Wholesale Systems for Advanced Services

global settlements carrier

TRI

subex
powering the ROC

Research Director Letter

Voice interconnect is the service that's always driven the telecom wholesale business – and it still does today. Yet as our industry boldly sails out of the harbor into the tempest-tossed seas of advanced service markets, wholesalers face dramatic change and challenges:

- Advanced telecom services, such as LTE, IPX, HD voice, and Carrier Ethernet services require enormous planning and pricing dexterity as they come into the wholesale mix;
- A flood of new partners has entered the delivery stream in content, cloud, and machine to machine (M2M) services – often bringing with them innovative, multi-party contracts that stretch a wholesaler's settlement dexterity to the max; and,
- Fast execution will be vital in this new world as time-to-market, profit assurance, and managing credit risks all rise in importance.

To better understand where carriers are headed from a wholesaler's systems perspective, my organization, Technology Research Institute (TRI), surveyed and conducted interviews with wholesale system experts across Europe and Asia Pacific. .

We would like to thank Subex and the Global Settlements Carrier Group (GSC) and its members for their contribution and expertise for the research. Special thanks to Arvind M from Subex and Lynn Du from GSC for their support and inputs.

We hope you find our analysis both interesting and profitable reading.

Regards,

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Introduction - Business Party to True Partnerships

In telecom, the wholesale business has always been a means to a larger end. A telecom has massive infrastructure costs to recover with only a limited marketing budget. So if a partner can help fill the pipe during off-peak hours, that's good business because the money can go straight to the bottom line.

But to be honest: the typical wholesaler-to-partner relationship of the past has been quite formal and business-like – often adversarial. And there's a good reason for this: the wholesaler was largely in control of the relationship because the partner's choice of wholesale suppliers was limited.

Yet now that advanced services have erupted on the scene, the wholesaler/partner relationship has curiously been flipped on its head. Today, it's the partner or reseller who has the stronger negotiating hand thanks to some dramatic industry developments:

- **The Commoditization of Voice** -- The impact of Skype, VoIP Providers, and mobile competition has turned voice – once a wholesaler's cash cow – into a low margin, high volume service.
- **Real-Time, Policy Driven Call Routing** – Least cost and optimal routing servers and associated traffic analytics systems are proving an effective way for retailers to select routes and drive rock bottom prices and competition among wholesalers.
- **Efficient Trading Systems** – Retailer partners also have highly automated trading systems which enable them to collect and organize new tariff schedules from wholesalers with the click of a mouse. This new capability enables the retailer partner to manage more and more wholesale suppliers than it could efficiently handle before.
- **Network Federation to Partners** – Telecoms used to be a business of great vertical integration: ninety percent of what a telecom sold were services from network infrastructure it fully owned and controlled. But next generation services have turned the tables on this old, simpler model. Today, the only prudent way to offer a "full-service" capability is to lease the facilities, content, or services of other providers. In short, the wisest operators are those who know when to own and when to partner.

The Emerging Global Telco Ecosystem

While the old carrier interconnect world was certainly more friendly to the wholesaler, telecoms can't be nostalgic about the "good old days". "Coopetition" with other service partners is here to stay.

What's now developing is a true ecosystem of partners – large and small – who bring their unique service and regional assets to the global exchange. There's an analogy here to the game of chess where the Queen is an order of magnitude more powerful than a Pawn. Yet the Queen needs many Pawns to buttress and defend her position on the board.

Likewise, in the wholesale game, it's the large carriers who have the resources to invest in expensive facilities and next generation services. Many of those network capabilities go way beyond what a small service provider can afford Yet it's quite profitable for the large carrier to resell those services to resellers in corners of the world market it can't serve profitably on its own.

In fact, Queens also support other Queens. While a large wholesaler's network reach may be global, marketing budgets and priorities often dictate that partnering is the wiser choice for a particular market.

Wholesale Partnering in the Emerging M2M Market

One of the most interesting advanced services that will transform wholesale is M2M – the Machine-to-Machine interaction of computers, sensors, and devices across the telecom cloud. When it arrives, M2M is going to be big: ABI Research's study predicts that 50 billion new M2M devices will be appear in the next 10 years.

In truth, M2M isn't a market itself -- it's an enabler for dozens of markets and hundreds of unique business models. Nascent M2M opportunities include:

- **e-Health Care** – Wearable medical devices will collect a person's vital stats then push the data into the cloud where doctors and nurses can examine it. If your 84 year old grandmother falls in her home, the M2M device alerts an emergency response team to react.
- **Automotive M2M** – Major auto manufacturer are inserting embedded modules in the vehicle to handle diagnostics, security and safety. And insurance companies will use GPS equipped sensors to track driving habits and charge lower premiums to good drivers.

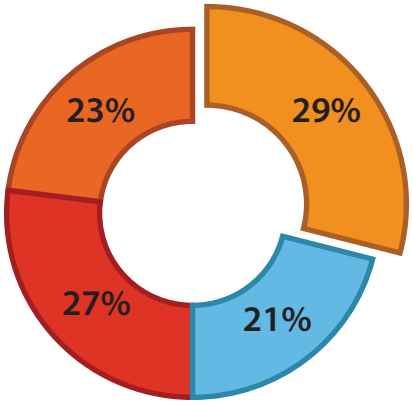
Research Methodology
Survey Findings

Backing up the analysis in this report are survey questions and conversations we had with experts on the settlement and systems side of wholesale. The telecoms who answered our research questions did so anonymously and were evenly divided between large carriers ($5 billion+ annual revenue) and medium to small carriers (See: Figure 1). The survey respondents hailed from two regions: Asia Pacific and Europe.

We asked these wholesale experts to answer six survey questions regarding advanced services areas they had a working familiarity with. And the areas they identified reveal the breadth of advanced services, as shown in Figure 2.

We think the high percentage of respondents working in areas such as IP Capacity and High Definition Voice/Conferencing services reflects the advanced services systems experience of the people who participated in the survey.

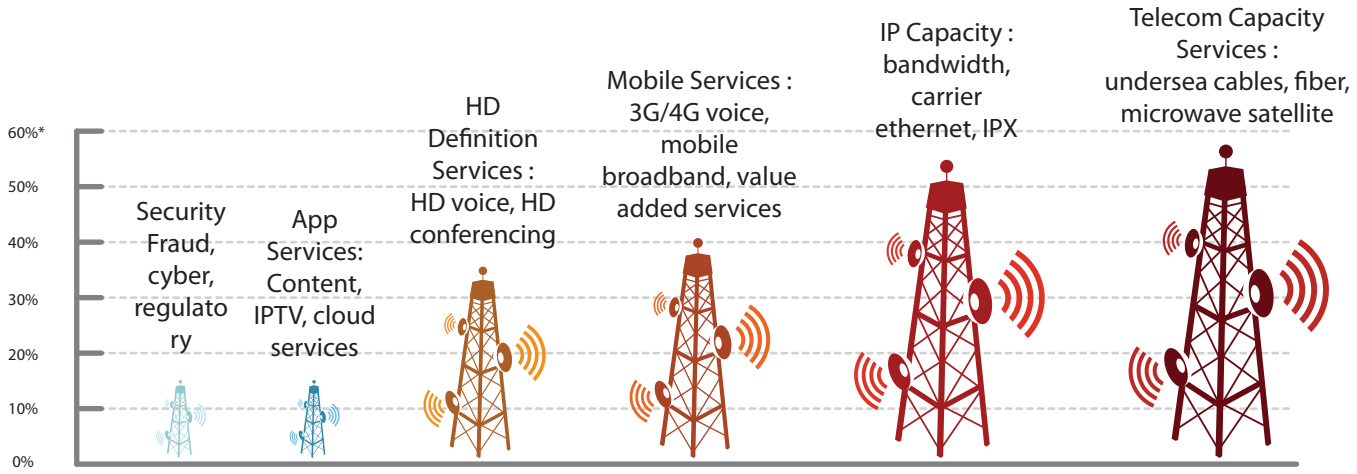
The revenue size of the wholesalers' parent telecom organization ranged from large to small operators



Tier 1	Tier 2	Tier 3	Tier 4
29%	21%	27%	23%
More than $10 BN+	$5 BN to $9.9 BN	$500 MN to $4.9 BN	Less than $500 MN

Figure 1: Revenue Size of Wholesaler's Parent Telecom

Survey participants were asked to report on trends in next generation services only. Circuit voice and 2G wireless services were excluded from survey discussion



* Percent of respondents who discussed above services in the survey

Figure 2: Advanced Services Expertise of Survey Participants

Revenue Growth Expectations in Advanced Services

We asked wholesale systems experts to predict which wholesale services are likely to experience the greatest revenue growth or decline. Their opinions (Figure 3) are rather interesting, especially when you compare the predictions across large carriers vs. medium/small carriers. See Figure 3.

What is significant, however, is that large carriers are optimistic about the growth in IPX service, suggesting that they may be placing their bets on IPX as a winning service.
This makes a lot of sense from a strategic point of view. Fierce competition in the IP wholesale market has brought the service down to a commodity.

But IPX is intriguing because it guarantees you end-to-end quality since it runs over a managed MPLS network. IPX essentially means that any type of mobile service provider – including alternative mobile players such as applications, enterprises and social networks – could have access to high quality service simply by plugging into a network, such as the global networks managed particularly by large carriers.

Guaranteed delivery of high quality IP services will command premium wholesale prices, so the large carriers are wise to target that segment. It fits their asset profile and it's a promising new path to higher margins.

Surveyed carriers were asked to predict which wholesale services would experience high revenue growth in next 24 months. Rated on a 5-point scale

Advanced Wholesale Services	ALL Carriers	Large Carriers	Med/Small Carriers
LTE Mobile service	4.3	4.0	4.6
Value Added mobile services (i.e. media or chat services, etc)	4.1	3.8	4.4
Cloud services for small/medium businesses	4.1	4.2	4.0
Mobile broadband service	4.0	3.8	4.2
Consumer Content Delivery (not including SMS/voice)	3.9	4.0	3.8
IP Bandwidth service	3.8	4.2	3.4
Security, fraud management & compliance services	3.8	3.8	3.8
IPX service	3.7	4.2	3.3
Machine-to-Machine (M2M) service	3.6	3.8	3.4
Wireless, WiMax, WiFi backhaul (fiber/microwave infra.)	3.6	3.8	3.4
IPTV	3.5	3.4	3.6
High Definition (HD) Voice service	3.4	3.2	3.5
High Definition (HD) Video conferencing service	3.3	3.4	3.2
Carrier Ethernet service	3.2	3.5	3.0

Predicted Revenue Growth/Decline No growth Small growth High growth

Figure 3: Advanced Services -- Expected Revenue Growth/Decline

Operational Systems - Broad Capabilities Needed

What's traditionally been called "wholesale billing" is much broader now. Yes, it's still about billing, rating, and settlements, but wholesalers today are also eager to gaining efficiencies across the entire order-to-cash chain.

This need for broad operations systems functionality is reflected in our survey results where wholesaler experts rated (on average) all the seven capabilities in our survey question as highly important: from reconciling complex agreements and service usage tracking, to shortening provisioning times and doing a better job at revenue assurance. (See Figure 4)
The similarity of ratings shows that lots of operational capabilities are important -- and wholesalers want them all. Here's a quick rundown on some of the key operational challenges wholesalers face:

- **Multi-Party Settlements** – So much of where telecom advanced services are headed – mobile content, M2M, HD services, MNVO services -- calls for complex multi-party settlement. Video demand, music and IPTV services are especially complex. For instance, in any video delivery there can be four parties to the transaction: the operator, the bearer of the traffic, the content provider, and a payment provider. Now in many cases these parties are one and the same. The operator is usually the one bearing the traffic; the content provider could be the payment provider, etc.

For the wholesale systems they were familiar with, survey respondents rated their operations support system enhancement priorities

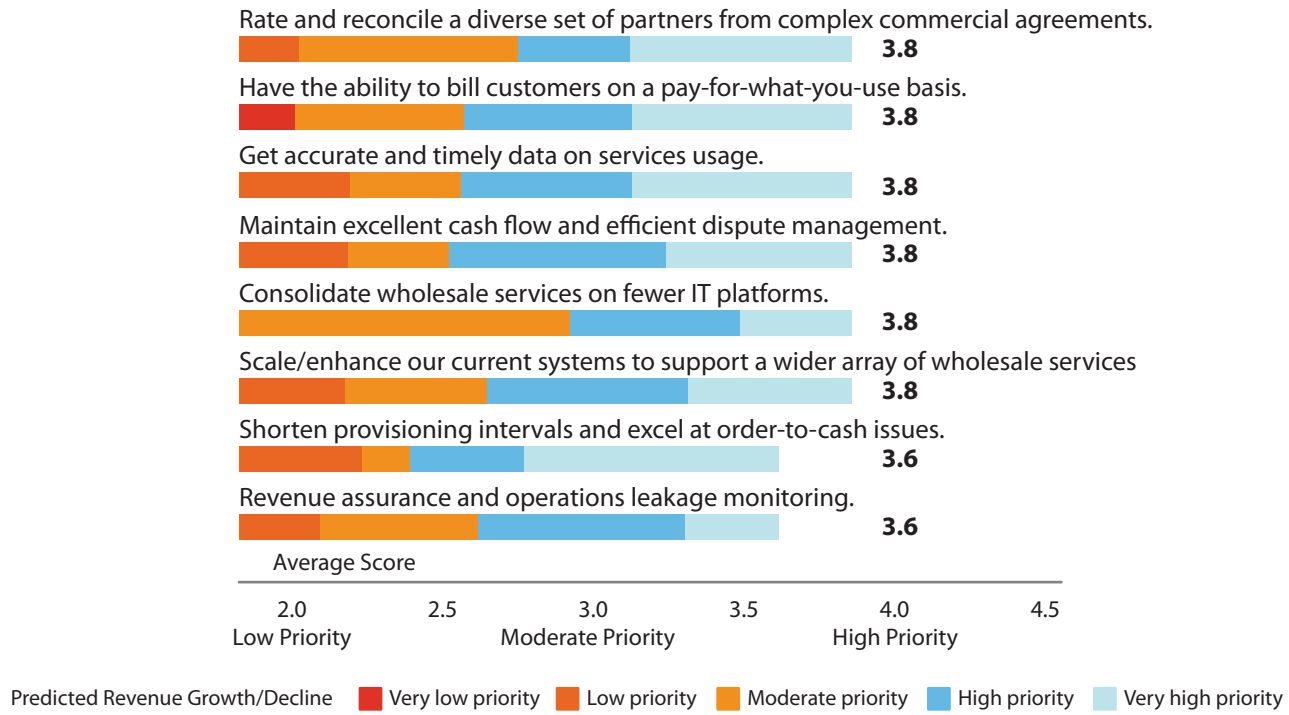


Figure 4: Operations Support Systems Enhancement Priorities

In the UK, BT sets up and runs thousands of WiFi hot spots, making arrangements with individual store owners and restaurants. Consumers, in turn, gain access to these hot spots by subscribing to a special WiFi plan from their mobile operator. So this is a rather interesting case because the mobile operator selling the add-on WiFi service needs to settles with BT. Another twist here is that usage transactions are being managed at the wholesale, not retail level.

- **Content Services** are certainly one of the most complicated of services a telco needs to manage. The content can be sold any number of ways: by bytes, number of customers, number of downloads, airtime – not to mention volume discounts. Another complication is that content owners usually don't know how many times their content was downloaded, so the wholesaler needs to supply those records. The telco sends the partner a statement saying X number of downloads occurred and the data needs to be accurate and clear so it doesn't invite disputes. With content services it's very important that partners are provided a share of the realized revenue, so the rating and billing is quite tricky. Content providers expect to be paid a share of realized revenue, but when multiple parties are involved, the revenue chain can break. For instance, what happens when the payment wasn't authorized to the operator? Or the service wasn't authorized to the payment provider, or the subscribers never received the content? A wholesaler's rating engine must sort through this maze and track all the financial relationships and all the departures from the normal flow.

- **Pay-As-You-Go-Services**. Lots of small partners are cropping up as resellers or MVNOs around the globe and the most popular way for wholesalers to serve them is on a pay-for-use basis. The fast-paced nature of telecom these days is such that you never know whether a partner can pay you on-time or even whether it may soon go out of business. Pay as you go has been the model for many years, but as wholesalers increasingly reaches out to small partners in new markets, pre-paid capabilities will grow in importance.

- **Greater Usage Visibility**. There was a time not very long ago that if a wholesaler knew what its usage and costs were by the end of the month, that was sufficient. But today the wholesale business is being managed in near real-time: traffic volumes and usage are being tracked on a daily basis so that end of the month margins can be predicted and adjustments can be made.

  Of course, the high traffic volumes, market segment complexity, and the many destinations make usage very hard to track. Spikes in traffic to a particular region may indicate fraud or system problems. Likewise, a partner may be violating his agreement by pumping traffic in at a peak time to utilize the low rate he's been given.

- **Dispute Management Excellence** - When things go wrong, your dispute management needs to be robust. The relevant CDRs and other records need to be collected fast so discrepancies are identified and the issue quickly resolved. The party with the best data to back up its claim is the one who wins the arguments. Disputes also consume valuable management time, so anything that can speed

the process along is valuable.
The issue of service quality for advanced services will force wholesalers to take their dispute management capabilities to the next level. In traditional wholesale services, most disputes are around billing rates: did we bill the partner accurately? But in advanced services, retailer partners will judge wholesalers on QoS metrics. And when QoS become the key differentiator, a wholesaler's sales team needs detailed data to prove the level of quality it's delivering.

Partner Support Systems

Having good partner management and support systems is vital to the evolution of wholesaler systems, but the carrier experts we surveyed did not rate partnering systems very high in terms of enhancements priority (see Figure 5).

The only two partner support areas scored as moderate priorities were "partner web portals" and "partner cost and performance monitoring".

For the wholesale systems they were familiar with, survey respondents rated their partner support system enhancement priorities

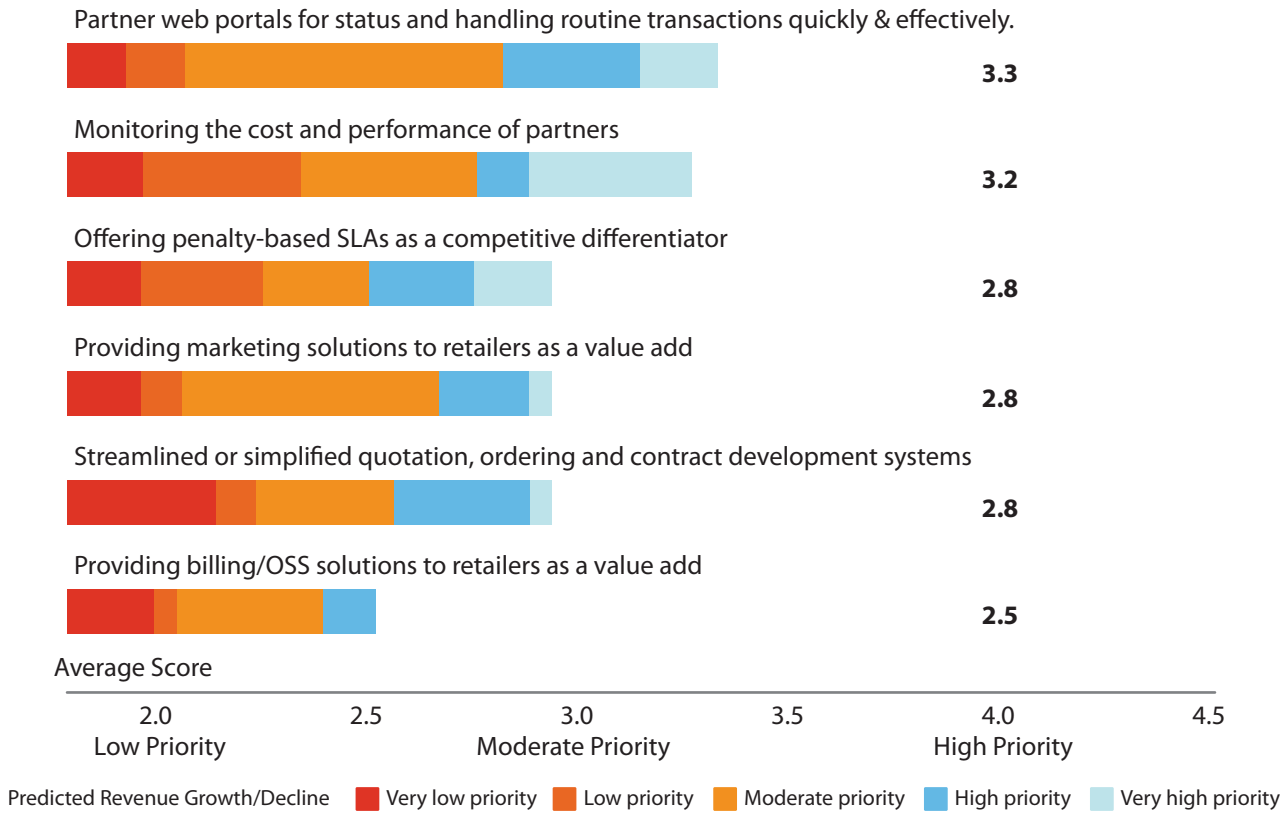


Figure 5: Partner Support Systems Enhancement Priorities

Clearly the other partnering capabilities -- penalty-based SLAs, reseller marketing solutions, streamlined quotations, and billing/OSS solutions as a reseller value add -- are viewed as far more "nice-to-have" than essential.

But the fact that these capabilities are not hotly pursued by wholesalers in general means such innovative approaches might prove to be a key differentiator for individual wholesalers.

One thing's for certain: the wholesalers who thrive in the next ten years will be those who are far more sensitive and in-synch with their retailer partners. And that includes having conversations with competitors in ways not seen before.

In the U.S. market, for example, the case of T-Mobile USA and AT&T in wireless backhaul partnering is illuminating.

In the early days of the smartphone, the issue for T-Mobile was that it did not have the money to invest in its own backhaul infrastructure for the mobile broadband market. Ordering more T1 connections from LEC providers (such as AT&T and Verizon) was increasingly cost prohibitive and microwave solution simply couldn't scale.

Knowing the ideal choice was fiber, T-Mobile started shifting its partner backhaul business away from AT&T's T1 lines and toward some of the U.S. cable operators who supplied fiber. So seeing a big chunk of its T1 wholesale business go away ultimately prompted AT&T to come to the negotiating table.

Today, T-Mobile USA leases a huge part of its wireless backhaul infrastructure from AT&T, and the irony of course is that on the retail side, T-Mobile and AT&T are big competitors. But such is the character of the new wholesale market – it often means pairing up with strange bedfellows.

The Partnering Impact of Real-Time, Policy-Driven Call Routing

Optimized and policy-controlled routing is revolutionizing the wholesale business. By redirecting all SS7 or SIP calls in real-time to network-resident servers, the painstaking task of translating and populating an entire network of circuit and IP switches goes away.

Instead, operators can set up a rich, change-on-the-fly routing policy to optimize lowest cost, or QoS, or network resilience, or any combination of policies.

Real-time routing has given VoIP (or enhanced service) providers a powerful tool for negotiating contracts. For instance, Vonage, a $1 billion VoIP provider in the U.S. has leveraged real-time routing to offer a flat rate international calling plan to 60 countries from the U.S. for about $30 a month (including taxes). By using their purchasing power to route traffic, VoIP retailers reward the wholesaler who delivers traffic at the right quality and price points. And that purchasing power makes up for its lack of a network.

The Urgency of Better Internal Communication

To better support partners, better internal communication and coordination within the wholesaler organization will become essential.

For the wholesale systems they were familiar with, survey respondents rated their analytics enhancement priorities

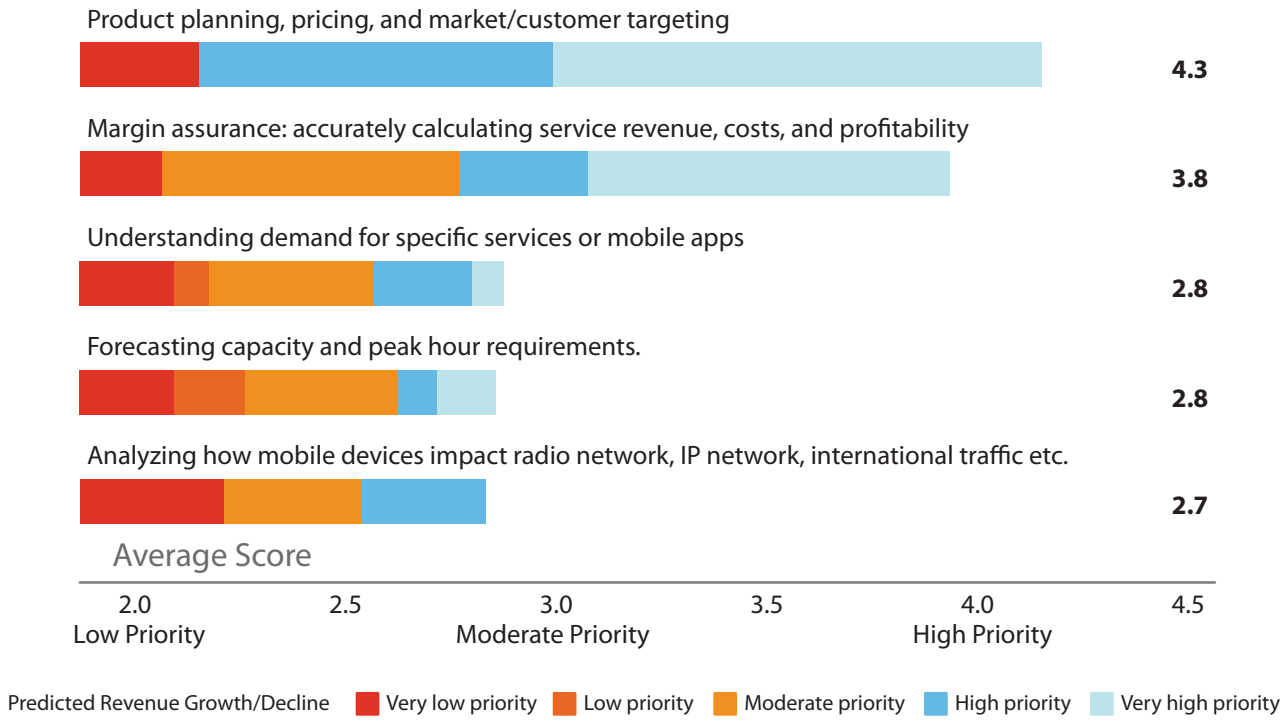


Figure 6: Analytics Enhancement Priorities

The move to advances services is certainly another factor driving demand for analytics in wholesale. It's much harder to analyze VoIP services than circuit voice for the simple reason that usage records are scattered across many systems as opposed to a few switches.

So wholesalers are being hit with double trouble. Not only is competition fiercer in advanced services, it's also tougher to measure network/service performance, costs, and usage.

Analytics is immensely useful in monitoring campaigns and promotions. To attract business, you may want to offer a partner free service for a month. Yet lots of detailed data is needed to support making informed decisions on such promotions.

Analytics Judged the Most Challenging Systems Area

In one survey question, we approached the systems issue from a slightly different angle: we asked the experts to judge which systems area they considered the most challenging for their organization to improve: operations, partner support, or analytics.

And analytics was voted the system area that is hardest to improve. We agree. Given the difficulty of gathering product, revenue, and cost from a wide variety of operational systems, there's plenty of justification to view analytics as the most challenging systems area (See Figure 7).

In the Figure, we sorted the capabilities within each system area high-to-low by the average enhancement priority survey respondents reported to us.

Surveyed carriers rated analytics systems (3.4) slightly more challenging than partnering systems (3.2). Operations systems (2.9) were considered the least challenging to improve

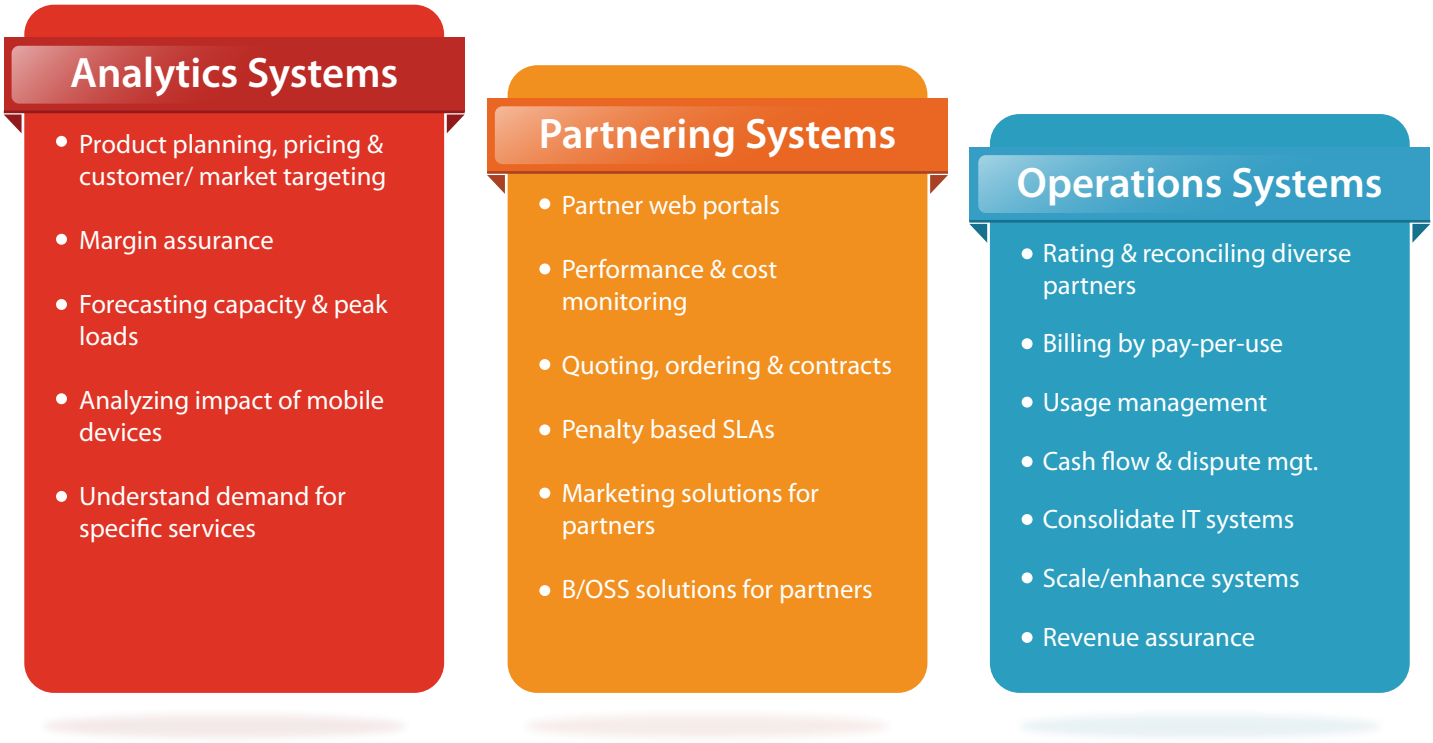


Figure 7: Most Challenging System Areas to Improve

Wholesale Business Strategy

While the carrier experts we surveyed work largely on the billing and settlements side of wholesale operations, we thought it would be interesting to ask them their opinion of wholesale business strategy.

While business strategy is not their responsibility, we felt they are probably close enough to the business to have an informed opinion about some of the factors they will drive success at their organizations.

The two highest rated success factors were ability to deliver a "Higher Quality of Service" and "Faster Time to Market" (see Figure 8).

Survey participants were asked to express an opinion about what factors would lead to success for the wholesale business they worked for

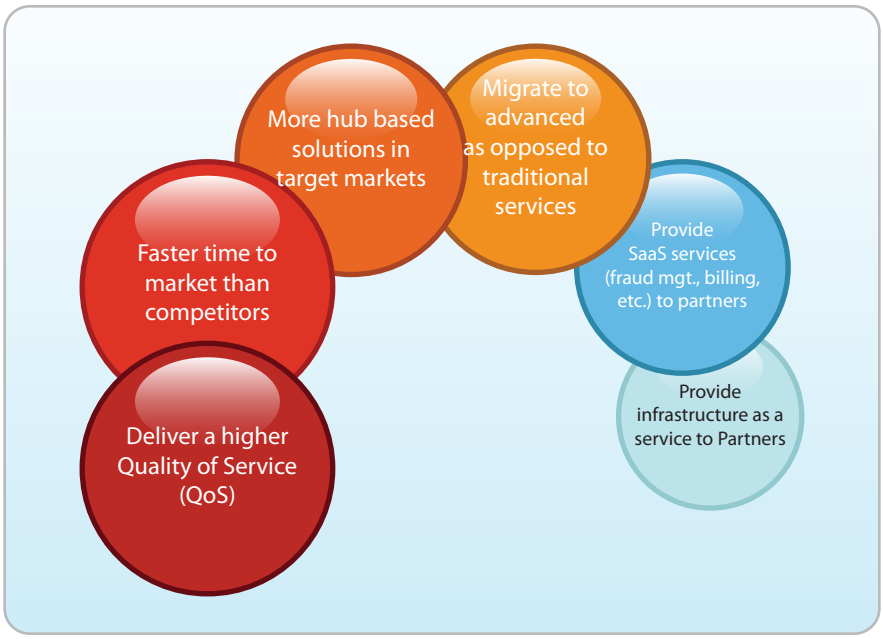


Figure 8: Future Success Factors for the Wholesale Business

Better traffic analytics tools to measure service quality will be essential to playing in advanced services markets because IP networks are complex and were originally designed for low quality services such as email. It takes a lot of good engineering and network management to achieve a high QoS in IP services, but that's the whole point behind IPX and similar standards which will enable premium services like high definition voice and video.

But like so much in the wholesale business – a promise does not equal a fact. The quality of levels of IPX services will need to be closely monitored to determine if contracted levels of quality are, in fact, being met.

And measuring that quality is not easy. Yes, certain quality measures such as jitter and latency of a VoIP or 3G/4G call are supplied by the soft - switches. In some cases, the CDRs come with quality metrics. In other cases they must be calculated. For instance, call traffic to a particular destination might normally have an average duration of 3 minutes, but in a week's time if the duration is down to one minute, you know that quality is poor even if the number of dropped calls is low.

KPIs can be set by carrier, switch, trunk, destination, and can be used to alert the user when certain thresholds are met. That information can then be rolled up into bar charts that show the best destinations or carriers. Better yet, a sophisticated optimal routing solution will enable a telecom to re-route calls automatically when thresholds are hit.

"Time to market" has always been important, but heightened competition in the advanced IP services will raise time-to-market to much higher stakes. And the key to success will be to have a thoughtful and streamlined back office, not just in settlements or billing, but also provisioning and the ability to test services in new markets.

Hot Systems Needs Across Wholesale Markets

It's rather interesting to see where the opinion of wholesale experts varies by market. In Figure 9 we broke out the top eight system enhancement priorities and wholesale strategies in one table so we could look at the difference across two break-outs: large vs. medium/small carriers and wholesalers who reported having mobile services in their wholesale mix versus those who did not.
One interesting contrast is on the subject of "rating and reconciling a diverse set of partners from complex agreements". Here the mobile segment rated it a very high concern while the non-mobile segment rated it only average concern. But given the complexity of mobile content services, perhaps it's no surprise that settlements are harder in mobile.

Carriers large and small are looking for greater efficiency and consolidation of IT platforms. Among survey respondents, however, medium/small carriers (on average) reported being more interested in "consolidating wholesale services on fewer platforms" than large carriers. Medium to small carriers have a slight advantage here. Their smaller scale enables them to more easily move to holistic platforms that revolve around a central database and therefore offer many operational synergies.

But whether the wholesaler is large or small, the cost of simplifying and integrating wholesale platforms is justified when you consider the long term benefits.

In this table we combine the highest priority system enhancements and business strategies to show how they differ across market segments

Advanced Wholesale Services	ALL Carriers	Large Carriers	Med/Small Carriers	Mobility Services	No Mobility Services
Product planning, pricing, and market/customer targeting	4.3	4.7	4.0	4.6	4.1
Deliver a higher Quality of Service (QoS) or services that are more diverse/resilient.	4.2	4.6	4.0	4.0	4.3
Delivering faster time to market than our wholesale competitors.	4.1	4.4	3.8	4.3	4.0
Rate & reconcile a diverse set of partners from complex agreements.	3.8	4.0	3.6	4.4	3.5
Consolidate wholesale services on fewer IT platforms.	3.8	3.3	4.2	3.6	3.7
Margin assurance: accurately calculating service revenue, costs, and profitability	3.8	4.7	3.0	4.2	3.6
Migrating to advanced services as opposed to traditional services.	3.7	3.6	3.8	4.3	3.4
Shorten provisioning intervals and excel at order-to-cash issues.	3.6	3.5	4.8	4.0	4.0

Predicted Revenue Growth/Decline Moderate priority High priority Very high priority

Figure 9. Hot System & Business Priorities

Another area where a wide gap exists between large carriers and medium/small carriers is "margin assurance: accurately calculating service revenue, costs, and profitability." It was voted a very big priority by large carriers, but medium/small carriers voted it only an average priority.

Margin assurance is the first cousin of product planning and pricing. In fact, without good margin analysis, planning and pricing decisions are based on inaccurate data.

A key reason that wholesale margins are so hard to calculate is key departments involved often don't coordinate as closely as they should. When marketing negotiates rates, it bases its prices on certain assumed costs, but the network folks often provision the service on entirely different routes, many times causing the service to be sold at a loss, not a profit.

Another challenge is keeping track of the many complex bilateral and hubbing agreements that exist. Given the penalty clauses in bilateral agreements, not only must you keep track of today's margins, but also project future margins, so if they are not high enough you can take immediate corrective action.

Also, from a content services perspective, margins for content services are especially hard to calculate. To launch a profitable service, the commercial & marketing team must first come up with innovative contracts with content partners. But considering the variety of payment schemes and number of partners involved, deriving accurate margins is a real challenge.

The ideal solution is to consolidate on a single unified system where finance, network, and marketing are all accessing and updating the same database. Happily, new analytics approaches are arriving to assist large telecoms. In the U.S., for example, CenturyLink built a margin assurance platform enabling it to turn around margin analysis every 24 hours so that margins on yesterday's services can be known today.

And for some services, carriers are even trying to achieve hourly visibility into profits.

Conclusion

Great change is afoot in wholesale. We believe the growth in advanced telecom services will change wholesale in five fundamental ways as shown below.

One conclusion is easy to draw from our research: system enhancements are key to a wholesaler's future. To compete effectively, improving settlements and rating capability is just the start. Wholesalers also need a broader range of operational capabilities in improved usage tracking, dispute management, and simplified or consolidated systems. Finally, all manner of analytics capability is needed to enable better decisions, monitor partners, and improve QoS and network price/performance.

Multi-Partner

The advanced services operators will offer in the future -- mobile content, M2M, HD voice / video conferencing, and MNVO services -- all call for complex, often multi-party settlement.

So operators must put the necessary systems in place to efficiently rate, provision, settle and expedite disputes.

Business-Awareness

Good planning, pricing and targeting are the mantras for ensuring wholesale is being business-aware.

Analytics and margin assurance systems are the tools of keeping score. If it's a hot service, do I need to ramp up my capacity? What services can I profitably redeploy to other markets before my competitors catch on?

Service Quality

Managing service quality is a top skillset for playing in advanced wholesale markets.

Industry standards such as IPX lay a path for high QoS services, but the devil is in the details. Wholesalers will need to excel at measuring, properly pricing, and then selling services based on QoS metrics, not just flat minutes of use.

Coordination

Better coordination within the wholesaler organization is key. Engineering, billing, and sales must synchronize more than ever.

What's more, carriers need to improve how they manage partners and associated service assurance and communication aspects of the partner relationship.

Time-to-Market

Speed is critical in a market that's constantly evolving.

This includes streamlining of order-to-cash and procure-to-pay life cycles.

Support systems must also scale up to speed time to market of innovative services & deliver the contracts that an operator decides to pursue.

About TRI

Technology Research Institute (TRI) is a boutique analyst firm that since 1994 has published dozens of research reports and papers in billing, analytics, revenue assurance, and other B/OSS subjects. TRI also publishes the on-line magazine, Black Swan Telecom Journal.

About GSC

The GSC Group aspires to provide a unique forum and practical solutions to continuously improve telco carrier's billing, settlements and related business processes, foster inter-carrier business relationship, and to explore solutions to business demands and enable Carriers to gain first hand insights on market movements and upcoming trends.

The GSC Group aims to help Carriers simplify and improve business processes; enhance bilateral relations; normalize industry benchmarks; and standardize business practices through the establishment of policies and guidelines. Likewise, the GSC provides a venue where Carriers trade experiences and knowledge critical to Telco operations and organization. The GSC priorities are to serve the Carrier Members' needs, provide a forum for sharing experiences and addressing challenges, and to develop solutions that will assist Carrier Members on process improvements and efficiency gains in their respective daily business operations.

As an Associate Member of the ITU, the GSC Group has been an active contributor to the ITU Study Group 3. Between 2010 and 2012, five GSC best practice guidelines have been incorporated as new supplements in the Recommendations ITU-T D.150 and ITU-T D.170. These significant milestones were achieved as a result of the GSC Members' inputs via workshops.

About Subex

Subex Limited is a leading global provider of Business Support Systems (BSS) that empowers communications service providers (CSPs) to achieve competitive advantage through Business Optimisation - thereby enabling them to improve their operational efficiency to deliver enhanced service experiences to subscribers.

The company pioneered the concept of a Revenue Operations Center (ROC®) a centralized approach that sustains profitable growth and financial health through coordinated operational control. Subex's product portfolio powers the ROC and its best-in-class solutions such as revenue assurance, fraud management, asset assurance, capacity management, data integrity management, credit risk management, cost management, route optimization and partner settlement.

Subex also offers a scalable Managed Services program and has been the market leader in Revenue Assurance and Fraud Management for 3 years in a row according to Gartner (2010 & 2011). Subex has also been enjoying market leadership in Business Optimisation for five consecutive years according to Analysys Mason (2007, 2008, 2009, 2010 & 2011). Business Optimisation includes fraud, revenue assurance, analytics, cost management and credit risk management. Subex has been awarded the Global Telecoms Business Innovation Award for 2012 along with Idea Cellular and 2011 along with Swisscom for fraud management. Subex has also been awarded the Global Market Share Leader in Financial Assurance 2012 by Frost & Sullivan.

Subex's customers include 29 of top 50 operators* and 33 of the world's 50 biggest# telecommunications service providers worldwide. The company has more than 300 installations across 70 countries.

*Total Telecom Top 500 Telecom Brands, 2013
#Forbes' Global 2000 list, 2013

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