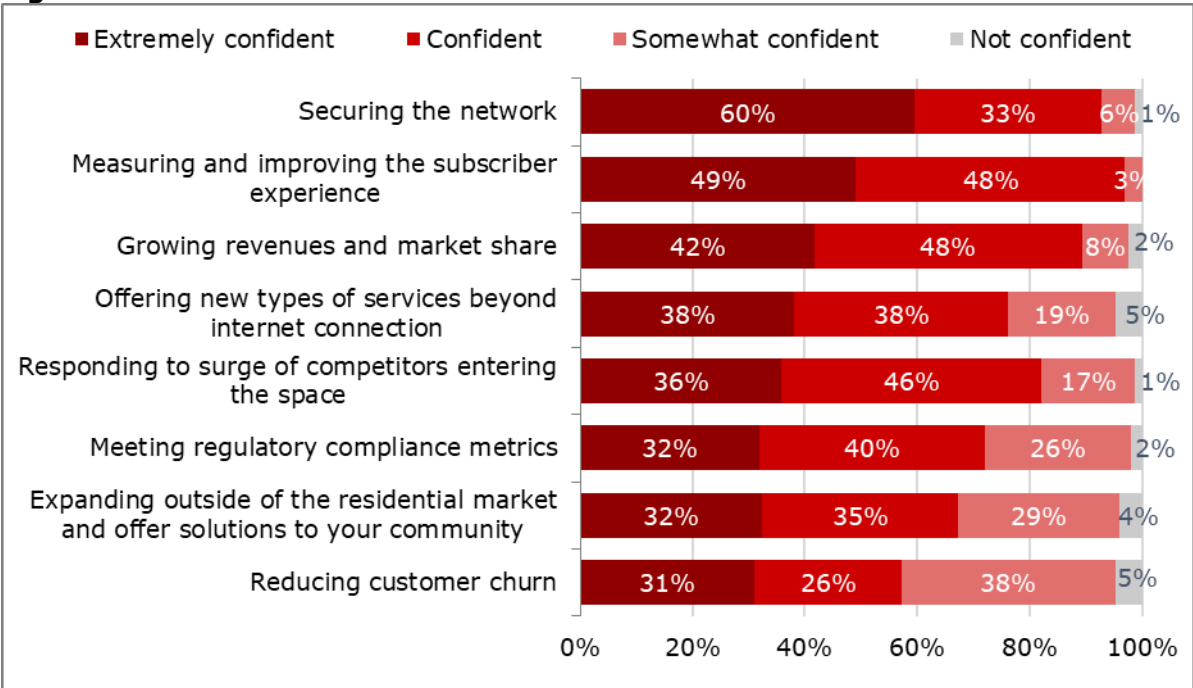
BSP executives face no shortage of technical and business disruptions in their ongoing quest to drive revenue growth. To understand perceived strength areas that can be exploited for growth strategies, survey respondents were first asked to assess their confidence levels related to network capabilities and service delivery.

As shown in **Figure 1**, based on “extremely confident,” the top three that stand out are securing the network (60%), measuring and improving the subscriber experience (49%), and growing revenues and market share (42%).

A lower but still solid level of “extremely confident” responses applied to other fundamental functions such as offering new types of services beyond internet connection (38%), responding to competitors entering the market (36%), meeting regulatory compliance metrics (32%), expanding outside of the residential market (32%), and reducing customer churn. When these inputs are combined with “confident” responses, the response levels range from 57% (reducing customer churn, 31% and 26%) to 93% (securing the network, 60% and 33%).

Heavy Reading interprets this data as validating that, overall, BSP executives believe they are well-positioned to face the technical and business disruptions on the immediate horizon. A substantial group of these same respondents (43%) are only “somewhat confident” (38%) or “not confident” (5%) that they can reduce customer churn, which raises a red flag. Moreover, despite their strident stance on their ability to secure the network (as documented later in this report), there are concerns related to securing crucial data (see **Figure 19**).

**Figure 1: Executive confidence levels**



Question: How confident are you in your organization’s abilities in the following areas? (n=84)  
 Source: Heavy Reading

One of the most complex challenges that BSP executives face is maintaining the delicate balance of optimizing network investment to deliver the scale to drive revenue growth of new and existing services without overinvesting. The latter leads to stranded investment, which negatively impacts profitability.

As **Figure 2** illustrates, the executives surveyed are focused on several priorities. Of these, the leading focus by a considerable margin is, not surprisingly, business growth/revenue generation (65%), which constitutes the litmus test of a company's overall growth potential.

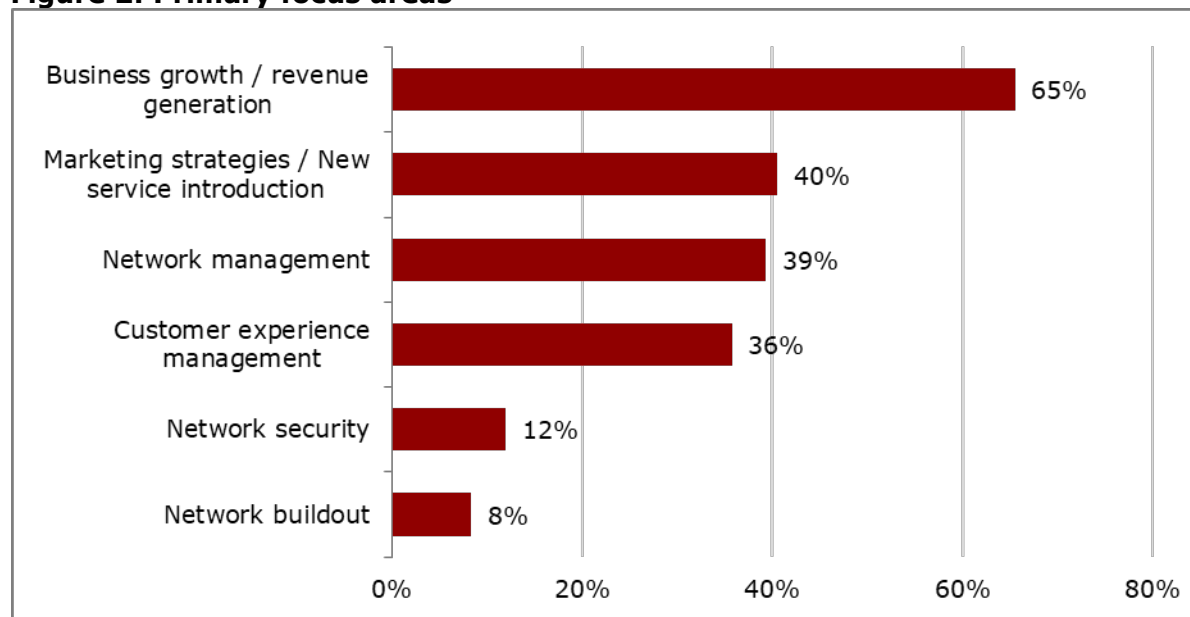
Rounding out the top four are a mix of marketing- and network-centric focus areas that reflect the need to balance network and marketing strategies. In this case, this translates to a focus on market strategies/new service introduction (40%), network management (39%), and customer experience management (36%).

The lowest two ranked focus areas are network security (12%) and network buildout (8%). Even if they may rank lower, Heavy Reading believes these are by no means secondary considerations.

As documented in **Figure 1**, C-levels are very confident about their network security strategies, which likely makes it less of an immediate focus. Instead, like network buildout, which is also fundamental to providing the technology base to grow revenue, both probably score lower because they represent constant long-term focus areas.

In other words, both may not represent the greatest *single*-year priorities, but rather, foundational investment priorities every year (see **Figure 6**).

**Figure 2: Primary focus areas**



Question: What is your primary focus? (n=84)

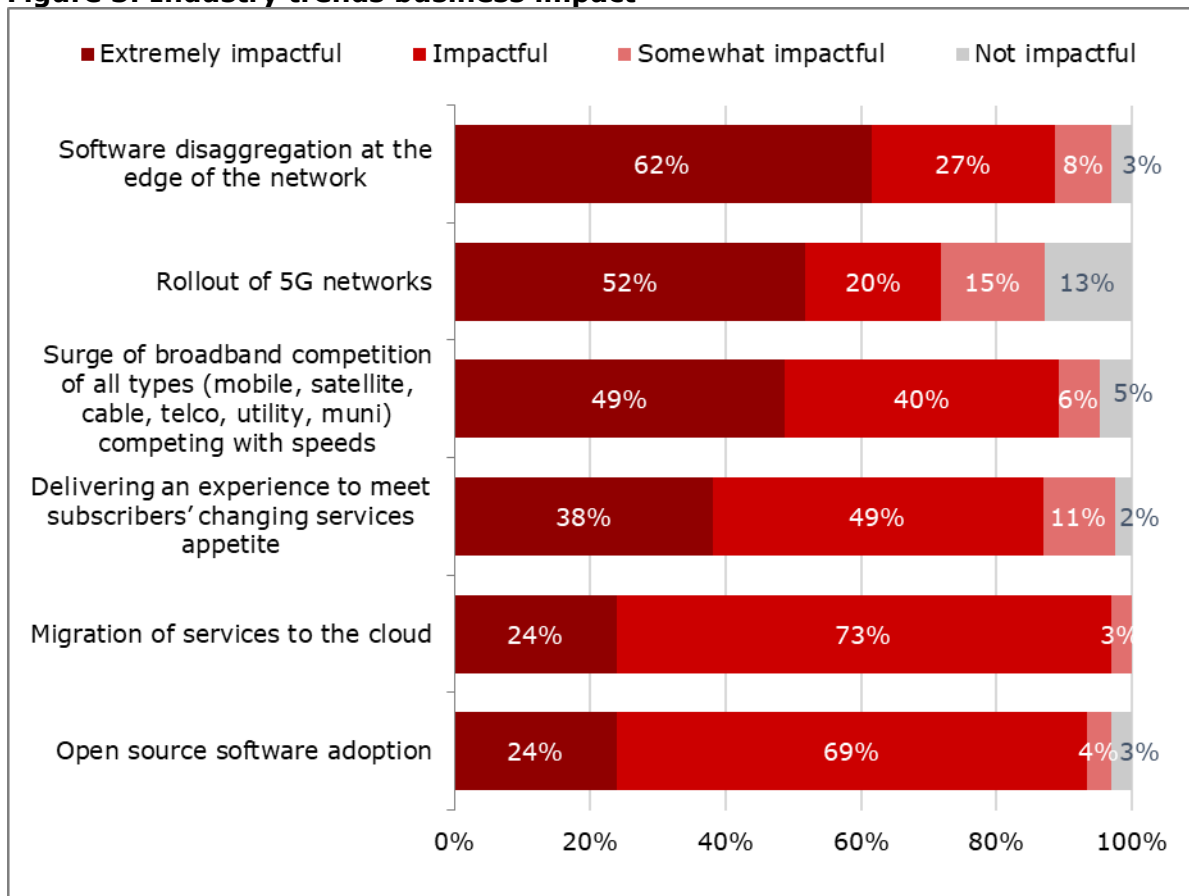
Source: Heavy Reading

Over the past decade, BSPs have had to navigate a myriad of disruptive technologies, including network functions virtualization (NFV). The adoption of NFV and the virtualization of traditional network functions it supports was important because it facilitated the ability to finally disaggregate software from hardware platforms.

One of the key benefits of software disaggregation is that it facilitates the ability to run software at the network edge, which is crucial for lowering latency budgets necessary to support mission-critical services. Although the positive performance implications of running software at the edge are indisputable, this approach can also impact the business landscape by allowing new players to enter the market at the edge.

Consequently, as **Figure 3** illustrates, software disaggregation (62%) at the edge is still the leading “extremely impactful” trend that BSPs believe they need to manage in a business context. In second place is the rollout of 5G networks (52%), which is based on a disaggregated software architecture. This is followed by a surge of broadband competition of all types (49%), some of which are also utilizing software separation to enable faster broadband speeds.

**Figure 3: Industry trends business impact**



Question: To what extent are the following industry trends impacting your business? (n=84)

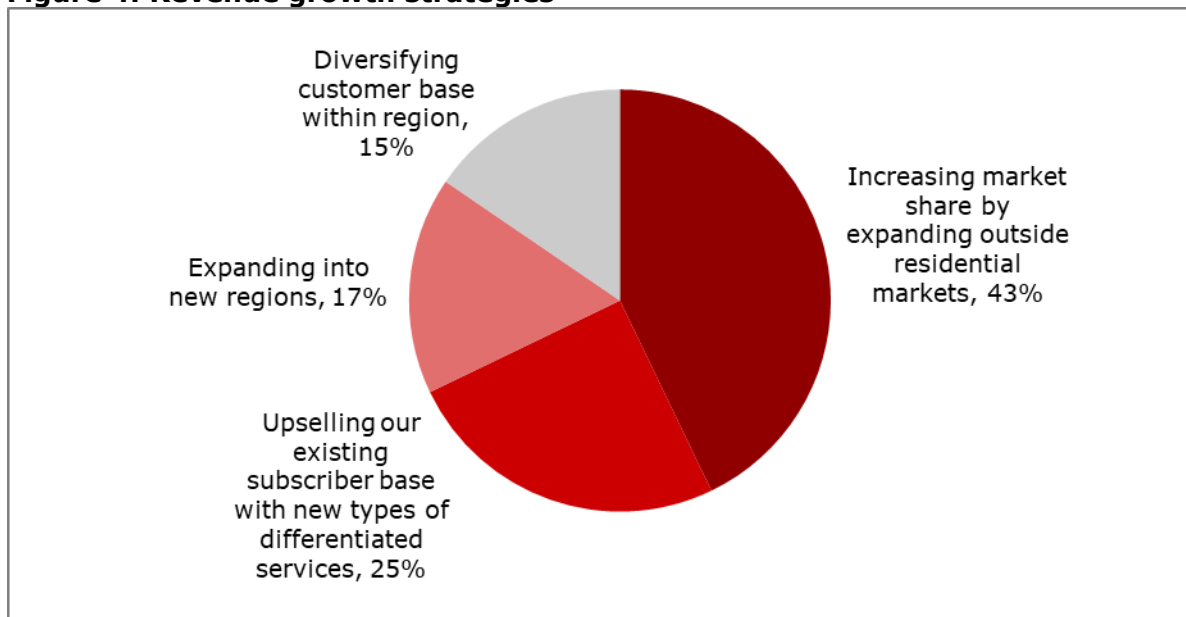
Source: Heavy Reading



BSPs can utilize several approaches to grow their revenue base and market share. These measures typically involve upselling existing customers or strategically expanding into other markets.

As illustrated in **Figure 4**, both approaches have some measure of support. The largest group of C-levels (43%) advocate expanding outside residential markets, while 25% are focusing on upselling new differentiated services. Similarly, the other two groups prefer to expand into new regions (17%) or diversify their customer base within the region (15%). Overall, 60% of C-levels prefer the market expansion approach (43% and 17%).

**Figure 4: Revenue growth strategies**

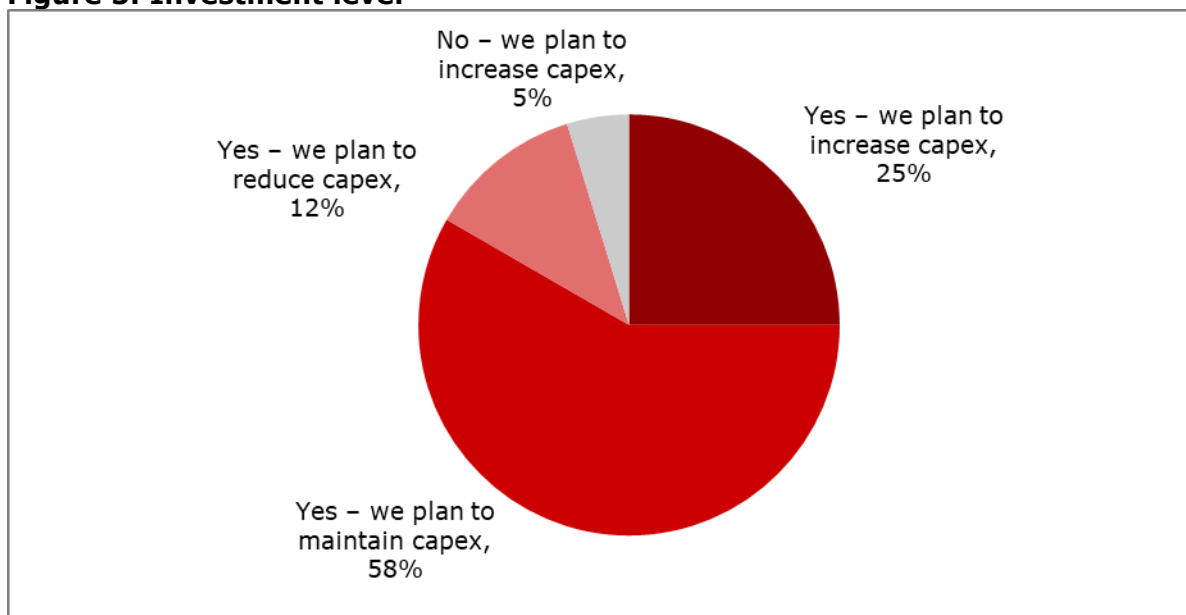


Question: What is your organization's primary strategy for growing its revenue base? (n=84)

Source: Heavy Reading

Although many of the C-level survey respondents are focused on increasing market share by expanding outside residential markets to grow revenue, as illustrated in **Figure 5**, even if investment priorities change within the next five years, almost 6 out of 10 (58%) of the C-levels expect that capex network investment will remain flat. Only 25% expect to increase spending.

**Figure 5: Investment level**



Question: Do you expect your network investment priorities to change over the next five years?  
(n=84)

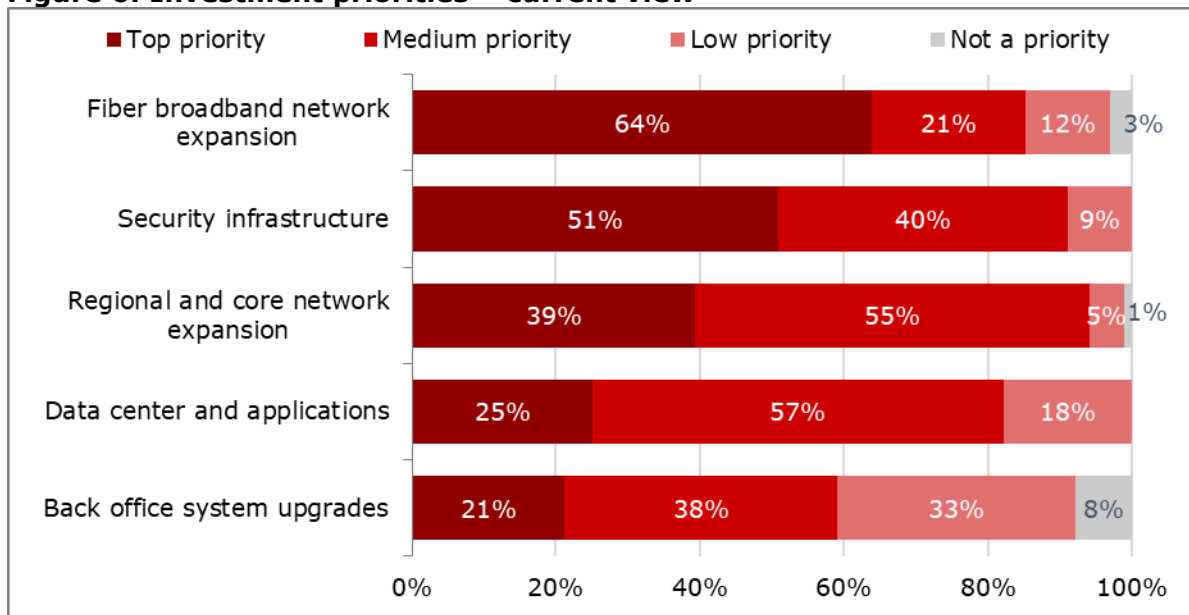
Source: Heavy Reading

Even if most C-levels are not planning to increase capex in the next five years, they do have well-defined opinions on where they plan to invest both today and in five years.

As shown in **Figure 6**, BSP's *current* network investment focus areas based on "top priority" inputs are fiber broadband network expansion (64%), security infrastructure (51%), and regional and core network expansion (39%).

Well back are data center and applications (25%) and back office system upgrades (21%). The high ranking of fiber and security investment was not unexpected because BSPs have been investing in fiber for some time and continue to see demand in underserved rural areas. Similarly, the continued growth and complexity of cyberthreats provide the impetus for service providers of all sizes to make the necessary investment to protect their customers.

**Figure 6: Investment priorities – current view**



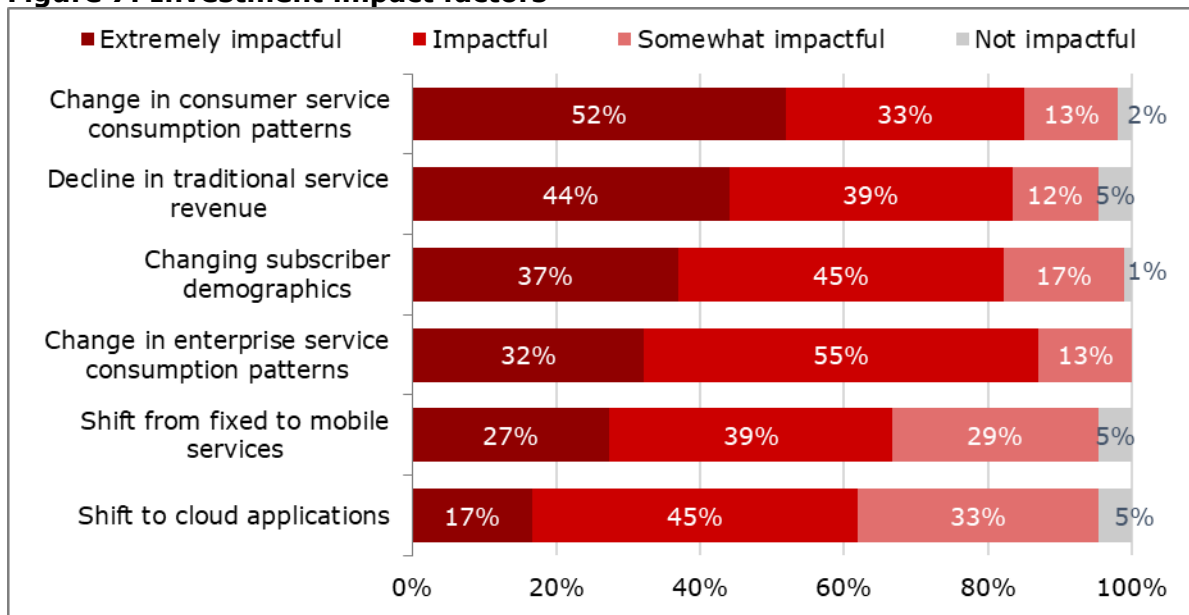
Question: What priorities do the following network investments have in your organization? (n=84)  
 Source: Heavy Reading

To optimize investment, C-levels need to acutely monitor a host of demographic and business trends that can alter service demand and negatively impact their network investment business cases.

Based on “extremely impactful” inputs, the C-levels’ three leading considerations are a change in consumer service consumption patterns (52%) and a decline in traditional service revenue (44%), followed by changing subscriber demographics (37%).

Though a change in enterprise service consumption patterns (32%) attained a fourth place “extremely impactful” ranking, it did receive the highest “impactful” score, which confirms that it is still viewed as a substantial impact factor by the executives surveyed.

**Figure 7: Investment impact factors**

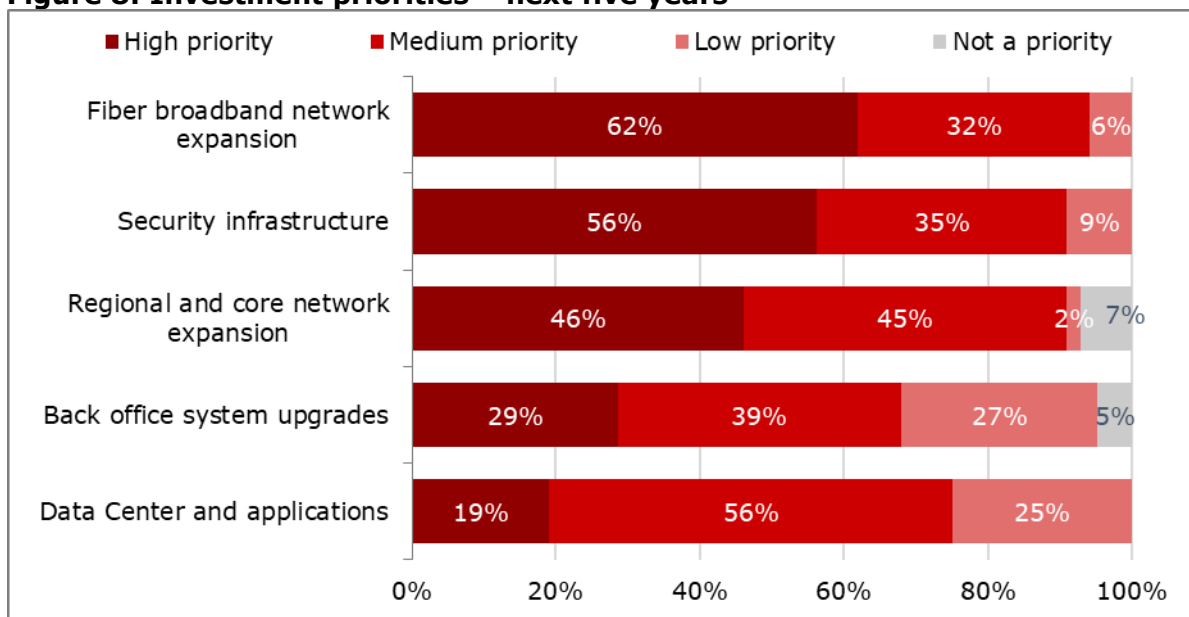


Question: To what extent will the following impact your investment priorities? (n=84)

Source: Heavy Reading

Looking forward to the next five years, C-levels do not expect their priorities to change that much, with fiber broadband network expansion (62%), security infrastructure (56%), and regional and core network expansion (46%) still leading their “high priority” rankings

**Figure 8: Investment priorities – next five years**



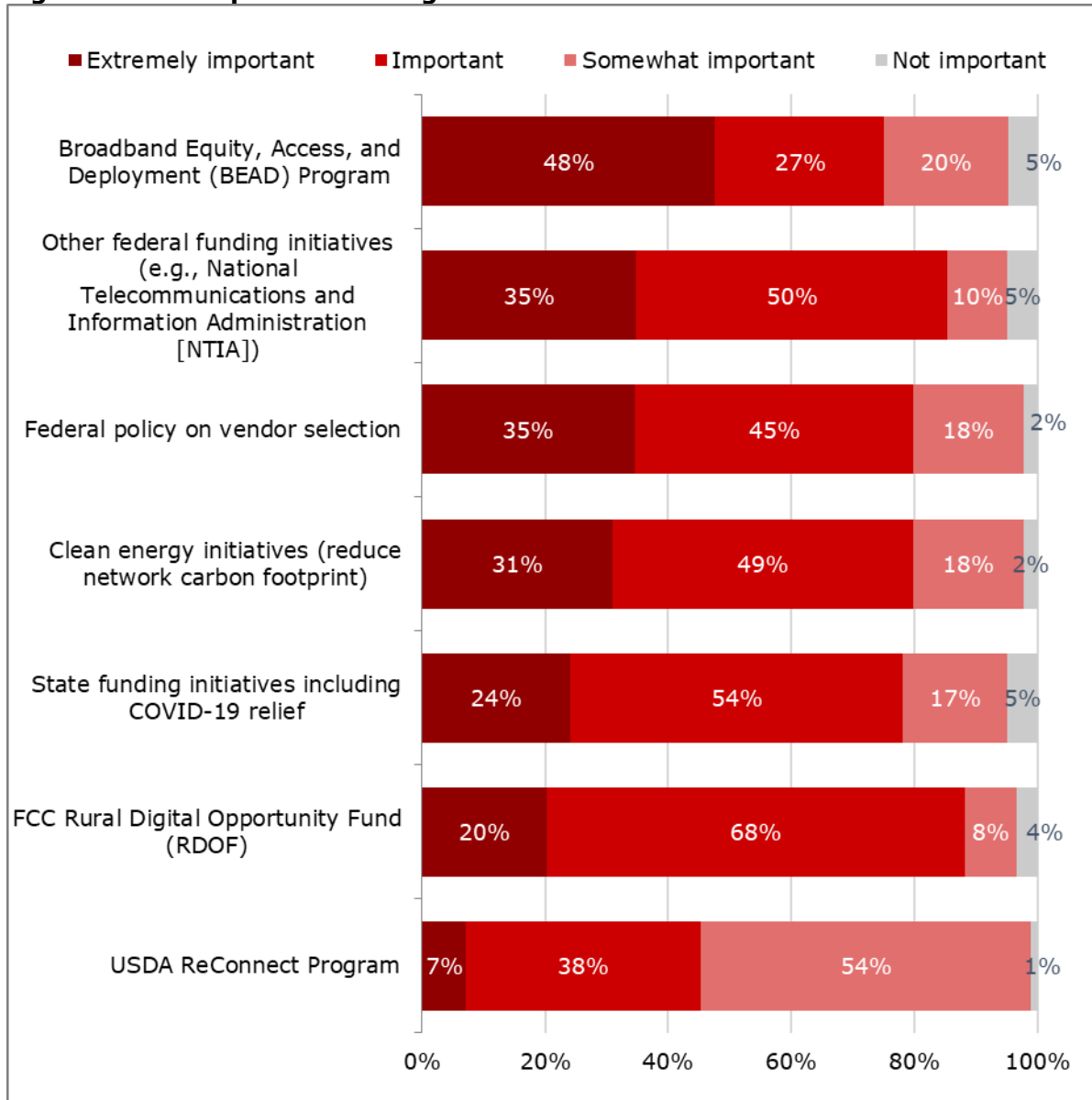
Question: What are your network capital investment priorities in the next five years? (n=84)

Source: Heavy Reading

To augment their flat capex strategies, many BSPs in the US and Canada (on some level) plan to tap into various federal funding initiatives to subsidize their network buildouts.

As shown in **Figure 9**, based on “extremely impactful” inputs, the top three US-based funding and policy initiatives include the BEAD program (46%), followed by other federal funding initiatives (e.g., NTIA) and federal policy on vendor selection (both 35%). The top ranking of BEAD was not unexpected because it has set aside a \$43bn tranche for building out underserved areas in the US.

**Figure 9: The impact of funding initiatives**



Question: How important are the following initiatives to the execution of your growth strategy? (Rank 1 = most important and Rank 4 = least important) (n=84)

Source: Heavy Reading

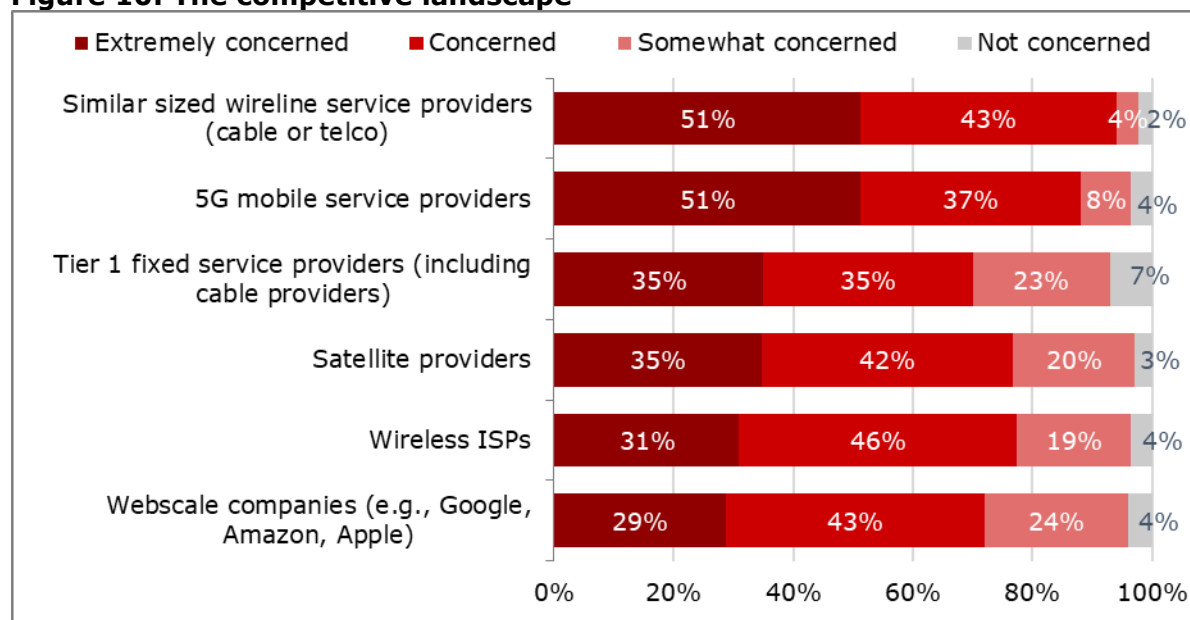
### 3. COMPETITORS AND SERVICES

In addition to documenting demographic trends, C-levels also need to monitor their competitors and mitigate their impact by ranking the competing entities most likely to negatively impact their revenue growth curve and by developing specifically tailored response strategies.

As illustrated in **Figure 10**, based on “extremely concerned” inputs, similar-sized wireline service providers and 5G mobile service providers (both 51%) and then Tier 1 fixed service providers and satellite providers (both 35%) are viewed as the competitors that have the most potential to negatively impact BSPs’ ability to grow revenue.

Even though wireless internet service providers (ISPs) and webscale providers placed fifth and sixth based on “extremely concerned” input (31% and 29%, respectively), Heavy Reading believes their scoring metrics, including “concerned” inputs (46% and 43%, respectively), are not so low that they should be discounted as viable threats, either.

**Figure 10: The competitive landscape**



Question: How concerned are you that the following competitors will impact your company’s ability to grow your revenue base? (n=84)

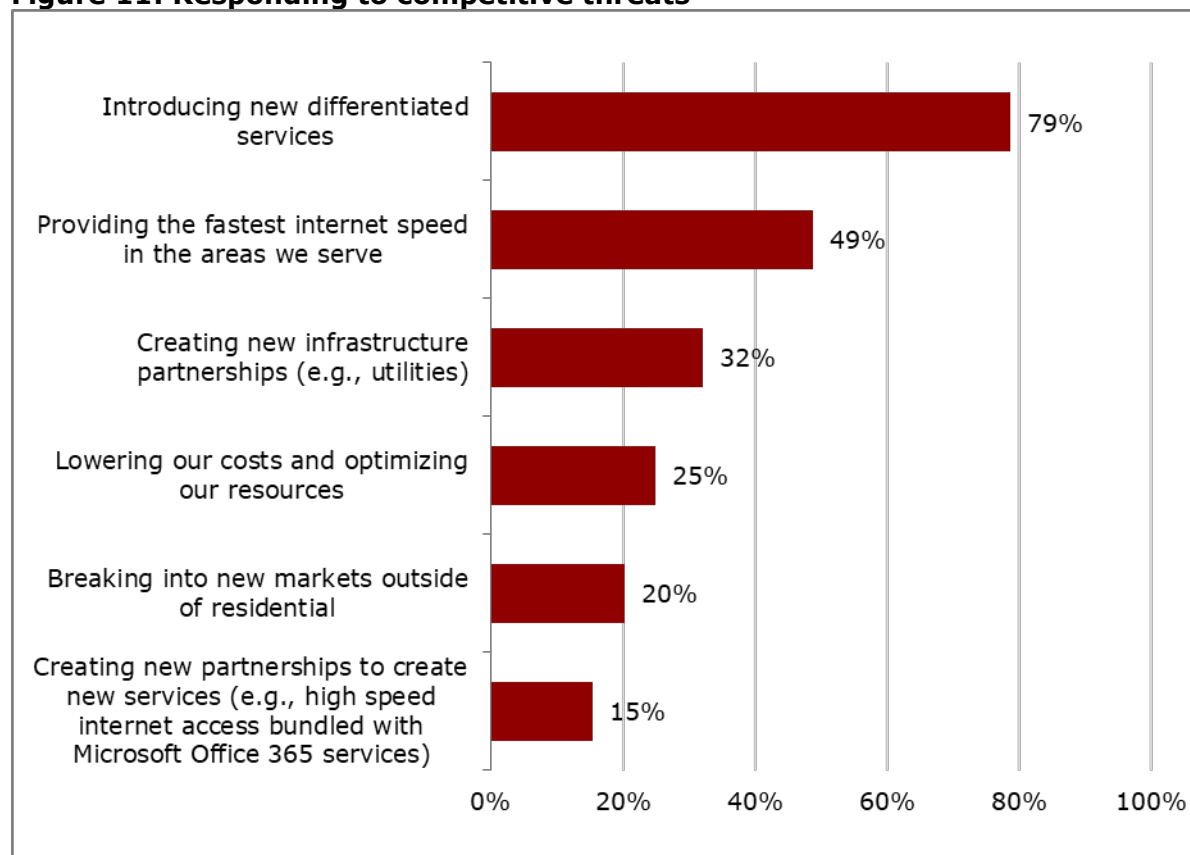
Source: Heavy Reading

As noted above, each competitor presents unique challenges that mandate a varied response strategy encompassing service innovation, network performance, and even pricing.

**Figure 11** illustrates that the executives surveyed favor service over speed. In this case, 79% selected introducing new differentiated services, compared to 49% of executives who aligned with providing the fastest internet speeds in serving areas.

Other considerations include creating new infrastructure partnerships (32%), lowering costs and optimizing resources (25%), breaking into new markets (20%) (see **Figure 4**), and partnerships for new services (15%).

**Figure 11: Responding to competitive threats**



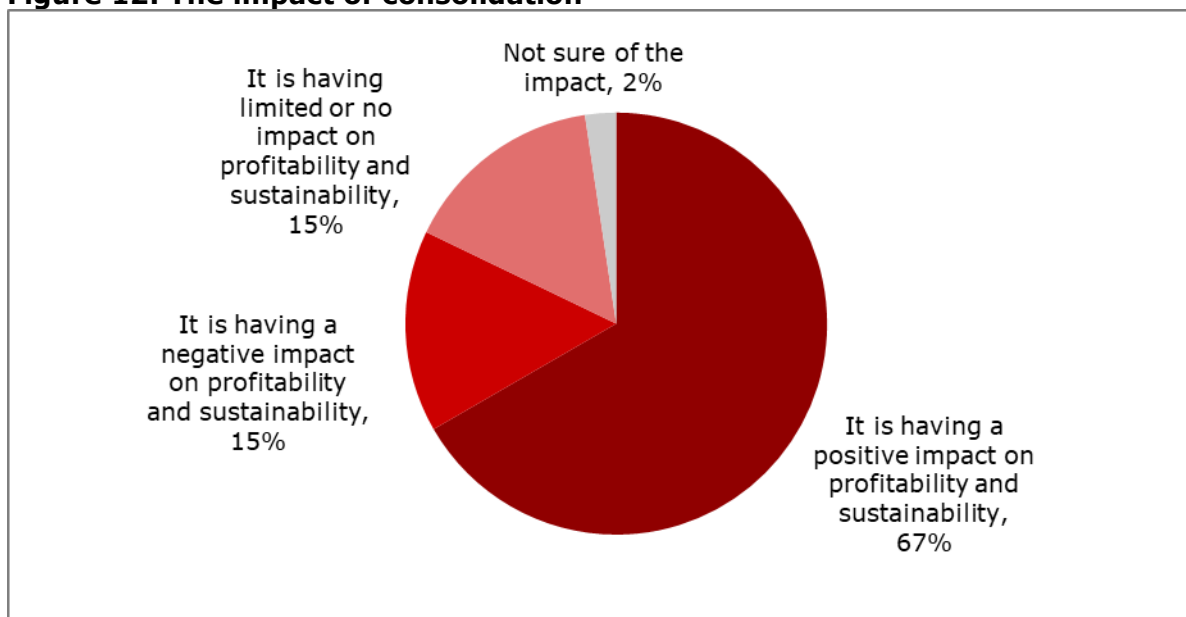
Question: How is your company responding to competitive threats? (n=84)

Source: Heavy Reading

One consideration in a fluid, competitive landscape is the gestation of new, more powerful competitors through consolidation. However, as shown in **Figure 12**, the majority of the C-levels (67%) believe that consolidation is actually having a positive impact on their company's profitability and sustainability.

One factor that likely is influencing this line of thinking is that BSPs have a very strong local presence compared to that of larger competitors, which have limited community visibility. Consolidation typically exacerbates this lack of community presence, which BSPs can exploit.

**Figure 12: The impact of consolidation**



Question: To what extent is service provider consolidation impacting your profitability and sustainability? (n=84)

Source: Heavy Reading

Without question, the greatest challenge that BSP C-levels face continually is ensuring that the company’s portfolio of services is well received by its customers.

To accomplish this, C-levels and their team must develop meaningful service-specific use cases that allow them to achieve service differentiation and “stickiness” in both present and future markets.

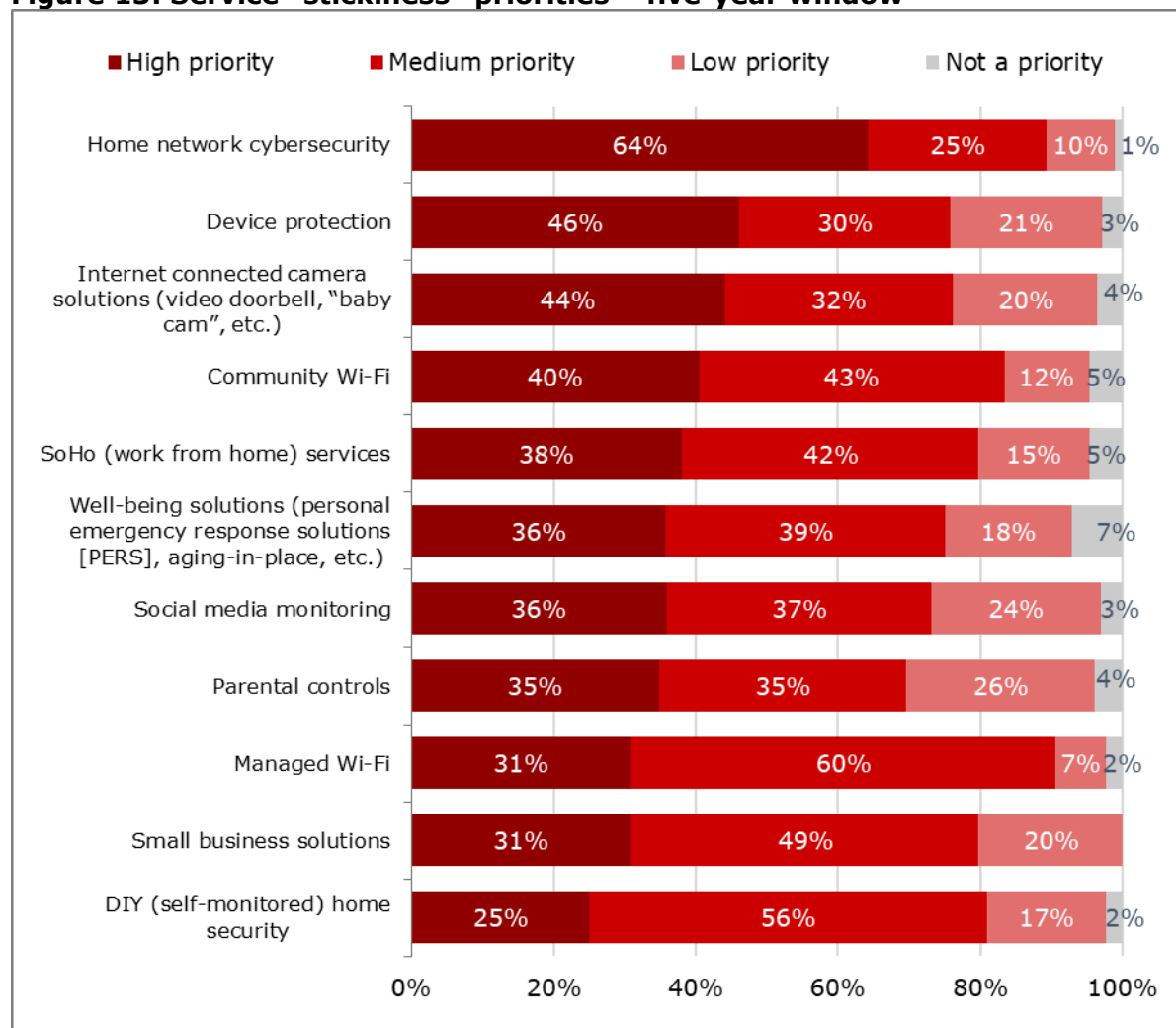
As **Figure 13** illustrates, looking ahead five years, C-levels’ “high priority” use cases revolve around a broad range of diverse use cases that encompass parental controls to well-being solutions. Of these, however, the leading two are security-related (home network cybersecurity [64%] and device protection [46%]).

Even though security is clearly a vital element of successful use cases and services, BSPs will need a broad mix of sticky use cases because service consumption trends and even connectivity requirements will continue to evolve in the next five years.

In other words, while C-levels firmly believe that security will be key to improving service stickiness, it is not enough to simply focus on only this area. It is also worth reinforcing that most C-levels are “extremely confident” in their current ability to secure the network and, hence, are well-positioned to offer security-based services (see **Figure 1**).



**Figure 13: Service “stickiness” priorities – five-year window**



Question: Which use case would improve your service “stickiness” in the next five years? (n=84)  
 Source: Heavy Reading

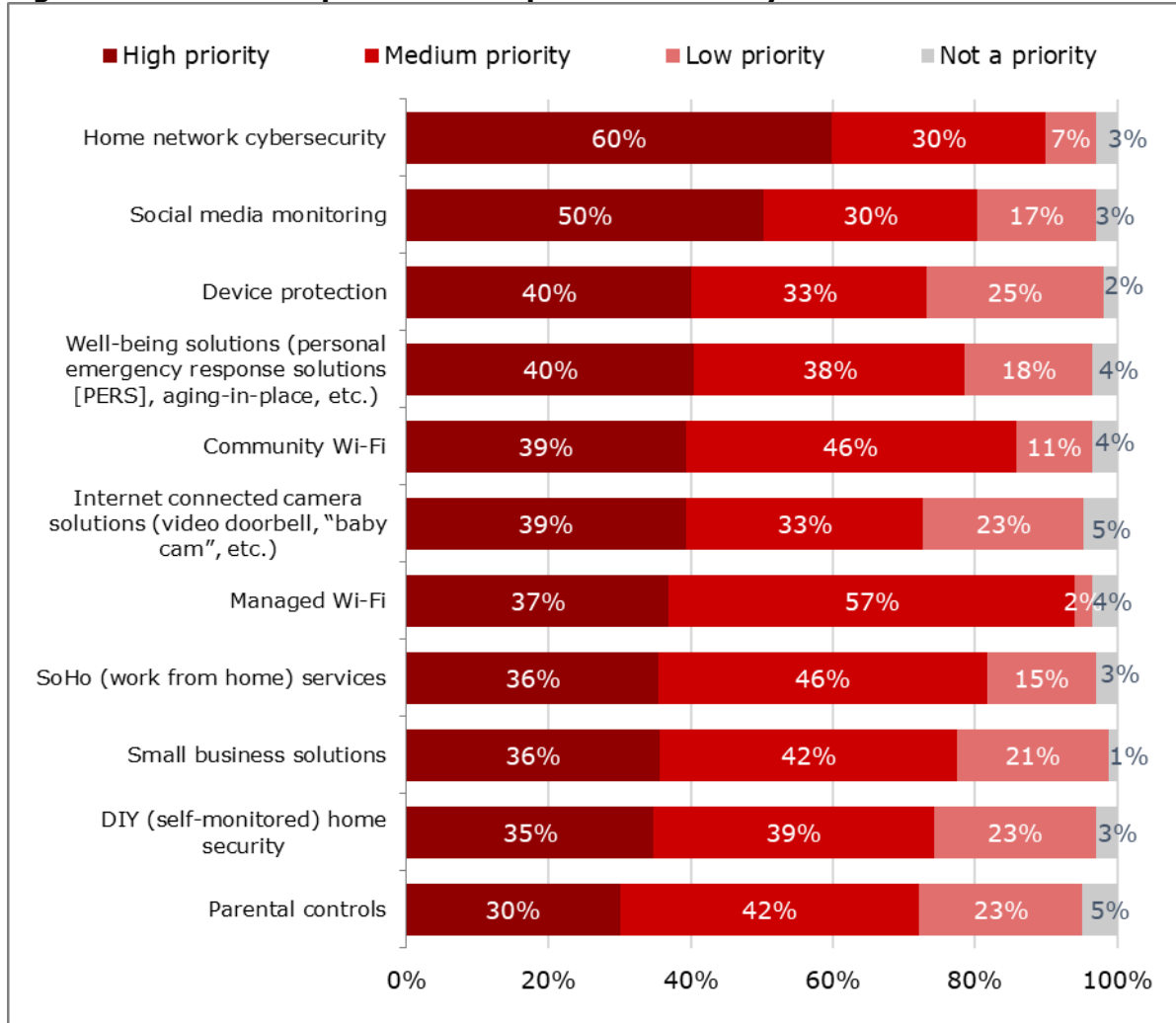
The next question in the survey closed the feedback loop on use cases and confirmed that C-levels planned to focus on the delivery of a broad range of services in the next five years.

As shown in **Figure 14**, unsurprisingly, the leading “high priority” is home network cybersecurity (60%). In second place was social media monitoring (50%), which confirms that social-media-based services will continue to exert an impact on BSPs’ service portfolio in the next five years.

This was followed by device security and well-being solutions (both 40%). Next was a very tightly ranked group of other relevant service priorities comprised of internet camera and monitoring (which also has a security component) (39%), community Wi-Fi (39%), managed Wi-Fi (37%), SoHo services and small business solutions (both 36%), DIY home security (35%), and parental controls (30%).

Consistent with the input in the previous figure, Heavy Reading believes this input solidifies the view that while security is the leading service priority, other capabilities in a five-year window are important as well.

**Figure 14: Service implementation priorities – five-year window**



Question: Which new service areas will you prioritize in the next five years? (n=84)

Source: Heavy Reading

## 4. OPERATIONS DATA AND SECURITY

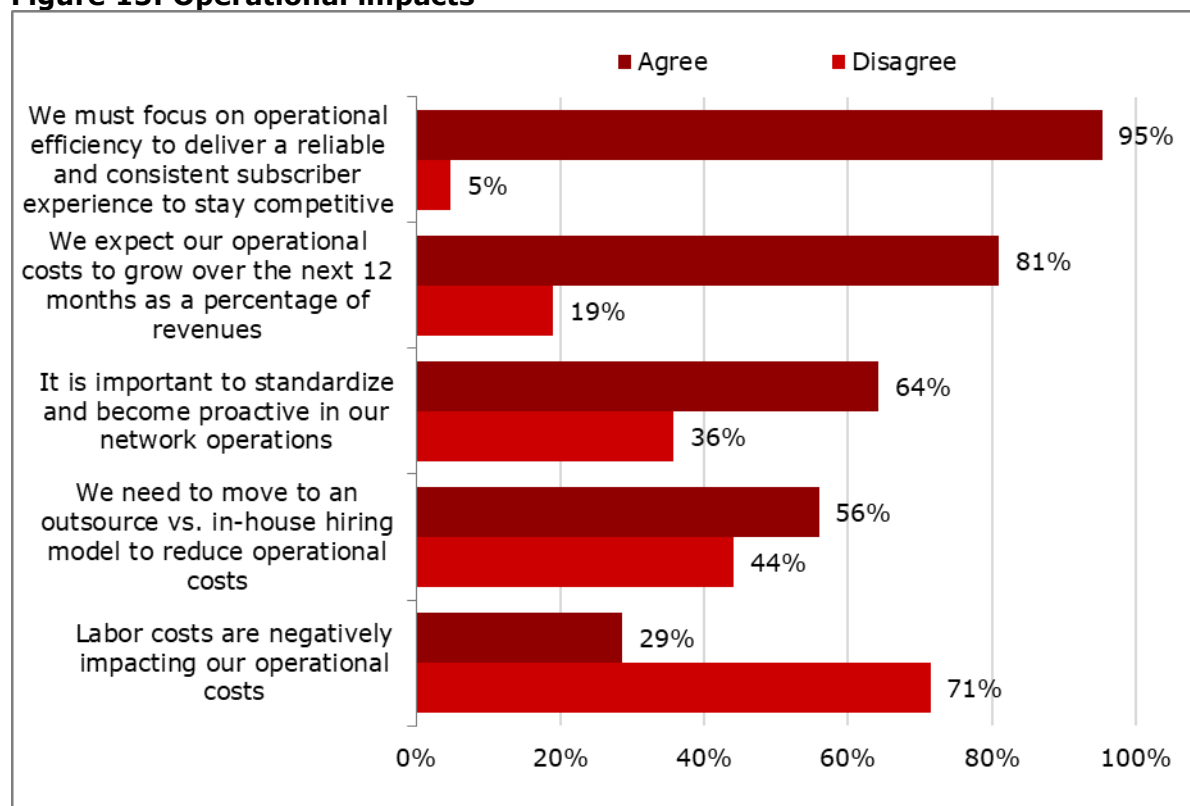
Services are important to drive revenue growth and stay one step ahead of competitors. However, other factors such as operational efficiency are also vital variables of the success equation.

As **Figure 15** illustrates, 95% of the C-levels pragmatically believe that they must focus on operational efficiency to deliver a reliable and consistent subscriber experience to remain competitive. They also recognize that despite their focus on operational efficiency, operational costs will rise in 2023 (81%).

Despite the operational challenges, C-levels seem split on adopting an outsourced hiring model. More than half of the C-levels (56%) are considering outsourcing, while the remaining 44% plan to maintain the “status quo” in-house hiring model.

One of the reasons why C-levels are split on whether to outsource is that more than 7 out of 10 (71%) have yet to see labor costs reach a tipping point and negatively impact their overall operational costs.

**Figure 15: Operational impacts**



Question: To what extent do you agree with the following statements? (n=84)

Source: Heavy Reading

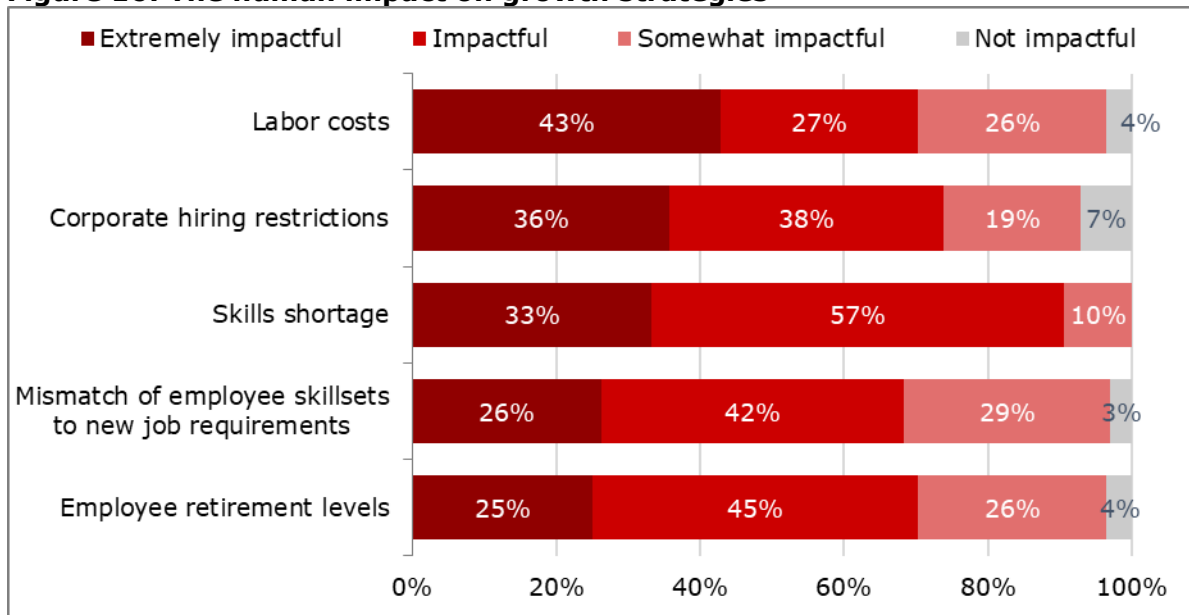
As documented in the previous figure, most executives (71%) do not believe that labor costs are negatively impacting their operational cost structures. However, as **Figure 16** illustrates, this does not mean that hiring issues, from labor costs to retirements, are not exerting pressure on the execution of their growth strategies.

Based on “extremely impactful” inputs, the top three concerns are labor costs (43%), followed by corporate hiring restrictions (36%) and skills shortage (33%). Skills shortage also attained the highest “impactful” score (57%), which positions it as an “extremely impactful” or “impactful” concern of 90% (33% and 57%) of all respondents.

Heavy Reading believes this strong level of consensus on the negative impact of skills shortage is also a factor in why more than half of the respondents (56%) are considering outsourcing hiring (see **Figure 15**).

Even though employee retirements attained the lowest “extremely impactful” score (25%), when combined with the “impactful” inputs (45%), it confirms that 70% also consider retirements as having a significant negative impact on growth strategy execution. The same applies to concerns related to a mismatch of employee skillsets to new job requirements (26% “extremely impactful” and 42% “impactful,” for a total of 68%). The impact of this mismatch also likely plays a role in driving some C-levels to consider the adoption of an outsourced hiring model.

**Figure 16: The human impact on growth strategies**



Question: To what extent will the following impact your ability to execute your growth strategy? (n=84)

Source: Heavy Reading

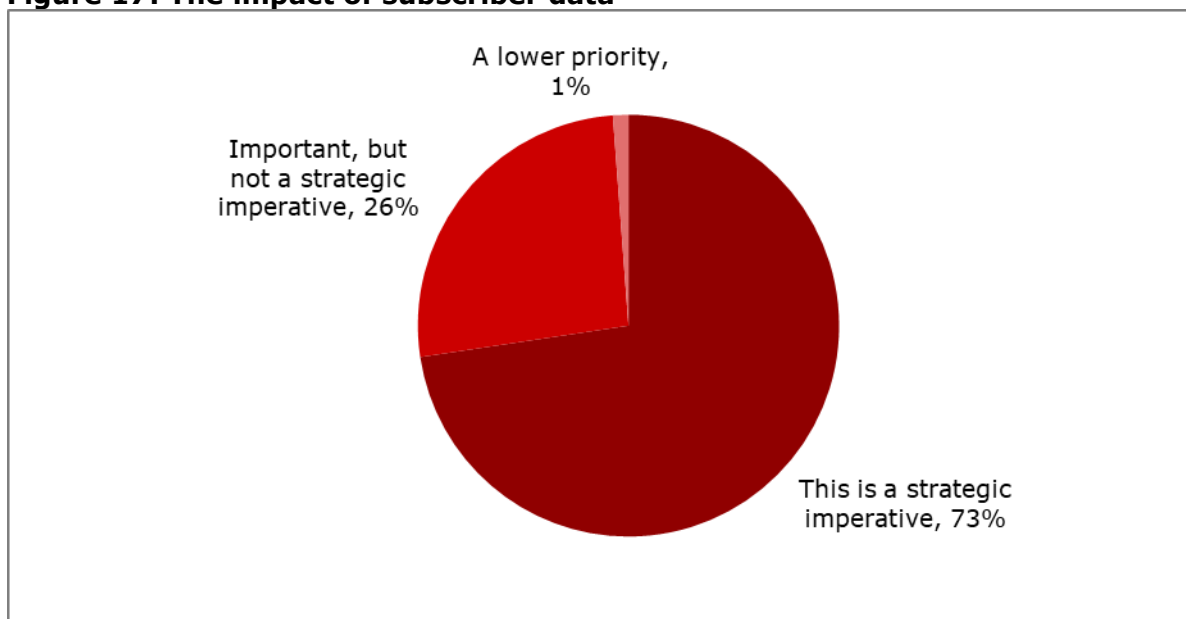
As noted earlier, a formidable challenge that BSPs face in making investment decisions relates to the change in consumer service consumption patterns (see **Figure 7**). This is because any change in service preferences can adversely affect the revenue “shelf life” of a particular technology.

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To counterbalance the risk, many BSPs implemented targeted analytics and data collection programs, which provide insight into current and future service consumption trends.

The importance of this approach is validated in **Figure 17**. As illustrated, 73% of C-levels categorize utilizing subscriber data as a strategic imperative to help them drive new service and revenue opportunities. The clear message is that subscriber data is a vital part of a successful services execution strategy.

**Figure 17: The impact of subscriber data**



Question: How important is it to utilize subscriber data to drive new revenue and service opportunities? (n=84)

Source: Heavy Reading

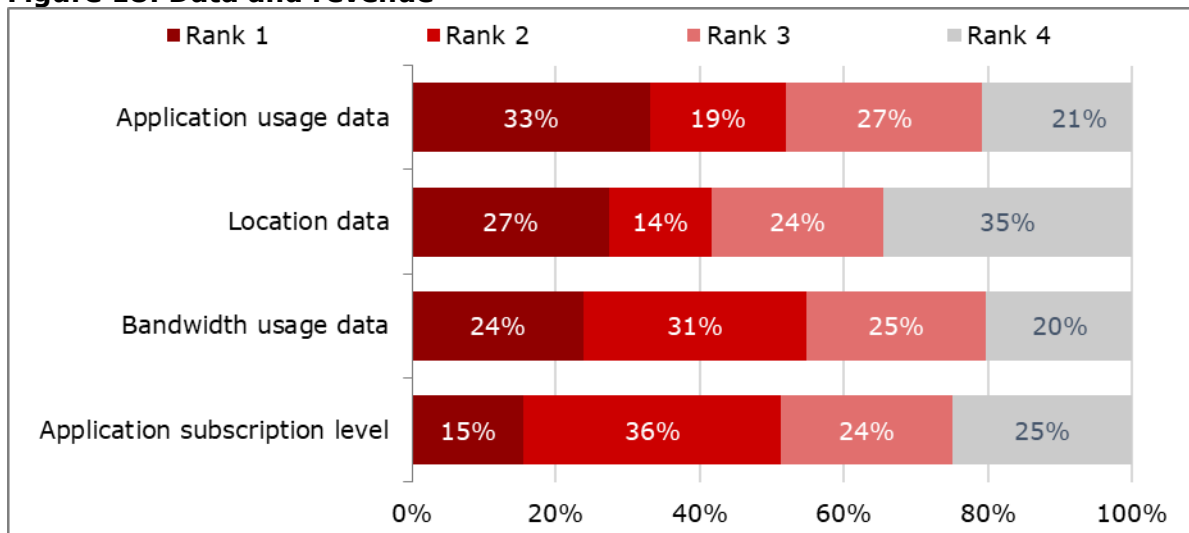
While subscriber data is unquestionably important, no shortage of data types and formats must be assessed and prioritized to effectively drive revenue growth.

When asked to rank four distinct types of data based on “Rank 1” inputs, executives assigned the greatest number of inputs to application usage data (33%), followed closely by location data (27%) and bandwidth usage data (24%).

These top three rankings are logical, given that revenue generation opportunities hinge on the delivery of differentiated services and a strong personalized customer experience, both of which rely on understanding the application the customer is utilizing the most and in which locations.

Though the application subscription level attained the lowest level of “Rank 1” inputs with 15%, it did attain the highest “Rank 2” numbers (36%), which in Heavy Reading’s view, positions it as a solid secondary priority from a revenue generation perspective.

**Figure 18: Data and revenue**



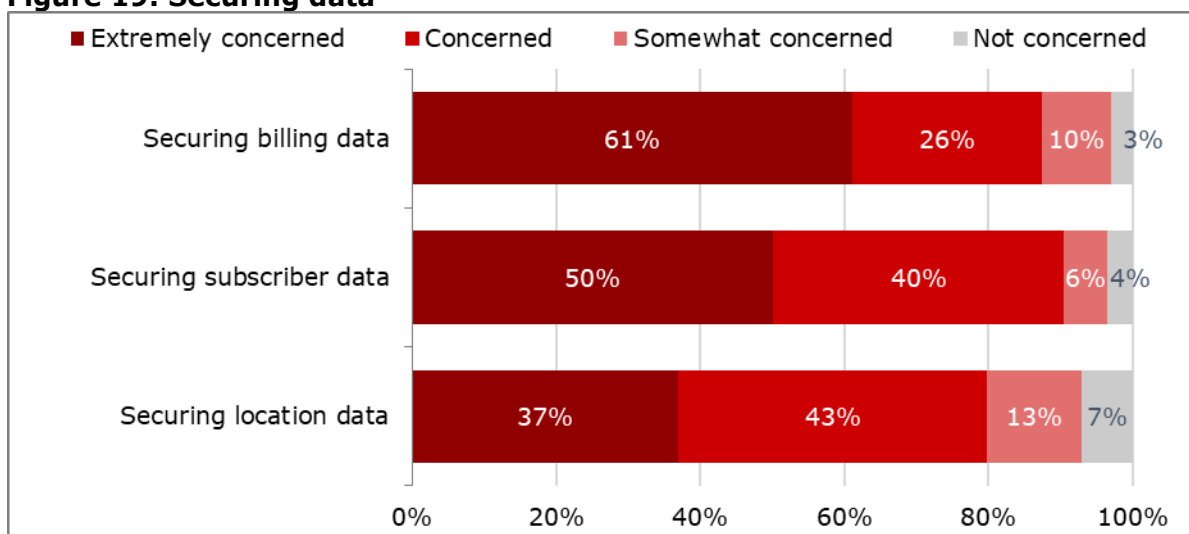
Question: Rank in order of importance the following data from a revenue generation perspective. (n=84)

Source: Heavy Reading

The first question in this survey captured that 93% of executives are either “extremely confident” (63%) or “confident” (30%) in their company’s ability to secure the network (see **Figure 1**). However, as shown in **Figure 19**, more than 6 out of 10 of these same C-levels (61%) are “extremely concerned” about their ability to secure billing data, while 50% and 37% see similar security risks associated with the protection of subscriber and location data, respectively.

These inputs do not in themselves undermine overall security confidence levels, but they do highlight that BSPs are continually facing security-related challenges that warrant a remedial response.

**Figure 19: Securing data**



Question: How concerned are you about your company’s ability to secure the following data? (n=84)

Source: Heavy Reading

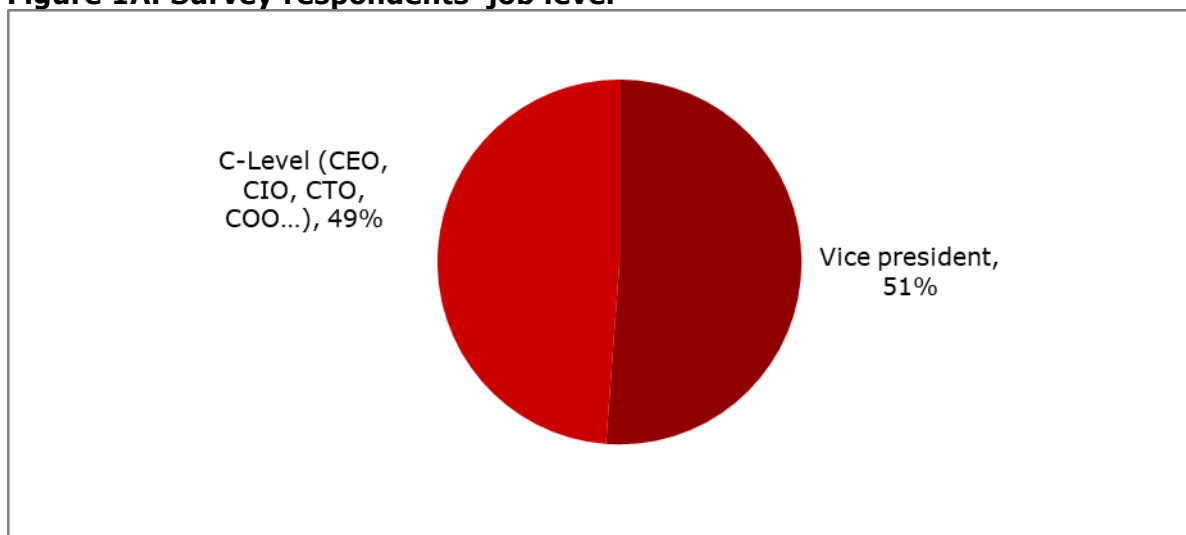
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## APPENDIX A: SURVEY DEMOGRAPHICS

This research is based on a 24-question custom survey of North American BSPs jointly developed by Heavy Reading and Calix and fielded in the fourth quarter of 2022. The survey exclusively targeted C-level sales and marketing executives who worked for BSPs serving 100,000 and fewer subscribers in Canada or the US.

As shown in **Figure 1A**, the C-levels who took the survey were split into either vice presidents (51%) or C-level executives (49%).

**Figure 1A: Survey respondents' job level**

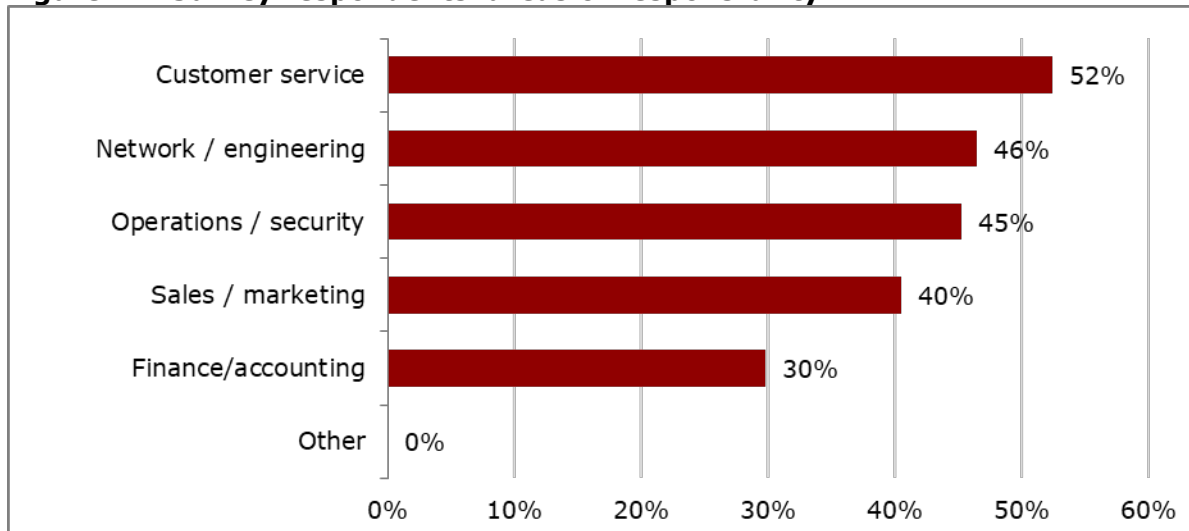


Question: Which of the following best describes your job level? (n=84)

Source: Heavy Reading

This survey targeted executives who lead customer service, sales, network, operations, and marketing teams. As illustrated in **Figure 2A**, in BSPs of this size, executives typically perform multiple roles. In this case, the four heaviest represented areas of responsibility included customer service (52%), network/engineering (46%), operations/security (45%), and sales/marketing (40%) functions.

**Figure 2A: Survey respondents' areas of responsibility**

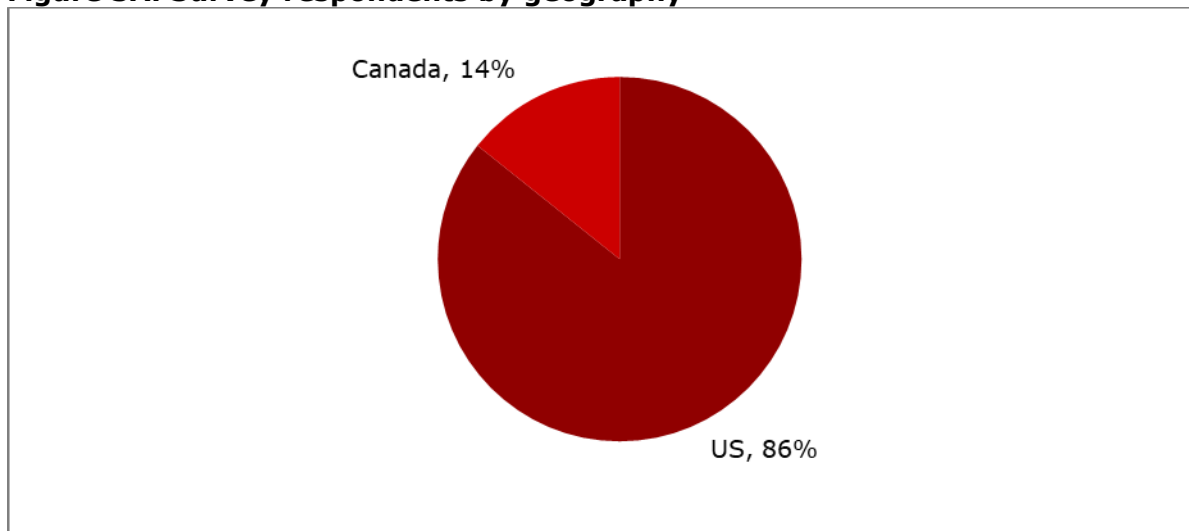


Question: What areas are you responsible for? (n=84)

Source: Heavy Reading

The majority of the C-levels (86%) who took the survey worked for US-based BSPs (see **Figure 3A**). Given there are a greater number of companies with 100,000 and fewer subscribers in the US compared to those in Canada, this distribution curve is considered an optimal mix.

**Figure 3A: Survey respondents by geography**



Question: Where is your company located? (n=84)

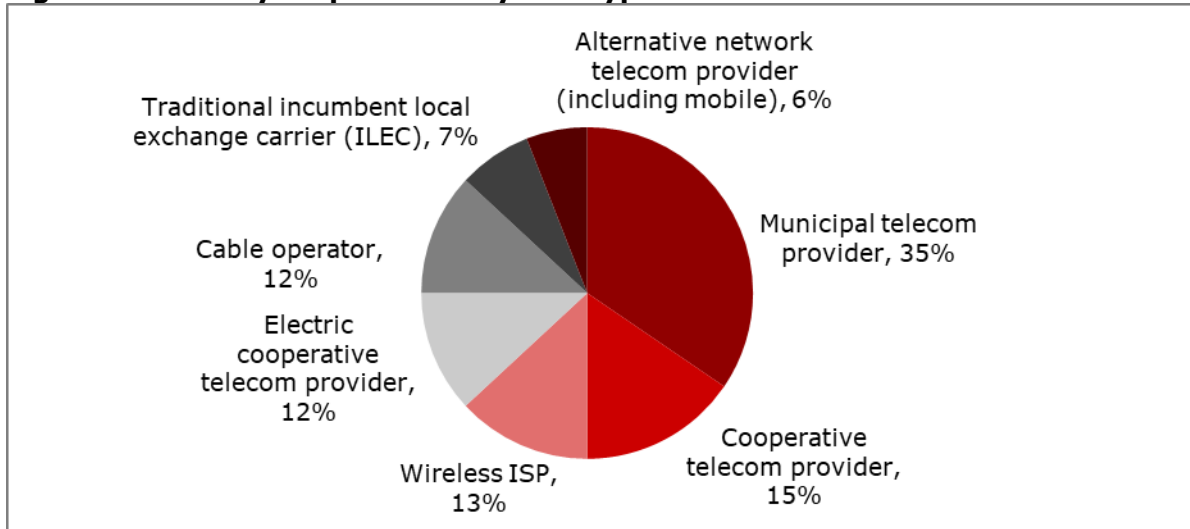
Source: Heavy Reading

The executives who took the survey worked for various service provider types. As **Figure 4A** illustrates, the largest data distribution was municipal telecom providers (35%), followed by cooperative telecom providers (15%), wireless ISPs (13%), and electric telecom providers and cable providers (both 12%).



Traditional incumbent local exchange carriers (ILECs) and alternative telecom providers represented 7% and 6% of the survey respondent base, respectively.

**Figure 4A: Survey respondents by BSP type**



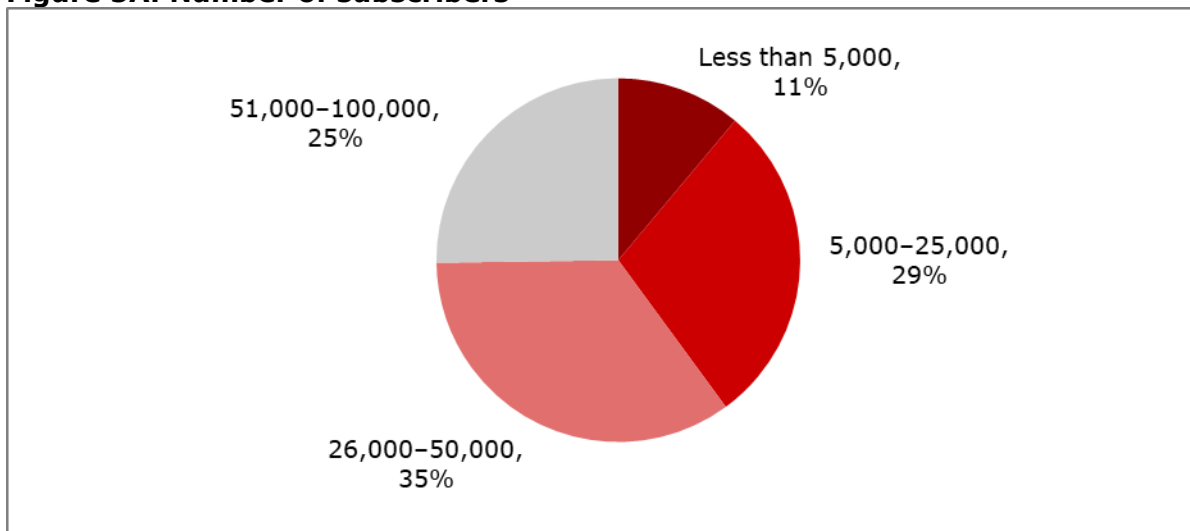
Question: What type of broadband service provider (BSP) do you work for? (n=84)

Source: Heavy Reading

As **Figure 5A** shows, the largest group of executives worked for companies that provided services to 26,000-50,000 subscribers (35%), followed closely by 5,000 to 25,000 subscribers (29%).

The remaining executive grouping included companies that served the largest subscriber group (51,000–100,000 [25%]) and those that supported the smallest number of subscribers (fewer than 5,000 subscribers [11%]).

**Figure 5A: Number of subscribers**



Question: How many subscribers does your company have? (n=84)

Source: Heavy Reading

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