2015

EMPOWERING THE DIGITAL TELCO TRANSFORMATION WITH CONVERGENT CHARGING AND POLICY

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Introduction

In 2014, the mobile industry passed an amazing milestone – the number of mobile subscriptions (SIM cards) surpassed the human population.[1] While these connected devices represent a smaller subset of the global consumer base, mobile has had a significant positive impact on literally every aspect of our lives, the supply-chain of trillion-dollar industries and national GDPs. At the heart of this transformation is the digitization of information, processes and democratization of opportunity. The three dynamic forces of network evolution, smartphones and applications brought the fundamental change in the industry. Faster networks meant quick access to content and applications. Smaller yet powerful computers in smartphones translated into billions are coming into the digital fold. The new applications and services have empowered consumers to discover ways to enrich their lives and entrepreneurs to reimagine the world.

The changes have also meant that the traditional ways of doing business and thinking about revenue streams is largely over in most parts of the world. Many mobile operators who dominated the industry for the first 30 years recognize this and are transitioning to become a digital telco, but a vast majority are caught in the cycle of inaction. For mobile operators to stay relevant and participate in the digital economy, they have to drastically change their processes and how they manage their services, launch new products, enable the ecosystem and think about digital services. At the heart of this transformation is the ability to launch and nurture new services whether it is one of their own or that from the larger ecosystem. The flexibility needed to launch at the speed of thought is essential to competing in the digital world.

Additionally, as the network becomes complex with millions of network nodes and billions of end points, we need a good framework for policy management to help manage the flow of data and thus manage the network.

Changing market dynamics due to economy and competition is also forcing service providers to consider a multi-play strategy, which helps protect the subscriber base whilst increasing revenue. As various services are integrated across different access means, one still has to maintain a single view of the customer to both lower the operational cost as well as better understand consumer's interests and preferences. Without a tight integration on the back-end, this won't be possible.

Finally, the communications and the IT industries are merging. Digital is changing the expectations of both the consumers as well as the enterprises. The digital economy is providing an opportunity to service providers to transform the business processes and become a digital platform where new applications and services can blossom. The massive growth in connected devices and applications means we need a more robust framework for policy and charging. One of the core strengths that service providers have

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[1] Source: Chetan Sharma Consulting, 2014

is their billing relationship with the customer. The architecture required to support evolving use cases needs a rethink.

In this paper, we will explore the emerging trends that necessitate the urgency for a more agile infrastructure. We will discuss how new revenue opportunities in communication, commerce, health and retail need a more robust framework to manage growth and keep service providers relevant in the value chain.

Global Mobile Industry Trends

Revenue curves and shifts

Since the advent of the iPhone, the mobile industry revenue streams have been undergoing a tremendous shift. Mobile data is becoming the most important revenue stream for the operators as consumers' insatiable appetite for more content and services is significantly increasing usage.

In fact, data is the primary revenue engine for service providers and rest of the ecosystem. In Japan, almost 80% of the revenue now comes from data services. In the US, this is in excess of 60%.[2] Other nations are not far behind. Even the emerging markets have caught up very quickly and in some instances are leap-frogging their western counterparts in certain application and services segments.
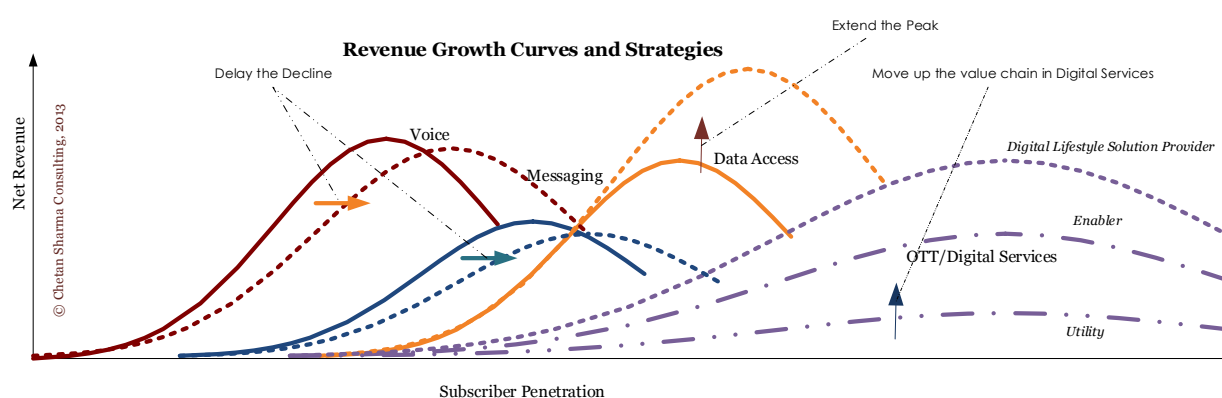

Figure 1. Mobile revenue streams and operator strategies

What is also evident is that the revenue curves in the mobile industry are changing and they are changing very quickly. As discussed in the paper, "Operator's Dilemma (And Opportunity): The 4th Wave[3], the once dominant revenue curves of voice and messaging have peaked and are decreasing rapidly (Figure 1). In the US, while data revenue has grown by 42% in the last two years, the voice revenue has contracted by 28% and messaging revenue has declined by 27%.[4] In Europe, the decline has been even steeper with some operators losing almost 50% of the revenue in a matter of few quarters. Even in the emerging growth markets like China, the voice and messaging curves are on the decline.

Another key insight to note is that the revenue on the 4th wave, or the digital services wave, is going to be much bigger than all of the previous curves combined. We are starting to see the first data points of this trend. In 2014, in the US, 4th wave revenues

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[2] Source: Mobile Market Updates, Chetan Sharma Consulting, 2015
[3] http://chetansharma.com/OperatorsDilemmaFourthWave.htm, 2012
[4] Source: Mobile Market Updates, Chetan Sharma Consulting, 2015

were more than the data access revenues (Figure 2).[5] We expect this trend to repeat itself in all parts of the world in due course. Each market is different with its own competitive structure and ecosystem dynamics that dictate the pace at which things will change.
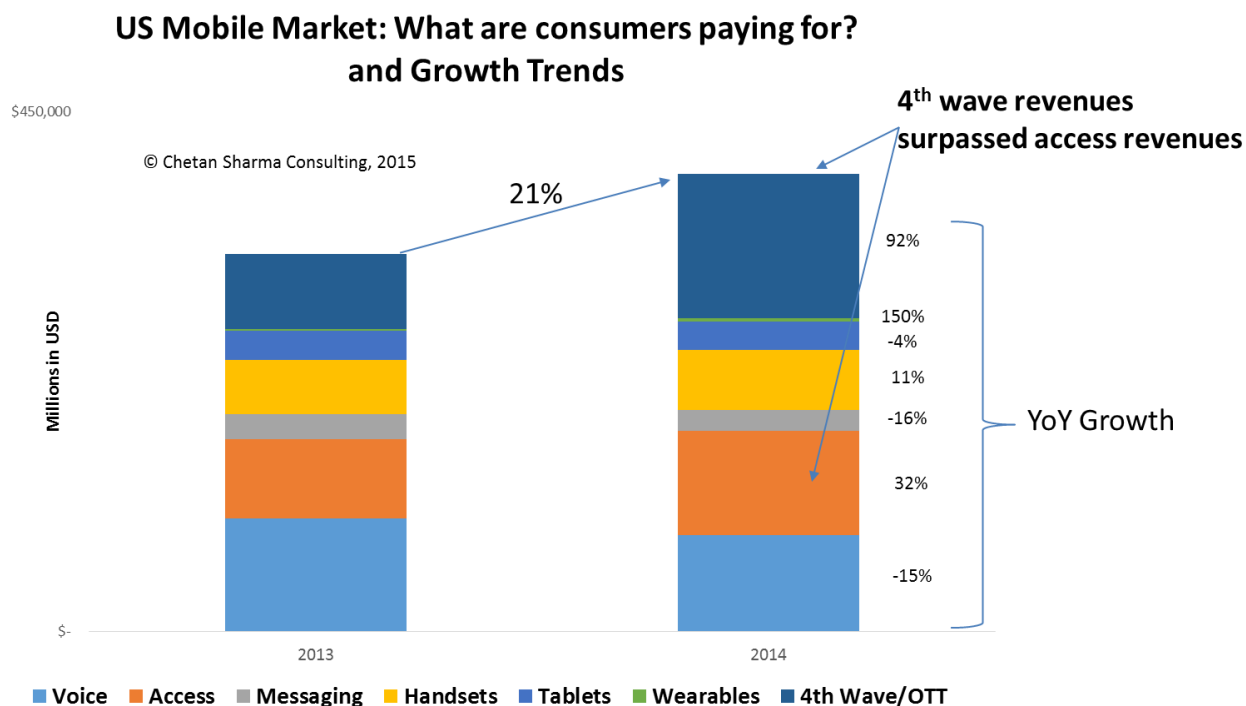
US Mobile Market: What are consumers paying for? and Growth Trends

Figure 2. US Mobile Market: Revenue splits

The Digital Telco Transformation

Being a digital telco is not just about upgrading to a new network. While having an all-IP infrastructure is table-stakes in the new economy just to compete as a digital telco, in reality, being digital means rethinking the whole ecosystem stack. It is very clear that the value in the industry is going to shift from access to platforms to end-user applications and services. Access and the IP infrastructure will continue to play the foundational role in the digital economy, but the trillions of dollars will be made on the layers above. As such, service providers have to figure out how they design, provision and launch new services for themselves and their partners, and in some instances, even their competitors.

Given that we are transforming quickly to digital services across all economic dimensions, operators can play an important role in providing some key services to the wider ecosystem in a simplified manner. Charging and billing is an example of a key business function that will be impacted by the digital transformation, serving both the operator and potentially their partner ecosystem.

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[5] Source: Mobile Market Updates, Chetan Sharma Consulting, 2015

Digital Lifestyle Service Provider

To be a player in the digital world, service providers have to become digital lifestyle service providers. Instead of selling rate-plans (different pricing tiers) and devices, they should endeavor to engage customers in experience and lifestyle choices.

Instead of segmenting the users by how much they can spend, service providers should look at customers by needs, preferences and aspirations. By assisting consumers to lead better lives, the "lifetime value" or the LTV of the household will improve significantly (Figure 3).

Customer Tier	High Tier	Mid-Tier	Low-Tier
1st	Devices	Devices	Price
2nd	Network	Price	Service
3rd	Service	Network	Devices
4th	Price	Service	Network

	High Tier	Mid-Tier	Low-Tier
Everyone	Solutions, Lifestyle, Experience	Solutions, Lifestyle, Experience	Solutions, Lifestyle, Experience

Figure 3. Mobile operators as lifestyle solution providers

Operators who have offered solutions around connected cars, home security or entertainment have seen churn rates go down dramatically and loyalty increase. As a result, the LTV of such households has multiplied.

To be able to tailor solutions and lifestyle experiences to specific individuals or households, one has to have a platform and service creation capability in the network without going through laborious archaic processes. The platform should also be capable of offering others in the ecosystem a way to leverage some key capabilities such as billing, policy, security, and analytics to launch new services.

IP Convergence (including 4G/VoLTE)

Voice and messaging revenue curves have served the industry well over the past few decades. However, we are at an inflexion point when voice and messaging become apps on the IP data access layer. We are not far from the days when operators will sell "data only" plans and voice, messaging and other services just ride on top. In some instances, even data plans might become invisible to the consumers (just like they do in the case of Amazon Kindle). This has implications on charging, rating, billing and policy engines.

Many operators are also looking to offer WebRTC enhanced communication and collaboration services over their IP network. Communication, commerce and entertainment can be tightly integrated in such experiences. However, if the platform is not tightly synched for rules and data, the new revenue opportunities will prove to be elusive. For example, if a group of friends are online debating where they should go on vacation, the service should be able to not only handle communications, but also assist in prioritizing destination plans, booking airfare and hotels whilst splitting the cost appropriately, all in real-time. The underlying infrastructure has to tap into the necessary information and data repositories to make the collaborative buying experience a pleasant one.

Additionally, convergence is taking place across many dimensions. The Internet, Cable, and Wireless industries are merging as is evident from the frantic M&A activities in the western markets. The core strategy behind this trend is that quad-play creates a sticky customer. It also offers an opportunity to streamline content delivery across different access modes.

Customers could choose to have different kinds of billing relationships with their service provider. For wireless phone they might be a postpaid customer. For video, it might be a monthly subscription fee. For tablets, they may choose a session based plan. For cars, they might buy GBs in bulk. For insurance products, they might pay indirectly through an insurance provider. For retail and financial services, the banking infrastructure might use operator assets of identity, location and security, but the customer doesn't pay for any of such services. It is the same customer who uses different solutions from different players in the ecosystem. The charging and policy across all of these is controlled by the platform that has the single view of the customer.

Given the proliferation of Wi-Fi, we can expect new types of mobile operators to enter the ecosystem who will provide wholesale cellular data access and offer services directly to consumers. Google Fi was just one of the first instantiation of such a service.[6] Some of these players might deploy their own charging and policy framework and others will just outsource this to the existing service providers whilst keeping their focus on product development, marketing and sales.

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[6] https://fi.google.com/about/

Digital Solutions that provide a Device Driven user Experience

It has become a cliché to say that the smartphone has become the remote control of our lives[7]. As new solutions come into the market, whether it is car services like Uber or commerce services in China from Alibaba or Snapdeal in India, the experience on the device drives the popularity of the services. The effortless ease with which one can hail a taxi has made Uber a giant. Its valuation is more than the market value of many mobile operators combined. Similarly, WhatsApp was able to disrupt the messaging market because of the simplicity and efficiency of the app. *User experience is the first and last moment of truth for the customer*. The backend has to work together to provide a great experience irrespective of the device, OS, payment type, prepaid/postpaid, network architecture, location, regulations and other layers of fragmentation. From the end user perspective, it should just work.

As consumers jump from one app to another, swap one profile to the next, the backend should be like a parent who understands the different personas and moods of their teenager. This provides a sense of comfort and confidence to the end-customer who is provided with a high degree of control, care and personal insight over their offerings, and hence is more likely to purchase more from their provider.

Harnessing the power of Big Data to drive monetization strategies

Service providers have one of the most useful information repositories about consumer behavior and interests. Aided with profile information, this consumer "big data" is incredibly potent. Such data can be used to design new products and services, aid every financial transaction, offer relevant content and advertisements, introduce customers to new experiences and help run their lives on a day to day basis more efficiently. It can also be used to help other parts of the value chain to understand the customer better. For example, a retail store can know in real-time, the aggregated profile of its customers in the store: how far the customers have driven to get there, how long do they stay in the store, which competitors did they shop before they came to the store and so on. Similarly, a doctor can understand the patient better, if there is continuous stream of data vs. collecting data on office visits. Mobile operators can not only use the data for their own services and operations but also offer "big data as a service" to the larger ecosystem.

Building blocks – Convergent Charging and Policy

Every industry, every large company goes through the process of moving from silo'd infrastructure frameworks to those that are unified in purpose. Winners and losers are defined by degree to which enterprises are successful at such a task. Wireless is no

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[7] Your phone, your life: New apps change how you use mobile devices, San Jose Mercury News, 2009 - http://www.mercurynews.com/ci_11900793

stranger to the silo'd approach as it works well in the short-term, but becomes an albatross around the neck in the long-term. Additionally, as companies merge, instead of doing a reset on the basic infrastructure modules (which causes disruption), it is often preferred to develop the building blocks around the existing framework. This creates further fragmentation and complexity in the network architecture. Many operators have shadow IT organizations that help launch new products at a faster pace. This approach has its obvious limits.
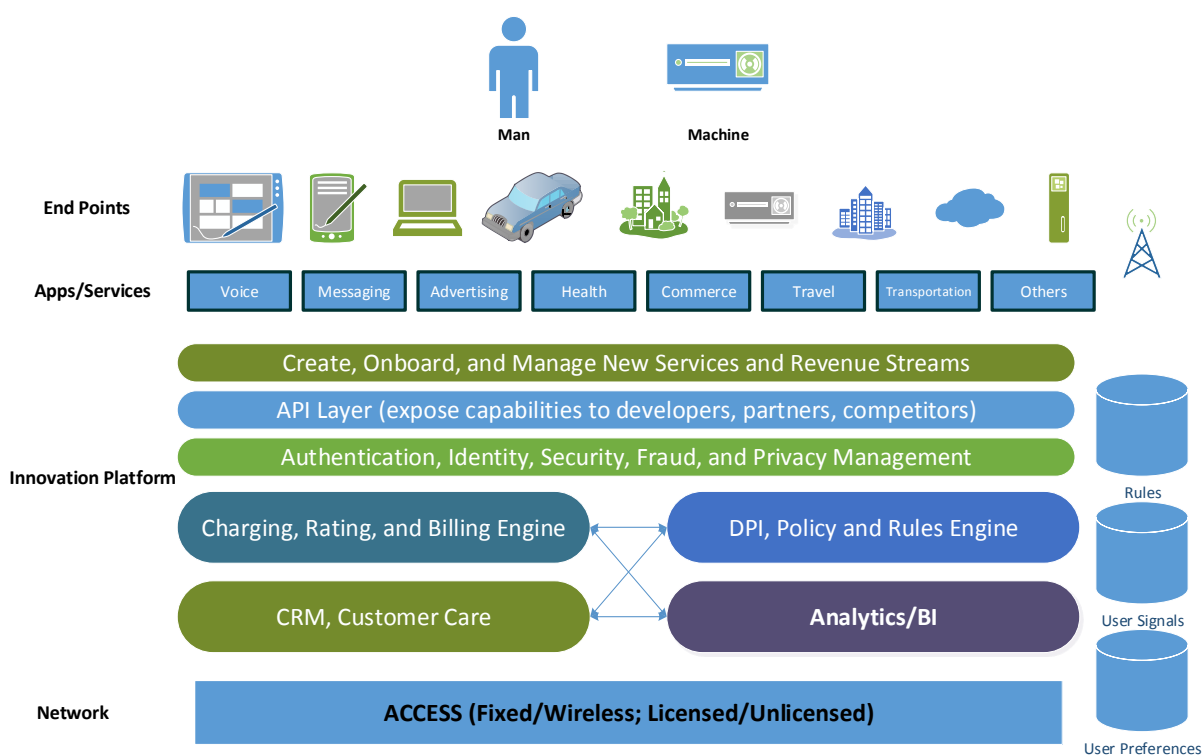

Figure 4. Digital Telco Architecture

First and foremost, systems should be integrated to provide a uniform view of the customer or the household across devices, applications and services (Figure 4). This not only simplifies the network architecture, but more importantly enables the service provider ecosystem to launch new services in a matter of hours rather than months or even years. For example, the identity layer should be able to authenticate and protect consumer's privacy across the board irrespective of the requesting device or application.

Similarly, the insight about consumer's preferences can be applicable to many services across different access modes, device types and services. In some instances, rival OTT providers can leverage the same framework to offer different services to the same individuals. For example, operator A might be strong in connected car, but has no business in offering health services. OTT provider B might have excellent healthcare services, but needs access to the customers of operator A. The healthcare providers want

to reach all of their customers regardless of which service they use for connectivity. The next-generation target architecture would abstract complexity from the user as well as the healthcare provider, while the billing system splits the revenue for the value each player brings to the table. Similar services could be envisioned for different verticals such as advertising, retail and education.

Online Charging

Charging and revenue management is one of the most important functions in the operator network. The billing relationship ensures a continued conversation with the customer. Traditionally, billing has been "metering-centric," meaning that it was based on usage, for example, $10 for 500 minutes, $1 for 20 SMS messages or even now $20 for 5GB of mobile data. However, the demands of applications and services both in communications and outside are changing. Digital operators have multi-dimensional relationships with their customers that require different modes of charging – postpaid, prepaid, fixed monthly, sponsored data, value-based, roaming, API-based, transaction-based, recurring, commission-based, advertising-based, etc. All of these might be operational at the same type for different types of services for the same individual, household or the enterprise.

Another key trend is the shift from offline charging for postpaid to an online model wherein the core network checks with the charging systems in real-time. This mechanism has been traditionally used by IN (intelligent network) platforms for wireless prepaid, however is now highly relevant for postpaid data services. Online charging can be used to support real-time customer insight and control of data usage, which is essential and even mandated in many countries to avoid "Bill Shock." An online charging model also allows for more flexible data and voice services where one can manage data allocation across multiple devices and accounts in real-time. It helps enable services such as parental control, gifting, remittance, P2P transfers, sponsored data, and others. Adopting the 3GPP PCC (Policy and Charging Control) architecture standards to establish a uniform charging and policy architecture is essential to enable operators to offer a differentiated, personalized and interactive user experience by combining network and business policies.

Beyond operator services, many new players in the ecosystem like car manufacturers BMW and Toyota, Internet players such as Google and Microsoft, startup unicorns like Uber and FlipKart, all benefit from their relationship with the operators. As the Internet of Things (IoT) world grows exponentially, we are likely to see the use-cases become much more diverse. These use-cases will enable new business models. The role of the platform is to adjust to the market needs quickly and make the launch of new partnerships, products and services possible.

Integrated Policy management

Policy management is a critical component of the application stack. Policy controls need to be implemented both at the edge (on the device) and at the network level. The intelligent policy layer enables the devices and the network to work in harmony. Many of the endpoints will be machines in the field, at home or in the enterprise. The environment around them will dictate which policy rules kick-in. The policy engine will need to be adaptive as well so it can learn from behavior and historical patterns. The Online Charging System (OCS) and PCRF (Policy and Charging Rules Function) work in harmony to deliver highly personalized and interactive services by combining dynamic IP session policy control with real-time charging. For example supporting tiered usage data plans with different levels of bandwidth, sponsored data plans and one time offer add-ons that users can purchase to boost bandwidth.

In other instances, when there is network congestion or a disaster scenario, the network takes over and decides how the end-points should behave in those circumstances. The applications running on those devices will act through the filter provided by the network. In some video streaming scenarios, network and devices can work in concert to optimize the experiences across thousands of end-points.

These use-cases also manage the authentication, billing, identity, handoff and security on the back-end.

Integrating digital services across channels

Forward-thinking operators such as NTT DoCoMo, KDDI, AT&T, Telefonica, China Mobile, Telstra, Verizon, SingTel and others have been aggressively investing in digital services both on the platform as well as building out end-user services. Many of them are already generating over $1B annually from digital services.[8] These services are quite diverse - entertainment, financial, home security, connected cars, healthcare and advertising.

Different operators pursue verticals based on their area of expertise and comfort. NTT DoCoMo is generating almost $3.6 Billion from digital services accounting for 20% of the data revenues.[9] In fact, digital is the primary reason that the overall ARPU hasn't declined precipitously (Figure 5).

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[8] Source: Chetan Sharma Consulting, 2015
[9] Source: NTT DoCoMo, Chetan Sharma Consulting, 2015

DoCoMo ARPU Distribution
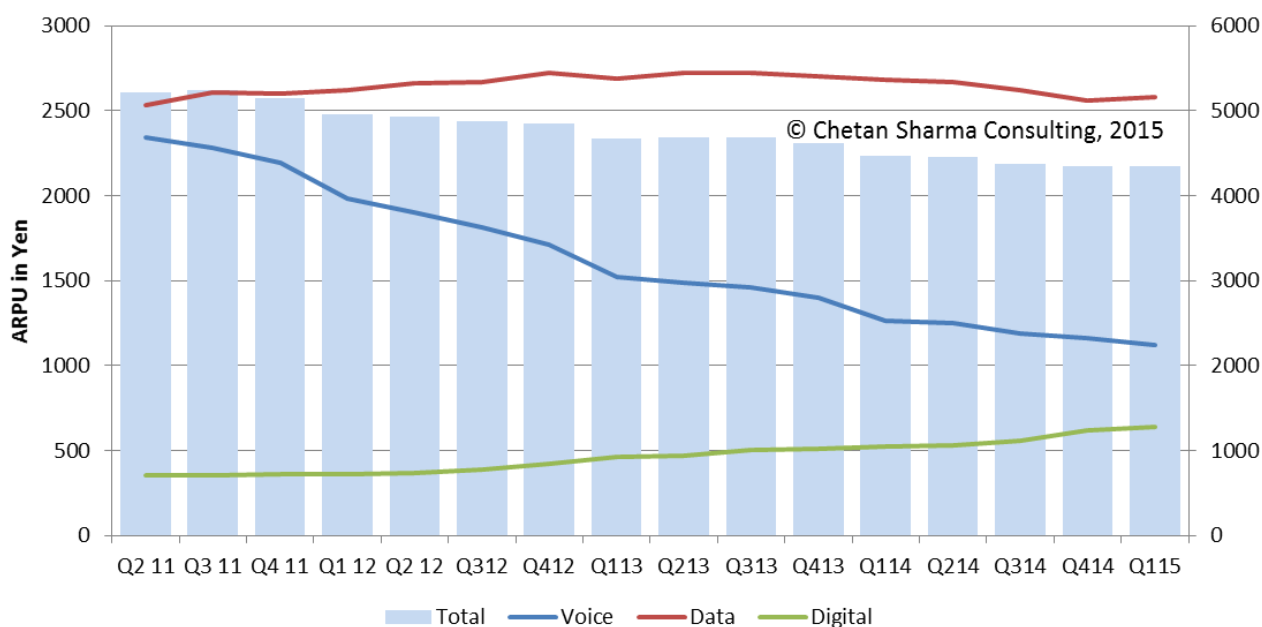

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Figure 5. NTT DoCoMo's ARPU distribution

Digital services need to be integrated across all access channels because consumer or enterprise customers will move from device to device and expect a similar experience and reliability of service. As such, the common elements of the backend such as identity, privacy, user preferences and interests, security and authentication need to be streamlined across all modes of access.

Revenue management

Given the competitive nature of the industry, operators have to manage their revenue streams, costs and margins very tightly. Any slip and the quarterly results will suffer. While subscribing to more services from the same operator creates stickiness and lowers churn, if the consumer is dis-satisfied with one service, this might spill over to other services as well. Reacquiring such a customer can be very expensive. As such, operators have to use the signals from consumer engagement to gauge the satisfaction level on a per customer basis. This will help lower churn, detect potential fraud and help manage the revenue streams more closely.

Given that there are so many permutations and combinations of devices and services, one size won't fill all. As we mentioned earlier, digital lifestyle solution providers can tailor their offerings and pricing based on the individual customer thus providing more flexibility and choices to them.

Building blocks – Convergent Charging and Policy |

Bridging the network and IT worlds

One of the underlying trends in the telecom industry is the merging of the communications and IT industries.

The IT industry has been using cloud services for a long time, whilst telecoms have typically relied on on-premise deployment to maintain five nines reliability. To be nimble and quick to the market, the OSS/BSS stack of the telecom world should be aligned to the modern architectures. Several of the components, like billing and policy, can be made modular so that they can be provided as a service to any internal or external applications that needs it.

Software Defined Networking (SDN) and Network Functions Virtualization (NFV) aim to leverage IT virtualization to streamline network, server, and switching and storage infrastructure to enable rapid and elastic deployment of core network applications. This provides more flexibility for the service provider. It helps create faster network dependent services while lowering Capex/Opex, thus expanding both the margins and revenues. As network infrastructure becomes more complex, SDN controllers can abstract the complexity from the applications and services. As online charging systems and policy management platforms are essentially core network functions, it is likely that NFV will play a key role in their evolution.

However, the transition is not trivial. It requires a complete belief that digital is essential for survival in the long-term beyond the vagaries of the quarterly earnings call. It might be tempting for some to see if they can just wait out the current storm, but digital has irreversibly changed the telecom landscape. The change requires the necessary technology as well as the skill set to manage it. By adopting IT strategies, the talent pool expands and some of the best practices from the cloud-computing world can be implemented to re-architect the telecom infrastructure.

Convergent charging – service provider roadmap

For the service providers, the only way to compete with the OTT threat is to become an OTT player or enabler themselves. Mobile operators who are able to transform themselves into digital lifestyle solutions providers (DLSPs) will go beyond just providing access and devices to their customers. By empowering consumers and enterprises with end-to-end solutions, they will reap greater benefits from the 4th curve. Such operators go beyond just being an enabler of the ecosystem; they actually launch complete end-to-end solutions in given verticals such as home automation, energy, health, education, entertainment and retail.

While new charging models and architectures are necessary for new services, one must also appreciate that the legacy systems won't just go away anytime soon. Typically, operators will have multiple charging systems depending on the past acquisitions and transition plans by markets. As such, operators will need to maintain both old and new

at the same time. This is best accomplished by adherence to industry standards (e.g. 3GPP and the TM Forum) and providing open and secure APIs to ensure interoperability across the existing systems.

For any telecom operator looking to enter the digital realm, the strategic options and the roadmap is fairly clear. First, they have to solidify and protect their core business and assets. A great broadband network is table-stakes to be considered a player in the digital ecosystem. Depending on the financial condition of the operator, the non-core assets should slowly be spun-off or sold to potential buyers so that the company can squarely focus on preserving the core and launching the digital business with full strength. The digital business requires a portfolio management approach that requires a completely different mindset and skill-set to navigate the competitive landscape.

Evolve to a common charging and policy layer

The first step for any service provider is to start consolidating and modernizing the charging and policy layer so that it can support multiple payment types (prepaid, postpaid), access technologies and business models. This will not only reduce the complexity and cost but will serve as a stepping-stone for future growth. Having a single view of the customer enables new insights. Ability to use a common platform enables new services and revenue streams.

Given the rise of connected devices attached to a subscriber or a household, the charging and policy framework needs to be more sophisticated to act as the connection between the experiences available across devices. Integrated charging and policy can be used to offer a differentiated and device driven user experience across sales, care and control for relevant and personalized user interactions. An integrated charging and network policy framework is a key enabler for using the device as a tool for more personalized services.

Expose the platform via APIs

Each credible digital player builds its empire on key platform assets that can give the company a significant advantage over its competitors. The business model might be different, but using the platform, each player looks for a unique competitive advantage that can give it a scale to reach the global customer base as well as generate billions of dollars in revenue and profits.

Apple has created a juggernaut on the back of its iTunes and iOS platforms that has captivated developers and consumers alike and made it by far the most valuable technology company on the planet. While it is starting to get some serious competition from Google and Amazon, Apple is miles ahead of its peers in terms of taking advantage of its platform.

Mobile operators use their network as a platform to launch new services in the areas of health, retail, commerce, security and advertising and can make a significant play in various sectors by bundling network, devices and solutions that consumers will find attractive.

Complete the consumer feedback loop with analytics

The underlying data of user interaction is a powerful tool to gain insights into user behavior and preferences. To fully take advantage of the data, one must architect the system such that insights from the system feedback into the processes.
This allows for:

- Better customer service: Having the knowledge of customer's voice and data experience in real-time allows the customer care representative to handle customers with a high propensity to churn more effectively. The process can be further automated for the device to proactively contact the customer care group to alert of potential problems.

- Offers and promotions: Many operators lose out on giving their customers what they want. Opportunities to cross-sell and up-sell can be only maximized if data can be analyzed in real-time to offer contextual offers and promotions. This additionally builds loyalty and increases customer lifetime value.

- New services: New services are generally borne out of insights about customer usage and patterns across millions of users. Operators are best placed to understand consumer commerce, entertainment, and enterprise trends before most others in the ecosystem. However, such data needs to be harnessed and understood.

By creating a feedback loop, analytics can create actionable intelligence that delivers real value to the customers.

Launch new services

One of the key tasks for service provider management teams is to realign digital revenue targets by vertical segments. Once an operator determines the areas to focus on, one has to lay out a bottoms-up plan indicating how the targets will be achieved by vertical. Some of the work by the digital team might impact the legacy revenue streams and the company should be prepared to deal with it. It should embrace the change vs. fighting to preserve the status quo. Forward-thinking operators such as NTT DoCoMo and AT&T have clearly articulated their goals by segments and given regular updates on how they are doing against those targets. This helps alignment of expectations and strategy both internally and externally.

Not all telecom service providers will have the resources or the fortitude to launch a digital services business wherein they have end-user applications in the marketplace. However, at the very least they can endeavor to become platform players or collaborate with their fellow competitors and partners to become a channel for such services to their customer base. Not participating in any way in the digital services evolution will force them to be a pipe player with less relevance in the ecosystem as the value moves from access to platforms to applications.

Become the digital lifestyle services provider

The execution capability of an organization can be measured in multiple ways – revenue, profits, revenue/employee, etc. It is apparent that the digital business for operators can neither operate nor be measured by traditional matrices. The performance needs to be in line with how the Internet players perform. There is evidence that some of the digital groups are starting to do that.

Operators are used to launching perfect services. They want to dot all the i's and cross all the t's. They want to ensure that services are tested perfectly, the business model is ironed out; the marketing machine is in place before any offer hits the market. However, the 4th curve requires different operating principles. Though the quality of products and services still needs to be paramount, they must embrace the concept of the "beta launch" - something that the Internet world lives by. The 4th curve business model doesn't require everything to be perfected at launch, but rather its functionality and roadmap iterated based on user feedback.

Traditionally, operators have missed out on lucrative opportunities because they were late to the party. Location, search, consumer cloud services, advertising and others are classic examples where operators had the expertise and the technology long before the Internet players came to the scene, yet, they never paid much attention. Now these are multi-billion dollar opportunities being harnessed by the Internet players.

Moreover, the multitude of the curves that constitute the digital opportunities demands that the investments be managed like a professional portfolio. Operators mustn't act like a subprime mortgage bond trader who had no clue of what he was doing, but rather an experienced portfolio manager who can weigh the risks and have the perseverance to see the vision through fruition.

Conclusions

We are entering the connected intelligence era[10] where the billions of sensors will generate several thousand yottabytes, create hundreds of new companies around the globe, generate trillions of economic value and usher in a new technology cycle that benefits all.

The role of the mobile operator in this changing environment has been a subject of considerable debate. To become digital lifestyle solution providers, operators have to rethink the architecture of their assets that can enable them to be more nimble, launch new services quickly and become an active participant in the digital transformation of other industries. The fundamental building blocks of charging and policy will play a critical role in their evolution to remain a competitive player in the ecosystem.

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[10] Connected Intelligence Era: The Golden Age of Mobile, Chetan Sharma, 2014, http://www.mobilefutureforward.com/Connected_Intelligence_Era_Chetan_Sharma_Consulting.pdf

About Chetan Sharma Consulting

Chetan Sharma Consulting is one of the most respected management consulting and strategic advisory firms in the mobile industry. We are focused on evolving trends, emerging challenges and opportunities, new business models and technology advances that will take our mobile communications industry to the next level. Our expertise is in developing innovation-driven product and IP strategy. Our clients range from small startups with disruptive ideas to multinational conglomerates looking for an edge. We help major brands formulate winning, profitable, and sustainable strategies. Please visit us at www.chetansharma.com.

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Oracle Communications solutions span the communications industry landscape -- from cross-channel customer experience and business and operational support systems, to network service and session delivery and control solutions -- enabling service providers and enterprises to deliver and monetize innovative digital lifestyle services, build strong customer relationships, and streamline operations. For more information, visit http://www.oracle.com/communications

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Chetan Sharma is President of Chetan Sharma Consulting and is one of the leading strategists in the mobile industry. Executives from wireless companies around the world seek his accurate predictions, independent insights, and actionable recommendations. He has served as an advisor to senior executive management of several Fortune 100 companies in the wireless space and is probably the only industry strategist who has advised each of the top 6 global mobile data operators. Chetan serves on the advisory boards of Ericsson, Telefonica, Kymeta and a number of other startups. Some of his clients include NTT DoCoMo, Disney, KTF, China Mobile, Toyota, Comcast, Motorola, FedEx, Sony, Samsung, Alcatel Lucent, KDDI, Virgin Mobile, Sprint Nextel, Skype, AT&T Wireless, Reuters, Juniper, Qualcomm, Microsoft, Reliance Infocomm, SAP, Merrill Lynch, American Express, and Hewlett-Packard.

Chetan is the author or co-author of a dozen best-selling books on wireless including *Mobile Advertising: Supercharge your brand in the exploding wireless market* and *Wireless Broadband: Conflict and Convergence.* He is also the editor of the *Mobile Future Forward Book* Series. His books have been adopted in several corporate training programs and university courses at NYU, Stanford, and Tokyo University. His research work is widely quoted in the industry. Chetan is interviewed frequently by leading international media publications such as *Time* magazine, *New York Times, Wall Street Journal, Business Week, Japan Media Review, Mobile Communications International,* and *TechCrunch,* and has appeared on NPR, WBBN, and CNBC as a wireless data technology expert. He is also the chief curator of the mobile thought leadership executive forums – Mobile Future Forward and Mobile Breakfast Series.

Chetan is an advisor to CEOs and CTOs of some of the leading wireless technology companies on product strategy and Intellectual Property (IP) development, and serves on the advisory boards of several companies. He is also a sought after IP strategist and expert witness in the wireless industry and has worked on and testified in some of the most landmark cases in the industry such as Qualcomm vs. Broadcom, Samsung vs. Ericsson, Sprint vs. Verizon, Openwave vs. 724 Solutions, and Upaid vs. Satyam. Chetan is a senior member of IEEE, IEEE Communications Society, and IEEE Computers Society. He has Master of Science degree in Electrical Engineering from Kansas State University and Bachelor of Science degree from the Indian Institute of Technology, Roorkee.