Planning today for the networks – and revenue opportunities – of tomorrow

How to break down silos and integrate processes to plan and deploy a 5G network that delivers maximum Return on Investment, with Infovista Smart CAPEX
Executive summary

In the 1990s network operators offered simple voice services. They were highly profitable and relatively straightforward to plan. 5G networks, though, offer myriad and diverse service possibilities, each with unique connectivity characteristics and underlying business models. Alongside higher spectrum frequency bands, diversification of network equipment form-factors and the introduction of advanced air-interface optimization technologies, this all adds up to much more complex rollout, expansion, densification and optimization challenges.

And yet it’s not entirely clear where the revenue will come from. Flat/declining ARPU is making it more important than ever that CSPs target their network investments in areas with the highest potential for sustainable growth and optimal return on investment (ROI).

While the maturity of the CAPEX allocation process may vary from one CSP to another, there are common challenges. Network design is typically organized as a separate process from the business analysis of the network’s total cost of ownership (TCO), time to market (TTM) and ultimately ROI. Compounding this are the ‘language barriers’ between CTO and CMO teams and the resulting difficulties in aligning key business objectives with the whole network evolution process.

CSPs need more visibility into not just how the network is performing today, but how to plan for mitigating against future poor QoE and churn hotspots and optimizing predicted revenue growth.

In a sentence, CSPs need to be able to model ‘what-if’ scenarios, predict the business impact of various network investment decisions, and systematically optimize their planning decision-making for business outcomes.

Thus, network planning and deployment needs to follow two models at the same time. First, networks must be designed and deployed today to make the most of revenue opportunities in the medium and long term. Second, there needs to be a proactive, tactical approach to exploiting new opportunities as they come into clear view (in whatever forms they take).

Basing network investment decisions on an understanding of both the addressed revenue of today and the revenue potential of tomorrow is essential.

With competitive dynamics bringing business agility up the agenda, and with it a real sense of urgency; it’s easy to see why managing CAPEX is such a pressing issue today.

It’s not just about where you place cell sites to serve your customers; it’s about how fiber backhaul costs could affect the economics of your network rollout. It’s also about the lifecycle of the network and how it adjusts to changing circumstances.

Figure 1: The CAPEX allocation challenges
The good news is that there's a lot of data and insight out there that can enable you to plan better: business data concerning service demand, customer behavior, subscriber density and equipment TCO (all data that’s available from inside your business today) can now be combined, modeled and predicted in ways that were not previously possible. Beyond this, market context data such as population density and household income can also enrich your perspective of how investment in different areas will impact on revenue, churn and ROI.

And that's where Smart CAPEX comes in, a new approach enabling operators to map 5G traffic and revenue potential – a very simple summary of a very complex process that intelligently finds, uses, and learns from multiple sources of data.

Smart CAPEX enables the CTO and CMO organizations to work in an agile, joined-up way, to quickly understand the impact of their combined investments and decisions on future business performance, ultimately ROI, by translating complex ‘what-if’ scenarios into predicted network capacity utilization, TCO, revenue and churn.

A legacy of siloed processes

As networks have evolved, siloed processes have taken root, preventing the network and marketing teams from working closely together making every task that bit harder. The technology capabilities simply weren’t there to enable these processes to be integrated.

But the complexity of the new 4G and 5G networks and the richness of the services they enable fundamentally challenges these traditional network planning and CAPEX allocation processes.

Operators must not only continue to plan for network capacity and speeds capable of supporting subscribers’ video calls and social media uploads, even during major events when the network will be under extraordinary pressure; they must also deliver a network tailored for the new business models – many as yet untried – that 5G in particular enables.

To address this dynamic 5G landscape, traditional linear processes are no longer fit for purpose. A new agile way of working is needed, combining traditionally separate disciplines, if CSP organizations are capitalize on the new opportunities 5G presents, while still profitably maximizing revenue from their existing network investments.

Today, the business side of a CSP is just as invested in the success of network planning as the technical side.

To optimize localized sales plans, marketing and sales departments need to know what capacity is available in the different locations in the network. They don't want to be told that a new service deployment is increasing latency in the rest of the network. They do want to communicate with technical staff in a language both departments can understand.

There’s no room for waste when expanding a 4G network or rolling out a new 5G network – planning must not only maximize today’s revenue; it must also be ready to accommodate potential new sources of revenue.
Putting business outcomes at the heart of RF planning

Senior stakeholders – including the CTO and CMO organizations – need predictive accuracy of how their network plans will deliver against business objectives to optimize KPIs such as TCO, incremental revenue, churn and ROI.

With insight into data-driven geospatial outcomes, they can make decisions on how to prioritize the allocation of budget in different areas, or how to target high churn probability hotspots in the network which exist today or will pop-up in the future.

Data can include the targeted number of sites, download and upload performance, outdoor demand, indoor coverage, throughput, capacity targets, hotspots identification, RAN products performance and antenna propagation, as well as functionality limitations such as latency and potential interference. Then there’s financial data, rental data, buildings, and obstructions.

And of course, where you site your cells is going to matter. What’s ideal? And what’s available? Rooftops? Street furniture? Trees? How well can each site do its job?

There are also issues involving radio hardware, fiber length and time to market – including site acquisition and site construction time, as well as backhaul cost considerations for both.

But it’s not enough to just understand the physical network, it’s vital that you can understand how the network is being used – the end-users’ experience.

The population density in different areas, the dwell time around different cell sites, what kinds of content users consume, even the price plans the customers are on, can be useful for planners. That means live performance management (PM) traffic data, crowdsourced data, social media usage, high resolution geodata and geolocated call traces should all be considered.

All this will allow planners to answer questions like: will demand increase over time? Are we missing areas of demand? Will there have to be a trade-off between coverage and likely demand if, say, a certain area experiences heavy social media usage for only a very short time?

The need to make decisions quickly, and to be agile and responsive, is more urgent than ever. Operators need to marry together network planning and business outcomes and to act on the information derived from this.

That means CSPs can be proactive when possible but need to be reactive when necessary. They especially need to keep on learning during the lifetime of the network. Operational data – observed data with predicted data – will support adjustment and learning over time.

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**Users**

- CMO and marketing teams
- CTO and network design and operations
- Engineering teams

**Benefits**

- Optimized network CAPEX return on investment (ROI)
- Proactive churn avoidance
- Prediction of future business impacting network issues and TCO/ROI impact
- Rapid, systematic what-if scenario simulation based on Digital Twin model

**Key features**

- Geospatial visualization combining business and network metrics
- Network digital twin model-driven visualization and prediction
- Business metrics prediction: revenue, churn, ROI, TCO
- Automated cell planning optimized for business outcomes (TCO, ROI)
- Heatmap-based geospatial visualization of changes in business and network KPIs over time

**Smart CAPEX**

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*Figure 2: Smart CAPEX has broad applicability and benefits across a range of stakeholders in the network operator’s organization*
Which brings us, inevitably to planning tools and network evolution strategies. These can help you to find out where there is revenue growth potential. Where there is (or is not) enough capacity. How efficient network performance is during busy hours and whether it can be improved. The likeliest date when a cell or cells will become congested. The traffic growth forecast for each cell. A given cell’s TCO and ROI. They can also help you to look forward, allowing you to extrapolate and predict future demand and build densification roadmaps.

All of this happens under time pressure. Automating the optimal layouts of cell sites and antennas quickly is an essential part of delivering the performance that is going to help you keep up with the competition. But the groundwork must be laid first and then network efficiency needs to be supported throughout the life of the network. And that’s what we at Infovista do – drawing on our experience of working with over 410 5G deployments across 94 countries around the world.

Modeling future revenue potential

Our approach – Smart CAPEX – supports engineering and network planning teams to optimize their efforts in radio network evolution planning for densification and expansion including multiple what-if scenarios simulation in a systematic, repeatable, and continuous way. It leverages fully automated business-driven planning algorithms along with rich geospatial views that provide ‘at-a-glance’ information about the current and predicted network performance, areas, and hotspots with poor QoE or capacity bottlenecks. On top of that, the solution estimates automatically the business impact of the problem in monetary values, the optimal TCO to fix this problem area and the resulting ROI.

From greenfield design and the network deployment stage, Smart CAPEX enables CSPs to intelligently optimize traffic and revenue potential against deployment costs and then invest where it matters most to increase the ROI from their networks.

Smart CAPEX is part of Infovista’s Network Lifecycle Automation suite that enables the automation of processes spanning multiple network lifecycle phases, from planning and testing through to operating and monetizing. The result is optimized CAPEX, OPEX and an improvement in customer experience.

Smart CAPEX enables CSPs to map 5G traffic and revenue potential. CSPs can then invest where it matters most to increase the return on investment from their networks.

Smart CAPEX ends silos and integrates processes to allow ROI-based site prioritization.

Smart CAPEX allows CSPs to undertake ROI-based site prioritization. How? By combining multiple sources of information that would previously have been used for siloed processes, to allow accurate analysis and understanding of the impact on network investments on revenue potential and therefore ROI. These sources of information can also deliver insights into the TCO and TTM constraints for both greenfield 5G deployments and network expansions.
No two cells site deployments are the same. Smart CAPEX helps planners to understand how.

For example, TTM is often bound up with distance to fiber. That’s because a good site becomes less attractive if the distance to fiber is 600 metres rather than 200 metres. However, if the 600-metre option involves fewer road intersections, faster construction time and lower cost, distance is less important. And if TTM will be affected by slow regulatory clearance it may be time to think again. Meanwhile, high user demand and excellent revenue potential may trump all these considerations. You just need to know.

Put very simply, no two site deployments are the same. Smart CAPEX helps planners to understand how. This includes automated calculations of both the TCO, including radio hardware and fiber length, and the TTM including site acquisition and site construction time, as well as backhaul cost considerations for both.

The primary objective of Smart CAPEX therefore is to enable a shift in focus in network evolution planning, from network KPIs to business KPIs. Smart CAPEX supports this by combining live network and traffic data to deliver actionable business insights based on accurate views of business performance, both current, and future.

Figure 3: An example of a heatmap showing predicted QoE, churn, traffic demand and revenue (top) and the impact of network investment on these KPIs (bottom).
The main functionalities and deliverables in the Smart CAPEX solution that support this objective include:

- **Geospatial heatmaps**: visualizations of current and predicted business KPIs in the form of heatmaps that users can view at various levels of granularity, from the national level down to the cell-site and ‘pixel’ level. The KPIs include: QoE, Churn risk, Revenue, TCO and ROI.

- **Digital twin modeling**: A model that replicates the live physical network alongside population density and traffic demand.

- **Focus area detection**: The identification of both current and predicted geographic areas with problems resulting from insufficient capacity, including insufficient capacity and coverage; insufficient or rapidly declining QoE; rapid capacity demand growth; and low spectral efficiency.

- **TCO and ROI modeling**: The configuration of equipment and associated costs, alongside maintenance overhead data to accurately estimate the overall TCO implication of different planning decisions, to support the identification of the most cost-efficient cell layouts.

- **ROI optimization**: Leveraging the Potential Revenue heatmap and TCO modeling capabilities, Smart CAPEX solution identifies the areas with healthy ROI and visualize that in various formats including ROI heatmaps and network upgrade schedule priorities by ROI.

Using advanced analytics and leveraging the digital twin concept allows Smart CAPEX to predict that and visualize potential revenue, user experience and churn potential alongside coverage and traffic demand growth.

These heatmaps can even be used to predict losses months before they happen. Will QoE targets be affected by the introduction of premium services? Will traffic load change over the next 12 months? These predictions are not going to be infallible, but the more data that is available, the better and the longer term they will be.

Meanwhile the Smart CAPEX dashboard draws on multiple data sources, including live PM traffic data, crowdsourced data, social media usage, high resolution geodata and geolocated call traces, as well as the technical and regulatory issues discussed earlier, to model prioritized cell site deployments based on their traffic and revenue potential.

The Smart CAPEX dashboard lets you model prioritized cell site deployments based on their traffic and revenue potential.
In short, Smart CAPEX allows 5G operators to effectively and efficiently plan, optimize and model to deliver next generation networks with the maximum ROI. It then continues to do so through the network’s lifecycle as adjustments and improvements are highlighted, costed, and implemented.

Mapping a profitable multi-vendor network

This concept isn’t new. A lot of vendors and specialists are trying to use a wide range of data – cost-related, usage-related, technology-related, and more – to put together a bespoke model with a bespoke prediction of the expected outcomes of different planning decisions. This is not a trend but a necessary response to a changing world.

But in a world where the network is becoming virtualized and multi-vendor, it is not enough to simply model one RAN vendor – you need a holistic view across all vendors. Smart CAPEX is vendor-agnostic, not aligned to a specific vendor of network-building hardware or software: it’s a guide for network-wide decision-making.

In addition, Smart CAPEX is for the long term. It doesn’t make sense for planning to only exist at the beginning of a network lifecycle. It’s not a four or five-year investment cycle these days. A network can change its purpose. It can shift from being mainly a consumer-based network into more of an enterprise network that focuses on the needs of manufacturing, ports, or mining. Or it can do both. And as 5G arrives the shift will be faster.

That means the planning process is important throughout the lifecycle of the network. You must test that your planning decisions are working accurately – not just at the start of the process but when you have put those decisions into effect. Testing, service assurance, customer experience management, financial input, BSS systems – they all must be put into the planning system.

Infovista is different not just because we do the early planning so well but because we have that portfolio of peripheral systems that are still relevant to planning even when the network is up and running. The core of what we do is in network lifecycle automation: a full end-to-end network lifecycle automation portfolio.

Automating the future

Network planning is a learning process. In a data-heavy environment where more and more data points can be incorporated into planning, that isn’t a task human teams can manage unassisted. That means artificial intelligence (AI) and machine learning (ML) will have an increasingly important role to play in combining operational data and observed data with predicted data to allow the automation of complex decision-making.

The list of relevant data will expand. Right now, you can view heatmaps that tell you network capacity, potential revenue and population density. You can plan months ahead. When data points can incorporate weather, road planning, power demand and more, your network planning becomes exponentially smarter. The prediction business may not be infallible but it’s going to become more and more reliable, thanks in no small part to AI and ways in which it learns more about the network and applies that learning.

And other challenges are on the way. Edge computing, for example, will make multiple business opportunities possible. However, there are many technical and business complexities inherent in edge computing systems, with prospective enterprise 5G customers requiring specific SLAs in areas such as network latency or availability.

AI/ML will be key to combining operational and observed data with predicted data to automate complex decision making.
Planning is also going to have to take into account the disaggregated nature of network architecture as virtualization and multi-vendor networks become realities – and also the more dynamic nature of the vendor ecosystem that supports that architecture.

We are already responding to change through our ongoing adaptation of Smart CAPEX to the cloud – enabling planning systems to operate from a single cloud environment. In fact, we are the first to market to support that opportunity.

The planning process was already complicated; and it’s going to become a whole lot more complicated. But we are ready for this, just as we are ready for multiple evolutions and revisions of 5G and – eventually – 6G.

Planning – every aspect of it – is a big opportunity. We are a front runner in this field, and we plan to remain there.

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**Conclusion**

As 5G rolls out, you need to apportion costs with more precision, based on your network’s needs and revenue. The bad news is that you will need a mountain of data to do so. The good news is that collating and using that data is now possible. The result will improve not just the networks of tomorrow, but the ROI they generate.

To find out more about the Smart CAPEX solution, and how you can use its AI/ML-based network planning, optimization, and modeling to deliver a mobile network with the highest revenue potential, please visit https://www.infovista.com/solutions/5g-investment-smart-capex.
Infovista is the global leader in network lifecycle automation (NLA) for the next-gen networks era. With its unique NLA approach, Infovista allows communications service providers (CSPs) and enterprises to improve their network performance and customer experience, optimize their productivity, and reduce their costs, while maximizing return on their investments. Spanning the entire network lifecycle, Infovista’s products and solutions leverage an open, integrated, cloud-native portfolio that automates tasks, flows, analytics, and decisions to the greatest extent possible. More than 1,500 customers, including 400 Mobile Network Operators, around the world rely on Infovista to plan, design, deploy, test, operate, support, optimize, evolve, report on and monetize their networks.