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As Jagbir Singh surveys his role to design, build and operate the network for India's largest mobile phone services provider, he knows that success is based on understanding two areas — the customer experience and his company's business needs. Singh is chief technology officer (CTO) and director of the Network Services Group (NSG), India & South Asia at Bharti Airtel, the world's third-largest mobile phone services provider (after China Mobile and Vodafone), with operations in 20 countries. He oversees more than \$4 billion in annual spending, based on capital expenditures and operating expenses.



“You need to have a good balance between the expectation of the customer and an understanding of the business needs,” says Singh, of the delicate balance needed to keep both the customer and the business side of his own company happy. He also sits on Airtel's management board, where his role expands to planning

and recommending capital investments and operational expenditures, forecasting spectrum bandwidths, and providing technology support for new products, services and pricing.

Airtel's customer base is large by any measure. With 184 million of India's 890 million mobile phone subscribers, Bharti Airtel is the provider for one out of every five Indian mobile users, whether it is individuals, small businesses or large corporations. Worldwide, Airtel has more than 260 million subscribers spanning markets in South Asia, Africa and the Channel Islands. The company has a presence in every market segment — fixed land lines, local and international long distance, mobile voice and

data services, 2G (second generation telecom), 3G, 4G, LTE (long-term evolution) Satellite communications and DTH (direct-to-home) digital television broadcasts.

Singh's turf is India and South Asia (Bangladesh and Sri Lanka), where the mobile phone services market is the most competitive worldwide. India has many operators — a dozen players in all. So it is natural that to attract and retain customers, he sees maximizing user experience and satisfaction as his top priority. India's growing upper- and middle-income populations, meanwhile, are using more high-end devices like smartphones and aggressive rural penetration by mobile services providers has dramatically expanded the market opportunity in recent years. Singh is constantly slicing and dicing those markets by demographics and by analyzing patterns of affordability and consumption of voice and data bandwidth.

Singh has spent more than two decades in the telecom industry, and strategic business roles have formed a large part of that career. He worked with Bharti Airtel for nine years and was the group CTO in 2010 when he joined Reliance Communications, another Indian mobile phone

services provider, as president of technology and networks. He returned to Bharti Airtel in April 2011 to assume his current role. He started his career as a scientist in India's state-owned Defense Research & Development Organization and then assumed leadership roles at Lucent Technologies (now part of France's Alcatel-Lucent) and later at Nortel Communications. Singh has a Master's Degree (Mhil/MTech) in physics with a specialization in Electronics.

Roles and Responsibilities

Singh sees the following three principal dimensions in his role as a Bharti Airtel management board member (AMB) and NSG head:

- satisfying customer expectations by creating a service aware network;
- laying out the technology road map, and selecting technologies and product/equipment portfolios; and
- monitoring and meeting capital and operating expenditures, and related requirements

A crucial role for Singh is to recommend the type and amount of spectrum bandwidth the company needs from government auctions based on an evaluation of strategic considerations regarding how the company wants to distribute its resources around the various market segments — 2G, 3G, 4G, Wi-Fi and LTE. To do all that in India compared to other countries is extremely challenging, Singh says, because India has one of the least amounts of available spectrum and the smallest wire-line networks coupled with a massive user base.

Bharti Airtel outsources much of the technological work for its network to a variety of vendors it calls "partners," leading Singh to describe his company as "significantly outsourced" and a "pioneer in outsourcing." Both terms can be traced to the company's growth years, with roots going back to 1992 when founder Sunil Bharti

Mittal won his first cellular services license for the New Delhi market. At various points since then, the company secured licenses for different technology platforms such as 2G, 3G and 4G, creating a network footprint for each. In its pursuit of seamless scalability to address Indian market growth, the company — in addition to developing strong in-house technological expertise — engaged its network equipment providers as partners to design, build and manage the network, Singh explains.

A Centralized Network Planning Team

Singh considers his biggest contribution at Bharti Airtel to be bringing all its network investments, project implementation and operations under one entity — the NSG — which he created in 2011. "NSG was the first one to propose the idea to management to combine all the network organizations rather than have them exist separately business-wise, because otherwise we wouldn't have the synergies," he says. Management readily bought the idea.

Under the new arrangement, each business unit sends the network technology requirements to NSG, and the two jointly plan out an investment program. NSG then makes the business case to top management, secures funding and implements the project. It operates as a no-profit, no-loss center, and apportions the capital investments and operational expenditures to individual business units through a transfer pricing mechanism.

"NSG was one of the big steps that benefitted the company both in terms of costs and time to market," says Singh. "We don't have every business unit trying to justify their technology investments; we do it ourselves." It also takes out many layers of activity in the investment decision-making chain, although Singh has to seek final approvals from his CEO and CFO. Operationally,

NSG brought big gains, Singh says. In the earlier arrangement, separate network teams worked directly with respective business units, at times not fully aware of the resources and plans of the other network teams. Occasionally, this led to duplication or multiple teams running parallel roadmaps.

Customers don't care what lies behind an interface as the company goes about delivering its services, says Singh. That is especially true of some customers who may use 2G services for voice, and want to seamlessly shift to 3G for data services and vice versa. "So we needed to create a network architecture with the planning, design, deployment and everything else that is agnostic to who sells to whom."

Securing Buy-in from Within

Singh says it's important to know what it takes to get the necessary backing from top management and the chairman. "Once you have anything that is good for the customer, it makes sense for the organization and you are convinced, it is easier to convince the management," he says. "Also, our chairman is very open to new ideas."

In his role as a member of Airtel's management board, Singh is part of the executive team overseeing the whole business. The usual business discussions, as he puts it, are: "How do we deal with competition, pricing, new products and growth? How do we differentiate between 2G, 3G and 4G offerings in various markets? How can we increase the range of offerings and revenue realization?" Singh also is the main driver behind more technically intensive areas, such as those relating to NSG or how the company should move to a more energy efficient ecosystem, optimize available spectrum or create a business continuity and disaster recovery plan for its core networks.

According to Sanjay Kapoor, Airtel's CEO for India and South Asia, the network is the backbone for the telecom service provider. "Over the last few years, the focus has significantly moved from deploying a scalable voice-centric network towards creating a multi service, multi technology, performance optimized network," he says. "This task had become increasingly complex owing to the outsourced nature of our network operations. With creation of NSG and in-sourcing of design, engineering and planning, we have not only been able to create a state-of-the-art knowledge pool of internal resources, but we also are now able to design and deliver services in a faster and cost effective manner."

The Drive towards More Efficiency

Singh uses technology as a tool to constantly hone his company's competitive edge. For example, he recommends the type of spectrum the company should invest in for a given market opportunity. Customers who need data connectivity require a more robust spectrum like 3G or 4G, while voice customers or rural markets could make do with 2G services. For data customers, his biggest challenge is determining how the network can produce the least cost per megabit download and what is the right vehicle to achieve that, keeping in mind the availability of devices in the market.

Singh also uses technology to help Bharti Airtel get first-mover advantage in a market. For example, the company is now focused on Bangalore, India's IT capital, to offer "everything that is possible within the realm of telecom technology" in Wi-Fi, 3G, 4G, FTTx (Fiber to the x) and other new technologies. Next, the company plans to offer its higher-end customers a seamless data path, and common policy and rating across 2G, 3G and Wi-Fi services, irrespective of the network they use.

In a “significantly outsourced” company like Bharti Airtel, Singh has also raised the bar for its partner companies. He wants them to help achieve efficiencies and improve customer satisfaction scores. In earlier years, the company expected partners to provide the expertise, manpower and knowledge to roll out telecom networks fast enough to meet market needs. But now, with intense competition, Bharti Airtel expects its partners to be aligned towards customer experience goals, rather than just delivering on their KPIs (key performance indicators) and service level agreements or focusing only on their contractual obligations.

“We expect our partners to tell us what is happening in the global market, what advanced countries and operators are doing, and what new products will help us achieve differentiation in the marketplace,” Singh says. “Partners are expected to take care of all the products, technology, networks and systems that are on the ground, and help us in driving synergies in the most cost effective manner. These are the high level expectations for our partners.”

Singh recently introduced a reward-and-penalty system for partners, based on customer satisfaction scores and complaint rates. The meter for partner companies ticks up or down depending upon what he calls the “CPC” (complaints per customer), and that scorecard is built into their contracts. For voice calls, it tracks issues like dropped calls, while for data users it tracks areas such as Internet download speed, throughput and latency. The new system is working well and the results are reviewed quarterly with partners.

Tips for Aspiring CTOs: Customer First

The drive to enhance customer satisfaction is not an option but a business imperative in Singh’s book. His advice to aspiring CTOs is “to keep the customer in the center and provide a good experience.” In addition, it is essential CTOs also understand the business side — the pain points of their colleagues, especially in sales and marketing.”

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