

Virtual, Augmented and Mixed Reality: exciting times ahead for CSPs

Atos Consulting - Telecom White Paper 2016



Management Summary

Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR) are hot topics. We believe they are about to cross over into the mainstream from the margins of gaming and highly-specialized medical and defense applications. In the not too distant future, we can expect these technologies to become as much a part of daily life as our smartphones and satnavs are today.

In this whitepaper, Atos Consulting considers the impact and implications for Communication Service Providers (CSPs). For convenience, we refer to VAM-R – Virtual, Augmented and Mixed Reality - throughout this paper, as shorthand for these three digitally-enabled experiences.

We normally like to avoid acronyms – especially when they are not in common use. But in this case, we have made an exception – simply because we needed to.

There are five reasons why now is the time for CSPs to take a serious look at VAM-R:

1. Affordable technology - the technologies needed to make VAM-R possible are more or less here.
2. Digital culture - people are now just one step short of mainstream acceptance for VAM-R.
3. Economic opportunity - as the ‘experience economy’ evolves, so do the market opportunities for VAM-R.
4. Communication shift - behavioral theory supports the belief that VAM-R will enrich the ways in which people and organizations communicate.
5. Investment - even if the overall economic climate remains fragile, we are seeing a massive growth in VAM-R investment.

Although VAM-R is set for a remarkable growth in momentum, we do need to recognize three very real inhibitors to early mass adoption:

1. No “killer apps” in general evidence - gaming is not quite mainstream.
2. Social inhibition and embarrassment - we are happy with phones but still awkward with headsets and gloves.
3. Assured connectivity and performance - “real reality” is jitter-free and ubiquitous and VAM-R needs to be the same.

CSPs are clearly going to make a crucial contribution to ensuring the connectivity needed for ubiquitous access and consistent performance. But not only. They are also going to play important roles both in promoting applications and shifting attitudes to equipment and usage – especially now that cardboard VR peripherals, for example, can be purchased for less than €5.

In recent years, successful CSPs have already radically redefined their business position - with sports and entertainment services, with business services and personal media management. With the advent of VAM-R, it's time for the next step.

And the next step will need both new business models and new approaches to core service provision. Simply keeping network performance and availability up to speed for VAM-R, for example, will demand a degree of agility which can only be achieved through Network Function Virtualization which in turn, demands new collaborative inter-CSP approaches.

CSPs will also need to look towards new partnerships and alliances with regard to VAM-R applications - and this demands serious and imaginative strategic thinking now. The choices you make, will have a direct impact on the way in which you are perceived by the new generation of customers and investors.

At the last Mobile World Congress, virtual and Augmented Reality were clearly dominant themes. They have been equally high on the agenda in recent media and broadcast events in Europe, the USA and Asia. The momentum is building and for CSPs, this means both excitement and disruption.

Atos sees VAM-R at the forefront of digital transformation for CSPs in terms of technology, market positioning and new commercial opportunity.

In this white paper, we will examine the overall landscape, hopefully sparking ideas and discussions which will help accelerate the inevitable CSP journey to embrace and celebrate VAM-R.

We look forward to taking these discussions further in person in the near future. As business technologists, Atos have an unashamedly practical attitude to digital transformation. Discussion is great, but experiments and pilots are better.

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Introduction:

new digital realities and the CSP

We believe that over the next decade, a new era built on “digital realities” will have a massive impact on human behavior and on every industry sector. We define these new digital realities as VAM-R – Virtual, Augmented and Mixed Reality.

There is a huge volume of work already available by specialists in each of these areas - but there is little coherent opinion on the implications for Communications Service Providers (CSPs¹). In this paper, Atos Consulting looks specifically at what these developments in digital realities mean for CSPs and asks what opportunities arise. By choosing to talk about CSPs, we deliberately look beyond the role of pure network operators to consider service providers in the broadest sense.

Every CSP has a choice to make right now. CSPs need to ask themselves if they are going to act as observers as VAM-R gathers pace, and then see where the business opportunities lie, or whether to choose to play an active part in shaping this emerging market from the start.

- Chapter 1 This introduction
- Chapter 2 Examines why now is the right time to focus on VAM-R.
- Chapter 3 Looks at VAM-R in more detail, with practical use cases and examples.
- Chapter 4 Explores the specific implications for CSPs.
- Chapter 5 Highlights what we believe to be the immediate opportunities for CSPs.
- Chapter 6 Summarizes our findings and suggests some next steps.

¹ Communication Service Provider (CSP) is defined as following by Gartner:

“Includes all service providers offering telecommunication services or some combination of information and media services, content, entertainment and applications services over networks, leveraging the network infrastructure as a rich, functional platform.

” <http://www.gartner.com/it-glossary/csp-communications-service-provider/>

Why now for VAM-R?

Moving beyond hype

It's not that long ago that smartphones, digital assistants and slimform tablets seemed like science-fiction products. Now they are standard accessories in our daily lives. Virtual and Augmented Reality still feel a bit futuristic – we don't yet have holographic friends helping us at work or around the house.

But the reality of these new digital realities is getting closer. We've seen a rush of recent publications, investments and acquisitions. We get new products and pilots every day and we have seen new digital realities taking center stage at top industry events, including the 2016 Mobile World Congress and the Los Angeles E3 Expo.

It's not always true, but when real money is in evidence, real things start to happen. Goldman Sachs expect the Virtual and Augmented Reality market to be worth some \$80 billion by 2025².

We believe that there is enough evidence of real investment, progress and activity to make this the right time for CSPs to seriously consider what VAM-R means for them.

Five specific drivers now point to VAM-R being poised to cross from hype to business and social reality in the near future:

Affordable technology

the technologies needed to make VAM-R possible are more or less here.

Digital culture

people are now just one step short of mainstream acceptance for VAM-R.

Economic opportunity

as the 'experience economy' evolves, so do the market opportunities for VAM-R.

Communication shift

behavioral theory supports the belief that VAM-R will enrich the ways in which people and organizations communicate.

Investment

even if the overall economic climate remains fragile, we are seeing a massive growth in VAM-R investment.

Let's look at these five in a little more detail.

² <http://www.goldmansachs.com/our-thinking/pages/virtual-and-augmented-reality.html>

Affordable technology - the technologies needed to make VAM-R possible are more or less here.

There's nothing new about the idea of artificial realities. Even before we had cinema, television or computers, there was a public thirst to experience things they would never see in person. Dioramas of exploding volcanos, ancient civilizations and ferocious animals were already a common entertainment in the 19th century.

Moving closer to our own times, the Sensorama system from 1962 took available technologies to the limit for an immersive sensory experience.

Nintendo introduced Virtual Reality gaming equipment as far back as 1995. Even though the subject always sparked the imagination, the gap between the dream and the actuality never closed.

The quality of experience was not great. With earlier electronic systems, the equipment was massive, slow and costly. We didn't have the processing power, the software tools, the display or the sensor technologies. Devices were power-hungry and thermally inefficient, and most important of all, we didn't really have the means to make, manage or consume content³. With some early experiments, human guinea pigs were lucky if they only suffered from nausea.

But now is different. Every barrier faced by the earliest pioneers can now be overcome.

In line with Moore's law, the technology is now approaching a level that can ensure the quality of the experience matches expectation. Combine that with genuine affordability, and we have a situation in which VAM-R is ready for mass take-off.

Momentum is building fast. All major tech companies are developing and launching products. We have VAM-R headsets including the Microsoft HoloLens, Samsung Gear, HTC Vive and Facebook's Oculus Rift. But the products don't stop with headsets - we've now got affordable 360 cameras, 3D audio systems, touch sensors, eye trackers and a growing wardrobe of digital wearables: it's worth watching the catwalks as well as the technology shows.

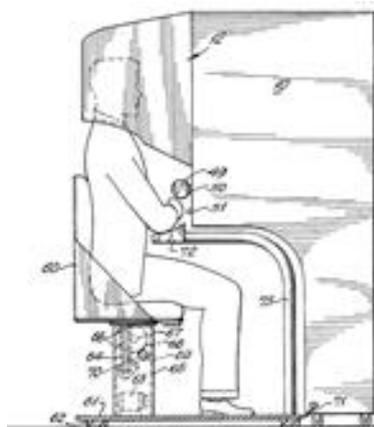


Illustration of Morton Heilig's Sensorama device, precursor to later Virtual Reality systems

Digital culture - we are now just one step short of mainstream acceptance for VAM-R

Over the last twenty years, people have developed an extraordinary dependence on mobile communications. When discussing holiday destinations with your children, "Is there WiFi?" is likely to be the first question. Walk down the carriage on a train, and the person not glued to a device is now the exception rather than the rule.

It's not just about personal communication. It's about access to services and information; about active membership of social networks; and about continuous connectivity to family, friends and colleagues. And while people talk to people, machines talk to machines as the Internet-of-Things escalates. Where communications between people and machines grows fastest, we are already moving into a new reality - people are just beginning to check out their virtual fridges; control lighting and heating from virtual models of their homes; and plan new kitchens with walk-through models.

Confidentiality and security continue to be key concerns in the world of digital communications, but when people have confidence in a brand, and an incentive to opt in, then more and more of us are willing to share personal data.

CSPs have been absolutely instrumental in driving this shift to a new digital culture, as we move from 3 to 4 and on to 5G and beyond. The parallel rise of Apple, Google and Samsung has been inseparable from the rise of mobile communications, and with new wearables whole new markets are starting to emerge.

Put all this together, and we see a society that is, we believe, now primed for the next wave in VAM-R - the gap between where we are and where we could be is closer than ever before.

³ Making Immersive Virtual Reality Possible in Mobile - Qualcomm White Paper

Economic opportunity - as the 'experience economy' evolves, so do the market opportunities for VAM-R.

Perhaps the term "experience economy" is used less frequently now than it was in the early 2000's - but it remains acutely relevant to any consideration of VAM-R.

We are all familiar with the idea that even the most basic product sale, now has an associated service element: you buy a bottle of wine, and in addition to pointers to

healthcare considerations you are invited to join the tasting club and maybe even go on the holiday to the vineyard.

The moment that we think about escalating these basic service additions into the world of VAM-R, the experience goes to a whole new level. The message from people who have experienced the best in Virtual Reality is clear. The new digital realities are not just a step into multi-media documentation. They actually constitute a genuine experience: virtual landscapes and objects can be perceived as

real - and that establishes a "wow" that has never before been possible⁴.

For the CSP, the implications of this emerging digital culture are widespread. Sure, the quality of the experience will always be determined by the quality of the network performance - but it goes much further. It is about how the CSP brand is associated with the experience and about which alliances and partnerships are going to create the greatest value.

Communication shift - behavioral theory supports the belief that VAM-R will enrich the ways in which people and organizations communicate.

People always build on what they know. Sometimes it takes generations. Sometimes it happens much faster. It took about a hundred years to get "a phone in every home" - more or less. It's taken less than ten years for two out of three people on the planet to embrace the smart phone with its near constant availability of the full spectrum of voice and data services.

We believe that the advent of these new digital realities will be absorbed into the communications mix far more quickly than many previous innovations.

Mark Zuckerberg says it wonderfully, "People will always want more immersive ways to express themselves. So if you go back ten years ago on the internet, most of what people shared and consumed was text. Now a lot of it is photos. I think, going forward, a lot of it is going to be videos, getting richer and richer. But that is not the end. In the future, I think you are going to want to capture a

whole scene, a room, to be able to transport to that. To be able to stream what you are doing live and have people be able to interact in that space"⁵.

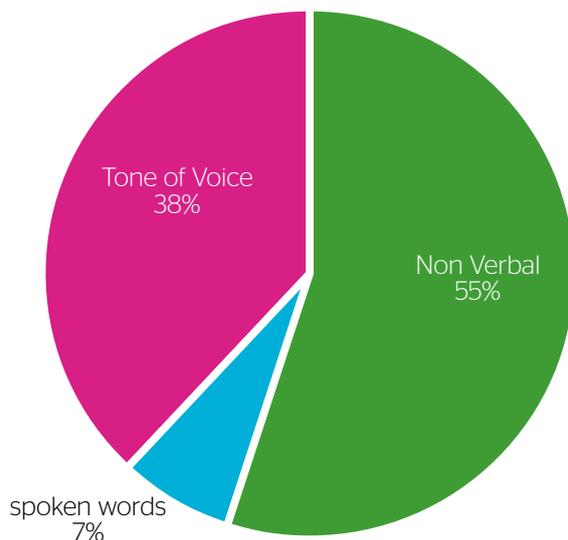
Communication is more than verbal exchange. It's a mix of verbal and non-verbal elements which together contribute to the shared experience of individuals and groups. Only 7% of communication is down to the words themselves. 38% is attributed to the actual tone of voice (pitch, rhythm, volume and so on) with 55% entirely non-verbal. In the world of VAM-R - of new digital realities - the potential to enhance the 93% of communication which lies beyond the words we choose increases radically.

In new digital communications we will all become more tuned to these non-verbal communication factors - is "camera on" a more honest state than "camera off"? how close do we sit and where do we look? What about dress, hand gesture and open and closed postures?

New digital realities don't just invite us to think about our own behavior. We need to think about environmental factors too ⁶. How do we minimize visual and audio "noise" - making sure that the sights and sounds around us do not interfere with the communication process? What about brightness and color - can our choices enhance or soothe? How can we create a virtual forum in which everybody's voice is heard and respected?

People used to say "you cannot beat face-to-face". In many ways that remains true. The question now, perhaps, is to ask how the characteristics of our new digital realities can be used to best effect in individual and group relationships conducted largely at a distance.

Non Verbal Communication



⁴ <http://www.wired.com/2016/04/magic-leap-vr/>

⁵ http://www.businessinsider.com/mark-zuckerberg-interview-with-axel-springer-ceo-mathias-doepfner-2016-2?op=1&utm_content=buffer45979&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer&IR=T

⁶ <http://www.tandfonline.com/doi/abs/10.1080/08923649709526970>

Investment - even if the overall economic climate remains fragile, we are seeing a massive growth in VAM-R investment.

Over the last twelve months over \$1.7 billion investment has been made in virtual and Augmented Reality, with \$1.2 billion of that made in Q1 2016. Remarkably, \$800 million out of this \$1.2 Billion solely went to highly-secretive, Florida-based Magic Leap, where the experience has been described as “dreaming with your eyes open”.

“Even without Magic Leap, investments are still 45% higher than the previous quarter^[1].”

Digi-Capital AR/VR Investments Overview

Analyst forecasts are bullish too. Goldman Sachs predicts that the VR and AR markets will be worth \$80 billion in 2025 ⁷. Digi-capital is even more optimistic, projecting the VR market at \$30 billion and AR at \$90 billion in 2020 ⁸. For Morgan Stanley, it's an area to watch, even if they have not yet mentioned numbers ⁹.

Investment forecasts have crashed and burnt, plenty of times in the past - with the dot.com bubble being the biggest of all. We think this is going to be different - it's ironic that with the focus on Virtual Reality, the actual developments and investments are more real than we've seen for a long time.

Confidence is widespread - you can see it in start-ups, in established technology vendors, independent investors and perhaps most importantly of all, an enthusiastic community of early adopters from the wider customer community.

[1] <http://www.digi-capital.com/news/2016/04/arvr-investment-hits-1-7-billion-in-last-12-months/#VzxLgPmLTIX>

⁷ <http://www.goldmansachs.com/our-thinking/pages/virtual-and-augmented-reality.html>

⁸ http://www.digi-capital.com/news/2016/04/the-reality-of-120-billion-arvr-business-models/#VzxSI_mLTIU

⁹ <https://www.youtube.com/watch?v=9Q9kfhiy-Os&list=PLMUUnYeeTvzNvIOdDcdIG3VAgKkclnoabN&index=2>

Overcoming the last barriers

The previous session painted a fairly positive picture for the immediate future of VAM-R – justified, we believe, but certainly not unqualified.

We see three clear and immediate barriers to the mass take-up of VAM-R. These are certainly not insurmountable, but it would be foolish to pretend they did not exist. CSPs will not necessarily have a direct role in meeting all three challenges, but should ensure, at least, that they are placed firmly on the agenda in associated business and partnership discussions.

No killer apps in general evidence?

What problem does VAM-R solve for consumers? Right now, there are no mainstream “killer apps” out there which only deliver because of their virtual, augmented or mixed reality characteristics.

There is some niche activity in gaming and the adult entertainment industry. There is other niche activity in both hobbyist and specialized professional environments – using VR for example in combination with drones, with surgical or surveillance equipment.

But right now, there is nothing that every member of society will either use or even recognize – and we need examples to break into mass acceptance. People will not buy into something unless they want it, or unless they believe they cannot do without it.

Google Glass, for example, failed because even though the technology was ready, the market was not. All thanks to Google – look at any pattern of innovation, and there are always outliers.

The challenge right now is to turn the confidence and the technologies of this emerging VAM-R industry and apply it diligently and creatively to the development of tangible use cases. It will take off because of what it does, not because of what it is.

Different players will take different approaches. Companies with promising VAM-R technologies, for example, are using hackathons and launching crowd-sourcing challenges¹⁰ to reveal and trial ideas.

Approaching from another angle, content owners, such as educational publishers and sports and entertainment companies, need to ask how VAM-R could create compelling differentiation for their own activities.

CSPs certainly do have a clear contribution to make in this process – especially when it comes to planning joint strategy and development with key technology and content partners.

Social inhibition and embarrassment

With technology, as with everything else, there is a fine balance between wanting to be a little bit individual, on the one hand, and wanting to conform, on the other. If you were the only person in a crowd of thousands wearing Google Glass, it didn't feel that comfortable.

Even at home, if the family is all sitting down to watch a movie, and one of you is wearing a box on your head, it does feel a little bit odd, and a little bit anti-social. It's interesting to see how in Oculus Rift promotional material, we always see a group of friends enjoying the game together – it's about social inclusion not about being a lonely geek.

But it's not just about feeling socially comfortable. If you are using an Augmented Reality overlay on a train, for example, you don't want the other passengers to be able to see your bank details. And if you are crossing a busy road in a city street, you do not want to be so focused on the virtual route that you fail to notice the actual bus heading straight for you.

Many of the VAM-R devices on the market today are, to be frank, a bit geeky. But this is changing and will change further. When the applications begin to attract critical mass, people will feel more comfortable with the devices themselves. For the devices, we are already seeing designs which are sleeker and less conspicuous. We can also expect single devices to be used for different functions, flipping for example, between Virtual Reality and enhanced reality.

It may take a while before the person without the VAM-R device feels like the odd one out – but it shouldn't be too long for people to feel at least, that using a device in company does not make them a complete pariah.

Digital etiquette for VAM-R will assert itself, just as it has for smartphone use – by all means follow the meal on your plate back up the food-chain in private, but please, not in a restaurant.

¹⁰<http://www.jamesallenonf1.com/2016/05/f1-reaches-out-to-fans-for-virtual-reality-solutions-in-crowdsourcing-challenge/>

Assured connectivity and performance

VAM-R is moving fast. The materials and methods are in place and ready for rapid advance. The application outriders are moving into place. But success or failure will always depend on performance - and performance will generally depend on the reliability and quality of the network - few VAM-R instances are likely to live entirely offline.

The CSP will naturally step into the game here - because only the CSP can ensure the network quality, availability and affordability. It doesn't matter if the datacenter or cloud provisioning that sits behind the application is provided by Google, Amazon, Microsoft or even Salesforce.com - it is the CSP that

enables scaling and access.

The rules will be fluid. Some VAM-R applications will demand realtime data connections from a single location on the other side of the world - just think of the Olympics. Others will require multiple points of access to fully distributed data and resources - consider, for example, international participation in education programs.

Whatever the application, the real enemy for the immediate future will be latency - because latency is what inhibits the natural experience: you press the button on the camera, but the shutter clicks a microsecond later; the interviewer asks a question while the interviewee has to wait a second to hear

it; you swing the tennis racket, but the ball doesn't move immediately.

Traditional approaches to network provisioning and management cannot meet the anticipated demands of VAM-R. The good news is that new approaches, including the introduction of software-defined networks and network function virtualization, will deliver the agility required.

The CSP challenge will, perhaps, reside more in the need to develop new collaborative business models, than in the need for purely owned capacity. In chapters four and five we take a closer look at both the relevant network characteristics and collaborative business models.

Getting ready

VAM-R momentum is building. There have been false starts, and there will be more - there always are. But it's happening all the same.

Advances in technology and material science continue, as do data capture and manipulation techniques. And it's not just about the technologies. We are also learning more about how we perceive and process information. New digital realities are beginning to gain a foothold in both leisure and business - with gaming and entertainment, unsurprisingly, in the vanguard.

Advances in personal digital communications and social media are creating a world population ever more comfortable in pushing the limits of digital literacy and community.

The costs of much VAM-R technology are now getting so low as to become more or less disposable - cardboard VR sets for under five dollars and selfie-sticks at a couple of dollars a pop.

VAM-R is going to have a massive impact on serious business endeavor - from undertaking monitoring for predictive maintenance

in hostile oil and gas environments to performing affordable remote micro-surgery; from revolutionizing language learning to changing planning and approvals processes in civil engineering and architectural initiatives; from managing essential security infrastructures to navigating unmanned transport systems.

Even though there are thousands of serious applications waiting to happen, however, don't forget one important fact: this stuff is fun - and you don't get to say that every day in the world of information technology.

What's it all about?

We've looked at why it's time to get serious about the new digital realities of VAM-R, about why the timing is right for take-off, and at the three key inhibitors to adoption that we need to be ready to deal with.

We are now going to take a look at what we are classifying as VAM-R - Virtual, Augmented and Mixed Reality. We are going to look at some practical use cases, and think about what the world of new digital realities could look like five years from now.

Some of the use cases we have chosen will resonate directly with CSPs - some are less directly relevant to communication service providers, but serve to illustrate just how broad this new world of virtual and enhanced reality is.

Application focus

Q: "What's the destination?"

A: "We won't know until we get there."

Q: "And if you don't get there?"

A: "We'll get somewhere else."

We can make plenty of informed guesses about how VAM-R is going to look five years from now - but in reality, we won't know until we get there. It's easy enough to extrapolate from early experiences in virtual, augmented and mixed realities, but how useful that extrapolation is will be consistently undermined by one simple fact: as the tools to construct and experiment become readily available and affordable for millions, even the most qualified and respected forecasts fail to encompass the possibilities that lie ahead.

But business is supposed to be serious, so what serious predictions can we make right now?

Gaming and entertainment have taken the initiative. Gaming has always been about immersing oneself in a world of pretend. But even if the gaming market is significant - currently worth about \$30 billion a year¹¹ - it remains niche. The influence, however, is far wider as "gamification" now becomes an accepted approach to engagement in everything from pharma to financial services.

Beyond gaming, entertainment and sports are natural hotspots for VAM-R. See [frame 3.1 \(see page 13\)](#) for use cases related to entertainment with CSP implications highlighted.

While the public is ready to embrace VAM-R in gaming and entertainment, in other sectors it still feels largely alien - except in selected highly-specialized professional activities, including medicine and defense. Although not as ready as entertainment and gaming, we believe that VAM-R applications will bring benefit to just about every industry sector in the near future - partly as a result of public expectations being changed through their experiences of gaming and entertainment. It is likely, for example, that in the near future, we will have the chance to experience "walk through" applications in real estate and architecture, that we will be able to enjoy lifelike holiday previews in tourism, take trips inside the body for medical education, and so on. [frame 3.2 \(see page 13\)](#) offers examples from beyond gaming and entertainment for Virtual Reality, and [frame 3.3 \(see page 15\)](#) for Augmented Reality.

And at the very heart of business for CSPs, we consider the application of VAM-R in communications. [frame 3.4 \(see page 15\)](#) gives a flavor of how we see the impact of new digital realities on immersive personal communications in both people's business and private lives. We don't only consider person-to-person communications here. We also think about the future of the physical interface. In Florida, Magic Leap are already exploring ways to liberate us from the tyranny of screens and keyboards. It's a massive leap to go from "thin screen" to "no screen" - but it is no longer completely unfeasible. A world without laptops and TVs is no longer unimaginable.

"AR/VR is the new UX/UI for everything, but it will take time" - Jason Ball, Managing Director of Qualcomm Ventures

"Despite it not being fully understood yet, AR/VR could surpass TV and PC in the long term" - Bill Malloy, General Partner of AITV

Different instances of VAM-R will have different technical and operational requirements in terms of graphic processing, connectivity and latency. A virtual property tour with a real estate agent, for example doesn't need realtime connectivity - competing live as a digital avatar in a real-life sports event does.

We'll take a short look at the similarities and differences between Virtual Reality, Augmented Reality and Mixed Reality - thinking particularly about application and requirement.

In Chapter four, we will then take a closer look at the roles and opportunities for CSPs as enablers in establishing and supporting the ecosystems demanded by these new digital realities.

¹¹Global Online Games Market Value - J'Son and Partners Consulting

Frame 3.1 - Entertainment industry

Sports

2016 has already seen numerous initiatives in new digital sports experiences. These include projects from the NBA, NHL and NASCAR in the United States ¹; the EURO 2016 football championships ²; and in Formula 1 ³. These immersive sports experiences aim to give millions of fans from around the world the sensation and excitement of being in the front row at the event. The real difference is that with VAM-R, the fans hear and see what they want to look at - not at what is broadcast to them. With digital overlays, fans can get all the background stats they love so much. As IT Partner to the Olympic Games, Atos has seen every edition of the Games become more digital than the last - but the emergence of VAM-R represents a real step change. Korea Telecom is already planning to make these new digital services available for the 2018 Winter Olympics in Pyeongchang, and will exploit 5G and IoT infrastructure to deliver seamless live streaming for massive audiences.

Movies

Digital enhancement for the audience has been a bit stop/start in the movie industry but it is happening. It is not just about the technology needed for production and consumption. New cinematic experiences need new ways of thinking about how to tell stories in a world in which linear narrative gives way to more game-like structures. Technical advances are gathering pace with Google and IMAX developing a VR Movie Camera⁴; a studio backed by Steven Spielberg secured a \$23 million investment in June 2016 from Chinese Mobile Services company Hengxin⁵; and numerous other VR initiatives are on the way in Hollywood ⁷.

Other entertainment areas

Entertainment is broader than sports and movies. Any area of the arts is open to new digital experience and remote participation with live concerts, dance and theatre all becoming open to audience extension through digital innovation. To highlight one of many initiatives, Live Nation announced a partnership with VR company NextVR to broadcast music concerts⁸.

Frame 3.2 - Various industry examples for VR

Real estate

Real Estate is a tough and highly competitive business. The foundation of making money is footfall - if you can get potential buyers to the properties, you cannot sell. Virtual Reality gives real estate companies the chance to radically increase footfall - albeit virtually: take a quick tour of twenty apartments before you even leave home - and link these up to local amenities to see what's in the area in terms of transport, shops, schools and the rest.

Fire fighting

When fire crews arrive at a blaze, they often need to work in extreme conditions in which visibility is limited and local knowledge is essential. Just imagine the contribution Augmented Reality could make, indicating hazardous storage areas and giving a clear view through smoke and flame - for robots as well as crews.

Automotive

Audi already presented their 'VR experience' at auto shows in 2015 and plan roll-out to selected showrooms in the second half of 2016, with worldwide implementation for dealers in 2017. Potential buyers can virtually experience their new car in any configuration ⁹. It's not just in the showroom - all automotive companies are now introducing some degree of VAM-R in their actual vehicle information systems for enhanced navigation, vehicle performance and in-car entertainment and communication. .

¹ <http://touchstoneresearch.com/the-6-companies-who-are-working-to-bring-sports-to-a-vr-headset-near-you/>

² <http://www.virtualreality-news.net/news/2016/jun/10/-euro-2016-virtual-reality/>

³ <https://www.formula1.com/content/fom-website/en/latest/headlines/2016/5/tata-communications-introduces-first-challenge-of-2016-f1--conne.html>

⁴ <http://telecom.economictimes.indiatimes.com/news/south-korea-to-use-ai-virtual-reality-in-pyeongchan-olympics/52269742>

⁵ <http://www.outerplaces.com/science/item/12215-google-and-imax-are-working-on-a-virtual-reality-movie-camera>

⁶ <http://www.wsj.com/articles/spielberg-backed-virtual-reality-co-grabs-23m-1465558204>

⁷ <http://vrworld.com/2016/06/09/hollywood-razer-shaping-future-vr/>

⁸ <http://www.theverge.com/2016/5/4/11589814/nextvr-live-nation-gear-vr-music-gigs>

⁹ <https://audi-illustrated.com/en/CES-2016/Audi-VR-experience>

¹⁰ <http://www.wired.com/2016/04/magic-leap-vr/>

Virtual Reality

In Virtual Reality, you are immersed in an artificially generated digital world. You will wear a headset which cuts you off from the real world around you. Additional devices may also form part of a Virtual Reality rig, to create the impression of touch and resistance or for interaction - these may be in the form of gloves, paddles or similar. It's early days yet, but advances in prosthetics act as a useful pointer to future forms.

Virtual Reality applications have varying characteristics, which in turn have different requirements in terms of network bandwidth, latency, graphical and processing power. These are summarized in [frame 3.5 \(see page 15\)](#).

Numerous headsets are already available with more being launched. Some are classified as Mobile VR devices, meaning no wired connections are required. Google Cardboard is the most basic example - a folded cardboard form into which a smartphone can be placed - and is a good ad-hoc viewer for people curious for a first VR experience. The Samsung Gear is more sophisticated, but still with a lower quality than headsets like the Oculus Rift, that connects to a powerful PC. The Oculus Rift contains a display for each eye, with a camera added to detect movement. The HTC Vive is another more high-end example.

Although classified as "Mobile VR", you need to be careful when using them: isolation from the real world makes any real mobility a risky business when wearing one of these.

Augmented Reality

Unlike Virtual Reality, Augmented Reality keeps you in the real world with a digital overlay. The digital overlay can deliver contextual information but without cutting you off from the world around you. Google Glass is the best known early example of an Augmented Reality system.

Many tech companies are in the race for winning Augmented Reality systems, but as yet, none have gained any widespread market success or public adoption.

In general, Augmented Reality will not require the high bandwidths of Virtual Reality, but the need for real-time delivery and ubiquitous availability will mean that latency remains crucial.

Mixed Reality

MR can be considered as being a mix between VR & AR. The user is not occluded off his/her natural surroundings, but in a darkroom MR will be experienced as VR. MR integrates visual objects into the real world. Those objects are often responsive to the real world as well. For example, the user can actually walk around a car presented in MR, and a tiger shown in MR will not be visible for the user when it walks behind the couch before it appears again.

Virtual Reality

VR provides the user the experience of completely being in another environment, enabled via software. The environment is presented to the user in such a way it is perceived as a real environment, whereas the user's natural surroundings are being occluded.

Augmented Reality

AR adds a digital layer over the real world, providing software generated images, sounds and/or data, mostly related to the environment where the user is located.

Mixed Reality

MR can be considered as being a mix between VR & AR. The user is not occluded off his/her natural surroundings, but in a darkroom MR will be experienced as VR. MR integrates visual objects into the real world. Those objects are often responsive to the real world as well. For example, the user can actually walk around a car presented in MR, and a tiger shown in MR will not be visible for the user when it walks behind the couch before it appears again.

¹² <http://www.wired.com/2016/04/magic-leap-vr/>

Frame 3.3 – Augmented Reality Examples

Just as the VR real-estate allowed you to explore a property from home, so an Augmented Reality twist will let prospective buyers get more out of the visit to the actual property – giving a heads up on the price of recent sales in the area, on local crime statistics, local authority services and so on – in short, giving information on the life not just the property.

Augmented Reality naturally meshes up with social media too, giving restaurant ratings as you walk down the street, and maybe even helping find somebody who'd like to join you for dinner.

Pokemon Go is a perfect AR example for gaming. The hype after its launch in July 2016 shows how similar AR applications are ready for mass adoption.

In less social environments, AR can also make it safe for people to manage action in hostile environments without exposing themselves to danger. Combining live-stream camera with AR data and robotics, for example, while carrying out underwater maintenance on rigs and pipelines, or in engaging in military campaigns.

Frame 3.4 – Communication industry examples

We've all got used to using unified communications to some extent – but the arrival of VAM-R is going to take this to another level in both business and personal communication. It's going to be more like face-to-face experience and less like manipulating windows.

Success will be heavily dependent on low-latency and high bandwidth – but we are getting close. Microsoft's HoloLens and Magic Leap are close to delivering startling Mixed Reality experiences in which the tradition world of the flat screen with its multiple overlapping panels is replaced by a world that resembles reality¹⁰.

Frame 3.5 – Virtual Reality Flavors

Participants vs Spectators

You are in the virtual front-row at a top sporting event. You see the sweat up close. You see a different view when you turn your head. You hear the sickening crunch of boot on bone. It's real up to a point. It's not like watching television. You can even chat to the person sitting next to you in the stadium, but when they spill their drink, your trousers don't get wet. You are enjoying an immersive spectator experience – you are not an active participant.

The depth of this immersion will increase rapidly in the near future – the tumbling price of sensors and smart 360 degree cameras mean more and more opportunities to add layers to the virtual experience.

In many instances, people will also make the jump from spectator to participant – especially in non-critical situations. It will be great, for example, for medical students to be able to choose how best to make an incision in a virtual kidney, or to rerun real operations – but genuine patients will not want to be actual objects in an educational game.

In fully animated digital environments, participation in Virtual Reality is less complicated. In a virtual chat room such as vTime, for example, friends can sit round a campfire in a jungle by the top of a waterfall and look into each other's digital eyes. Some equipment already extends the experience to allow you to pick things up and pass them round.

Animated vs Real-life Environments

Even if we can almost make the representation of real and virtual environments indistinguishable, they are very different in terms of treatment. A completely digital construction, for example, of a Formula 1 racing circuit remains completely digital. This means that designers (and players) have complete control – over the light, the weather, the track conditions – over everything. No matter how lifelike the experience, the entire world is contained within its own digital construct.

This changes fundamentally when an actual Formula 1 race is projected onto the fan's VR headset in real-time, layering the digital world over the real one. With a football match, for example, those who provide the experience can continually enhance it in innumerable ways, but the interaction between real and digital must be limited. It may be possible, for example, for Virtual Reality spectators to show their faces on actual or virtual digital advertising panels around the ground. It will not be welcome, or possible, for them to score goals.

For both animated and real-life representations, low latency is critical to quality of experience.

Realtime or not

Whether or not a Virtual Reality application requires realtime networked communication is a critical characteristic. If a game is downloaded to the device, or the real estate application is resident on the agency computer, then it can be used independently of the communications network: there is no relation between the quality of experience and the quality of the network.

The moment that the application relies to any extent on the network, then the quality of the network impacts the quality of the experience – and the heavier the demand, the greater the impact. With hundreds or thousands of people expecting instant response in a multi-player environment, network performance and latency need to ensure that the digital experience is smooth and seamless. The bigger the action, the bigger the demand for the CSP.

VAM-R

implications for the CSP

The new digital worlds of virtual, enhanced and Mixed Reality are still very much in their infancy: many major tech companies are only just launching their first headsets. The same goes for all other VAM-R devices and peripherals: sensors, 360 degree cameras, 3D sound systems, content development platforms, remote controllers, and so on.

For the CSP, the full impact of these applications remains speculative, at best. But even so, every forward-thinking CSP needs to start seriously considering the future implications.

It's not all hypothetical. Pundits and analysts cite network availability and performance – and particularly mobile network availability and performance – as a potential barrier to VAM-R adoption. It's also recognized that low latency becomes critical to VAM-R quality of experience except, of course, for offline instances.

But for now, much bandwidth consideration is guesswork. Some estimate that Virtual Reality applications require about five times the bandwidth needed for HDTV¹³. Others that video at 6K quality for VR has 20 times the load of a video for HDTV¹⁴. For now, VR devices connected with fixed network cables put seamless experience seems within reach. With the emerging market for mobile VR devices, seamless experience over wireless connectivity is less exhaustively tested.

There are however, some serious pointers to VAM-R implications for CSPs. Facebook, not surprisingly, is both interested and influential – how can social media not embrace new digital worlds?

Facebook has launched an initiative to boost bandwidth with the Telecom Infra Project (TIP)¹⁵. The project itself is an indication that Facebook are concerned that network development in telecommunications is not keeping pace with the demands made on it by a digitally transformed society.

Deutsche Telekom and BT Group company EE joined TIP in February 2016 with Vodafone and Telefonica following in May¹⁶. This participation is a pointer to the fact that leading telcos are taking the opportunities and demands of VAM-R seriously.

TIP is not limited in focus to new digital realities – it also embraces the Internet-of-Things, for example. It is, however, a clear indication of the belief in the irreversible shift to digital transformation and of the need for close involvement with CSPs. The simple fact that video and Virtual Reality are such data intensive formats is one of the main triggers for the initiation of TIP¹⁷.

The potential CSP role in VAM-R, however, extends way beyond network provisioning with massive bandwidth and minimum latency. Over the last 10-15 years, the heritage telcos have been under sustained attack from new Over-the-Top players. The OTTs have

been able to attack traditional telco markets, free of the baggage of network operation and using leaner and more agile business systems. The heritage telcos fought back, not only leveraging brand and network ownership, but also by aggressively promoting bundled communications and entertainment services.

The advent of VAM-R promises to be a new battleground in the ongoing shake-out between heritage and OTT players. For both, the ability to establish winning partnerships with technology players, with media and entertainment companies, and indeed with lifestyle and public sector agencies will be key to sustainable success in the next wave of digital transformation.

¹³ <http://telecoms.com/opinion/virtual-reality-the-reality-for-connectivity-providers/>

¹⁴ http://datacenterfrontier.com/virtual-reality-data-center/?utm_source=twitter&utm_medium=social&utm_campaign=SocialWarfare

¹⁵ <https://telecominfraproject.com/>

¹⁶ <http://www.computerworld.com/article/3074893/networking/facebooks-plan-to-disrupt-cellular-gets-big-name-support.html>

¹⁷ <https://telecominfraproject.com/news/facebook-why-were-building-the-telecom-infra-project/>

VAM-R

opportunities for the CSP

Beyond superior network provisioning services, where will CSPs find business opportunity in the world of VAM-R? CSPs have seen margins in traditional voice and data services shrink as pure network services are increasingly commoditized. To shine in the world of digital transformation, CSPs need to look beyond commodity.

We've seen how the top tech companies are investing in and bringing VR and AR products to market. We've seen similar hard investment from entertainment and media companies. This is also spreading into education, medicine and healthcare, manufacturing, construction and just about every other market.

As with CSP service developments over the last 20 years, successful operators have provided more than the plumbing. CSPs have learnt how to work with content owners to deliver compelling functional bundles to their business and domestic customers. With the rise of cloud, they have also positioned themselves as digital custodians of their customers' digital assets.

CSPs have also continued to deal in devices and service packages - both in store and online.

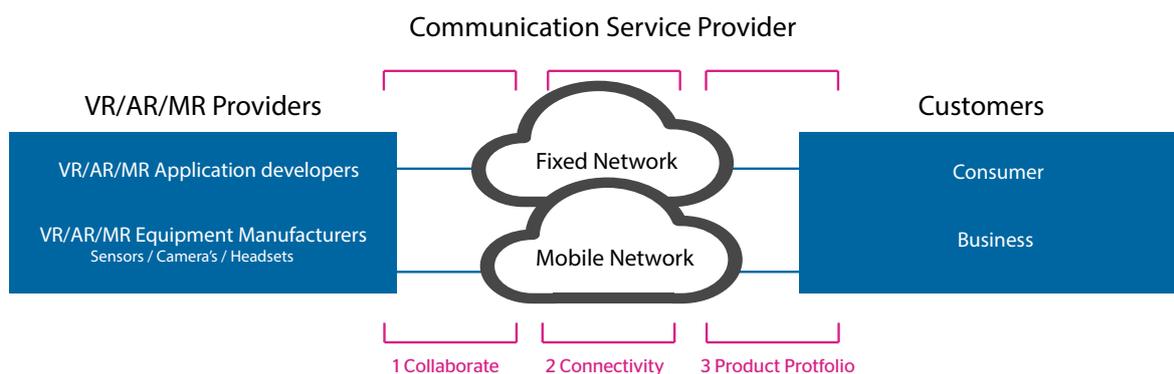
With the emergence of VAM-R, CSPs now need to apply the same business ingenuity and imagination to this as yet, largely unformed market. It certainly makes sense to explore the implications with existing partners - CSPs should leverage the quality and investments they have made amongst current partnership ecosystems.

They also need to scan the radar for interesting newcomers. This always has a higher rate of business attenuation - the majority of new companies and new technologies never make it to maturity. But this doesn't mean don't look. CSPs can

increase their chances of picking winners here by working in partnership with companies like Atos, who already have a strategic business focus on emerging technologies.

In Chapter Three, we took a brief look at just some of the use cases which are emerging for VAM-R application. It also makes sense for CSPs to work closely with their business clients in this area. Where an automotive company, for example, is exploring virtual drive and design options, they will welcome expertise from those who know best how to deliver the connectivity and performance needed for successful implementation.

In the new world of VAM-R, Atos sees forward-thinking CSPs taking a central and enabling role, as illustrated below :



This is a useful and practical model with which to explore opportunity, asking:

Where can CSPs collaborate directly with VAM-R technology and service providers?

Where can they make the quality, scalability and cost of connectivity a differentiator?

Where can they enhance our own direct and third party portfolios for sustainable sales success?

We'll look at each of these questions in a little more detail in next pages.

Collaborating with VAM-R providers

There is no such thing as a VAM-R industry. It is a loosely associated community of people and organizations with wildly different interests and competences. There are the giants of technology on the one hand and academic groupings of neuroscientists on the other. There are individual games developers and there are influential academic publishers.

For CSPs, perhaps the first question is, "Who do we want to talk to and why?" - and conversely to be sure that you have a reason that they will want to talk back.

Here are a couple of starting points ...

Welcome application developers

Application developers need CSP networks. They need them during development, test and trial - and of course for all commercialized delivery.

No matter what the VAM-R application focus, consider offering a set of standard APIs to tailored network services. This won't just reduce cost for both developers and CSPs. More importantly, standard connections mean accelerated time-to-market.

If the CSP also offers a cloud development environment - either themselves or in partnership - make this part of the proposition as well.

And remember, that the CSP probably has many more customers than the VAM-R developer. The better the CSP knows their own customer base, the more valuable this information becomes to the VAM-R partner - both for target trial and pilots and for eventual product and service sales.

Alliances for end-to-end solutions

All successful CSPs already have sophisticated segmentation for both business and domestic clients. That industry-specific segmentation, together with any existing sector alliances, can make a valuable incentive for VAM-R businesses to engage with the CSP.

It gives, in effect, a fast-track to knowledge and customers that the CSP may have been building over many years.

This doesn't need to be about one-to-one ...

CSPs are used to managing complex multi-party alliances, and this experience will be valuable as VAM-R opportunities move into the mainstream. It will be possible, indeed desirable, to coordinate alliance ecosystems in which major tech companies, micro start-ups and industry experts all need to work side-by-side before any practical value is revealed.

In healthcare, for example, the surgeon may lead - but the peripheral designer, the visualization experts, the data analysis and retrieval specialists and the network providers all play collaborative and essential roles.

The same goes for manufacturing, for travel and tourism, for retail and, thinking of the core business for most CSPs, for communication and collaboration. All these industries will have varying requirements when using VAM-R to create added value, opening up opportunities for new alliances in which CSPs will feature prominently.

With VAM-R, we are also going to see a closure of the gap between academic research and business application - not least because this new discipline is ultimately about

how we perceive reality - not about what is real. CSPs are under massive pressure to make money, so they are not going to be paying for years of fluffy academic indulgence. They may, however, be interested in understanding how psychologists and neuro-scientists can contribute to their alliance ecosystems.

Connectivity as a differentiator

The second area in which we see VAM-R opportunities for CSPs is the networks themselves. CSPs will need to think about network services as a means for VAM-R players to differentiate – to ensure visible value and excellence in performance and availability. It is not about the same old commodity of connection. We see two distinct areas of opportunity ...

Push capacity

If CSPs are going to make a success of VAM-R services, they must be seen to deliver on capacity. As stated in Chapter Four, VR already requires about five times the bandwidth of HDTV, together with minimum latency.

As VAM-R gathers momentum, 5G will be the baseline requirement for many applications.

Developers have already flagged network capacity and performance as a potential barrier to mass adoption – and anything the CSP can do to mitigate this perception will have positive results.

Not all CSPs are network operators. That doesn't matter. It's the access to service that counts, not the ownership. Whether a CSP owns or accesses network capacity, it becomes increasingly important not only to drive transition to 5G, and to increase capacity and coverage. Almost more importantly, CSPs need to communicate these advances – especially to those with a clear interest in VAM-R.

This takes us back to partnerships. CSPs will not win this new tranche of business by waiting for requests to tender. They will create a position for themselves through active involvement – by making high-capacity networks available for joint trial and by actively communicating network strategy and development news, with targeted messaging, to the emerging VAM-R players.

Profile according to use

All successful CSPs understand not only just how much capacity their customers are using, but also what they are using it for. With unprecedented focus on customer experience, it is essential to know how to make performance fit actual need: if you are watching TV, a second dropped can ruin the experience – if you are sending a mail, you will never know there has been a second's delay.

When VAM-R starts to take off for real, this ability to profile according to use becomes even more critical. Compromised performance for remote surgery or realtime traffic management can be a lot more serious than a glitch in a game.

CSPs have the ability to ensure performance levels for individual services – and with VAM-R this becomes a commercial essential. If a gamer, for example, is paying a premium for a platinum service, drops in quality will soon be followed by a switch of provider – there is no loyalty.

There is good news for the CSP here. Network innovations, particularly in Software Defined Networks and in Network Function Virtualization, make it possible to:

- Profile individual use with pinpoint precision
- Deliver customized service for custom use communities and even individuals
- Tune capacity and performance in synch with realtime changes in demand

The commercial implications of these developments are just as interesting as their technical and operational impact. SDN and NFV will, for example, allow CSPs to offer on-demand service boosts to create entirely new revenue streams. A customer with a standard low price voice and data bundle, for example, may well want the platinum service for just 120 minutes to attend a virtual film premiere.

This takes us back to the "economy of experience" discussed in Chapter Two – the idea that the experience itself can be a finite commodity features strongly in the commercial logic of VAM-R.

And with these new opportunities, the essential quality of experience will need to take local net neutrality agreements fully into account.

Enriched product portfolios

Whether it's selling business services to SMEs or entertainment bundles to domestic customers, CSPs have moved a long way beyond the basic business of commodity communication services offered at best cost.

The emergence of VAM-R will present opportunities for CSPs to extend their own product and service portfolios, creating entirely new revenue streams. In some cases, these can be owned and delivered by the CSP independently. In others, the new product and service offerings will be developed and commercialized in partnership.

VAM-R enabled communication services

Today's communication services will become VAM-R enabled. It's not even such a huge step. Think, for example, about the way people conduct online business meetings today.

Unified communications mean that multiple participants can collaborate, share files and so on. But for most of us, the norm today means shuffling between display panels, sharing screens and changing views.

With VAM-R, we will be able to recreate the actual meeting rooms on a genuinely human scale - we sit round a virtual table, we use the display systems, we make and document decisions with a Cortana style avatar to take notes, perhaps.

And if you can do it for business meetings, you can do it for anything else - from trade fairs to family reunions.

With the new commercial and business models which underpin the experience economy, such services can be offered on contract for heavy usage or paid by the session for less regular use.

VAM-R tuned subscription

When all you could do with a phone was talk to somebody from a fixed line, commercialization was easy: you paid by the minute (in Europe at least) for local calls; you paid a bit more for distance calls; you paid more again for international calls. You paid by the month and you knew what you paid for - with a few extras for line rental and the rest.

It hasn't been like that for years. CSPs have learned how to sell by bundle and to ensure that the commodity pricing is framed according to meaningful categories for the target client - just think of "family and friends" contracts, for example.

As VAM-R gathers pace, CSPs will have a whole new level of service considerations to explore, market and price. Just as VR headsets range from the €5 Google Cardboard to the €3,000 Microsoft Hololens, so CSPs will be able to craft VAM-R bundles to suit different practices and different budgets.

Success will be due as much to marketing as to technical definition - the language and the proposition must be super-clear. The "virtual grandma" package for a family living in different countries, for example, will be very different from the "Global gaming warrior" for those who spend all their spare time fighting the forces of virtual evil in their bedrooms with a headset. Bloggers and journalists who need to live-stream activities to a large crowd, perhaps using VR extensions of an app like Periscope, could be attracted by a "social globetrotter" package featuring the largest possible data bundle to handle seamless wireless usage.

These offers will have variations in latency, bandwidth, mobility, extra hardware and headset type including 360 camera and sensors, with resilience "under the hood" - but they will require a lifestyle, not a technical sale.

VAM-R product and service bundles

The idea of the VAM-R tuned subscription described above, can be further extended to become full product and service bundles - again carefully conceived and marketed according to customer type.

Such bundles could comprise a choice of headsets and peripherals; a specified time allowance, defined according to activity; and a minimum performance promise - with standard, gold and platinum options or their equivalents.

In the "experience economy", it would need to be easy to step up a bundle according to an individual's preferences and circumstances: a student spending four months travelling in Latin America, for example, would want to

be able to virtualize experiences on the Inca Trail or canoeing up the Orinoco for friends and family back home. Once the trip was over, they probably wouldn't want a similarly intense VAM-R blog of their lectures and laundry.

In addition to providing network and device options, bundles could also be extended to include partner propositions - access to games and entertainment, to Augmented Reality travel and business services and so on.

As the bundle becomes more articulated, so does the monetization mix, particularly when allocating payment to third party carriers or conversely, collecting revenue from contextual advertising. But this is not a revolution - it is an extension of what CSPs already need to manage with current multi-party bundles.

In B2B bundles, this articulated monetization, though manageable, may become even more complicated. In healthcare, for example, VAM-R bundles will need to integrate services from specialist medical equipment manufacturers like Phillips or Siemens, who in turn, will expect commission according to usage.

In both private and business VAM-R bundles, the CSP will also need to take into full consideration all aspects of security, compliance and governance. For the moment, this whole area is an unknown quantity - but it will become a hot topic as soon as VAM-R goes mainstream. Data-breaches in the games industry have already hit the business headlines - and this is before the real revolution has even begun.

Frame 5.1 Why should VAM-R players care about CSPs?

Even in the VAM-R player if offering products and services that are entirely offline, there are still plenty of reasons to be interested in great relationships with CSPs.

The CSP customer base

Everybody has a phone. Every business has communications contracts. This means that CSPs have established billing relationships with millions of customers. It's always easier to sell to somebody who already buys from you.

For any VAM-R player, the CSP offers a fast-track to commercial engagement with an extensive and existing customer base - and that's always better than starting from zero.

CSP retail channels

Some CSPs have online retail channels; some have a high-street presence; some have both.

Even though the world of VAM-R is virtual, the experience is intensely physical. The phone shop is already a place for people who love tech to hang out - and that's a great environment to experiment with new VAM-R applications for different themes. For example, picture a VR entertainment corner or a VAM-R communication space in CSP retail shops.

Retail floor space is not cheap - and CSPs don't want their stores to become free gaming arcades - but do it well, and this is a real win-win - with increased footfall for the CSP, with immediate opportunities for service up-sell, and a direct contact with a ready market for the VAM-R player.

Business models

The three areas of VAM-R opportunity for CSPs outlined above, all have potential impact on the CSP business model. This is nothing to be nervous about. In recent years, CSPs have shown themselves to be amongst the most resilient and adaptive of all business sectors - change is nothing new.

We have identified three areas for immediate consideration in terms of the impact of VAM-R on CSP business models.

Open platforms versus “walled gardens”

As a rule, open is better than proprietary - unless proprietary is so big you can't argue with it. In VAM-R, we see both. On the one hand, we see the continued success of proprietary gaming platforms. On the other we see some of the giants of the technology industry driving innovation based on open standards and open source technologies.

CSPs, by definition, need to favor open standards - in the world of telecommunications, everything ultimately connects to everything else.

When promoting platforms and building partnerships for new VAM-R ventures, CSPs will be driven by practical strategies. It would be a mistake to opt exclusively for platform partnerships that closed development opportunities down through proprietary technologies. It would also be a mistake to avoid big hitters just because they rely on proprietary platforms.

Winning VAM-R players are unlikely to be willing to sign exclusive rights to any individual CSPs - and there is no reason why CSPs should not take a reciprocal position. As always, early and proactive dialog and involvement becomes the key to making the best decisions.

Content and exclusivity

While we are likely to see a situation in which those who provide the VAM-R platforms agree multiple deals with multiple CSPs, content owners play a different game.

Winning entertainment franchises, major sporting events, and high profile sporting leagues know that they become the aces in the hands of CSPs. Exclusivity is something CSPs must be prepared to pay for - and that makes exclusivity a serious strategic investment.

All high profile content providers are exploring the implications of the new digital realities made possible by VAM-R. Where CSPs are already in partnership, early collaboration in innovative service initiatives is always wise. It is, however, equally important to consider the implications of any current investment or collaboration for the future beyond the current contract.

Back in the sixties in the UK - televised snooker had a major impact on the sale of color televisions. It did not happen by accident. Broadcasters showed a game which really did not make sense in black and white - as people learned to love the game, they switched to color. In today's language - they'd found a “killer app”.

This will happen again with VAM-R - and the CSPs associated with the winning examples will benefit.

But let's not forget the differences between now and the sixties. Technology has become massively democratized and massively accessible. In the years ahead, CSPs will not only find value with the “content stars” - with big league football and Star Wars or The Game of Thrones.

Shared pricing models

Pricing models for CSPs and their partners are already labyrinthine - and VAM-R will make it even more complicated. Who will pay who? What for - and how much?

VAM-R will not mean completely reinventing pricing models, but it will mean opening already complex models to new elements. CSPs will need to build on top of their current investments in billing, monetization analysis and CRM.

There are plenty of options - and plenty of precedents. There is no need, for example, to think of participation in a VAM-R event as any different from watching a Netflix movie or using a set-top box.

Connectivity and access time, for the customer at least, are inseparable from the ticket price. How the CSP, the content provider, the advertisers and the rest split the money gets more complicated.

The tools and techniques exist. CSPs will need to place monetization high on the agenda in discussions around the emergence of VAM-R, and be ready to explore options, as they have done many times before.

What next?

We believe that VAM-R is about ready to start moving from the margin to the mainstream.

We feel a bit self-conscious about inventing the acronym, but at least it does what it says: Virtual, Augmented and Mixed Reality. In Chapter Two, we explained why we believe the time is now for these new digital realities. In Chapter Three, we looked at how these three approaches are both related yet distinct.

Atos had been helping CSP clients meet the challenges of wave after wave of disruption and innovation for over thirty years. We are convinced that CSPs are set to benefit from the emergence of VAM-R, as long as they approach it with passion, imagination and enthusiasm.

But business is business, and after years of fighting to retain customers and profit from smaller and smaller voice and data margins, no CSP will put their faith in a sci-fi wonder cure. VAM-R needs a business case, and CSPs are in an excellent position to build one, in partnership with those companies that have already proved their value in collaborative ventures.

There will be immediate short-term opportunities - make the headset the must-have Christmas gift from the high-street store for 2016 and CSPs will already have won the first battle.

But the real opportunities, we believe, will be the ones that grow naturally out of each CSPs existing business culture: creating new value in business service offerings, with VAM-R as an extension of unified communications; taking VAM-R into the markets they know best - perhaps education, manufacturing or retail; and promoting VAM-R as a natural progression in immersed communication for the social media age.

As always, partnerships will be key - and in the coming wave of VAM-R applications, CSPs will need to manage a broader range of partnerships than ever before. CSPs are in a good position to lead in these initiatives - partly because their existing customer bases, both business and consumer are exactly the right targets for new digital experiences.

About Atos

Atos SE (Societas Europaea) is a leader in digital services with pro forma annual revenue of circa € 12 billion and circa 100,000 employees in 72 countries. Serving a global client base, the Group provides Consulting & Systems Integration services, Managed Services & BPO, Cloud operations, Big Data & Cyber-security solutions, as well as transactional services through Worldline, the European leader in the payments and transactional services industry. With its deep technology expertise and industry knowledge, the Group works with clients across different business sectors: Defense, Financial Services, Health, Manufacturing, Media, Utilities, Public sector, Retail, Telecommunications, and Transportation.

Atos is focused on business technology that powers progress and helps organizations to create their firm of the future. The Group is the Worldwide Information Technology Partner for the Olympic & Paralympic Games and is listed on the Euronext Paris market. Atos operates under the brands Atos, Atos Consulting, Atos Worldgrid, Bull, Canopy, Unify and Worldline.

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Let's start a discussion together

