FROST & SULLIVAN

BEST PRACTICES AWARDS

IKIN

2020 GLOBAL HOLOGRAPHIC MOBILITY SOLUTIONS TECHNOLOGY INNOVATION LEADERSHIP AWARD

Contents

Background and Company Performance

Industry Challenges

5G networks will usher in a new paradigm of connectivity, with networks able to handle data traffic and bandwidth at levels significantly greater than preceding generations (4G). Deploying connected solutions across verticals and throughout value chains will enable novel use cases and unimagined applications, along with new potential revenue streams for mobile operators and vendors. Optimized for software-defined networking, 5G will handle massive amounts of data and allow complex computations for billions of connected devices. End users will experience a highly reliable, low latency service that is vastly enhanced compared to previous generations, resulting in rapidly responsive consumer and enterprise applications, many times faster than 4G.

5G networks will have the capacity to pool bandwidth and increase the effective network range and speeds in supported applications. The massive boost in capacity will connect applications previously limited by insufficient bandwidth, and make cloud computing more efficient in the broader ecosystem. However, international standard-setting global bodies have unified the standards for some but not all of the frequency bands. Technology vendors and network operators are effectively betting on the selections; the associated delays and lack of clarity add to the already expensive network build-outs. Operators and vendors are cautious in making new investments and looking for more reliable use cases and monetization opportunities to ensure return on investment.[1]

While increased speeds may be one of the first visible manifestations of 5G, there are many use cases envisioned in a range of industries that will have compelling applications far beyond simply watching videos on a smartphone. End-users experienced a massive improvement in communications and data services in the jump from 3G to 4G. Still, the introduction of 4G LTE enabled massive disruptions across industries and with use cases that did not exist initially (e.g., rideshare, social media, streaming, travel). High-quality and secure remote connectivity for the highest bandwidth applications typically depends on wired networks at present. However, with 5G-enabled mobile systems, ultra-low latency will materialize with edge computing and open the door for entirely new applications.

While the potential is vast, monetization success is not clear cut, and the roadmap to recouping capital vestments is essential. Mobile operators are looking to use cases leveraging enhanced mobile broadband, the Internet of Things (IoT), and mission-critical applications to serve as the drivers of commercialization and market growth, i.e., virtual and augmented reality, connected transportation, smart manufacturing, smart cities, personal artificial intelligence (AI) assistants, connected energy, wireless health, wireless entertainment. The global race to lead in 5G is underway, and market participants must

[1] *5G: The Emerging Digital Frontier: Ushering in an Age of Boundless Connectivity and Intelligent Automation,* (Frost & Sullivan, April 2019).

now identify commercially viable applications that can serve as the 'face of 5G' and spur future development.[2]

Augmented reality (AR) and virtual reality (VR) systems can capitalize on 5G networks by reducing latency and efficiently delivering real-time, interactive content. AR and VR use cases often promote amazing new encounters, but the actual experience can pale in comparison to the promises. The most notable holography demonstrations exist in the domain of complex and expensive stage shows, requiring specific lighting variables. Mobile users have, in general, resisted new hardware and device purchases (whether goggles, headset, or glasses). These systems remain limited to the computing capacity available (whether locally on the device, at the edge, or a distant data center), thus, limiting the user experience.

Moreover, the lack of content for AR/VR systems continues to hinder adoption. AR/VR systems are almost all tightly held propriety systems—leaving the ecosystem in a 'chicken-and-egg' bind (i.e., which comes first to propel development?). Developers face a significant risk in building on unproven systems and learning new environments. While gaming systems have taken hold as the most visible use case, the potential for new applications is vast. The current crop of AR/VR systems has functional limitations (e.g., one popular smartphone game features approximately 20 seconds of AR content before it must shut down and revert to geo-location function). Currently, the hardware, software, and network availability (in addition to price) continue to constrain the processing and optical capabilities of AR; overcoming these constraints could catalyze a universe of development and use cases.

New Product Attributes and Customer Impact of IKIN

IKIN has developed its RYZ platform, delivering innovative optical holographic experiences through existing mobile devices and networks. IKIN's RYZ platform catalyzes an array of use-cases and revenue-generating opportunities as it does not requires goggles or headset to create robust and compelling holographic displays. Founded in 2017 and headquartered in San Diego, IKIN leverages team expertise in visual content, telecommunications, as well as hardware and software design to drive the company's business, engineering, and development strategies. With 27 patents already filed and prototyping complete, IKIN will launch the full RYZ product package in 2021. By uniquely enabling the ability to display and control objects within an actual volumetric holographic space, IKIN is committed to meeting and exceeding customer expectations.

Delivering Holographic Imagery to Mobile Devices

IKIN delivers true innovation to create a holographic field using sophisticated AI for existing mobile devices over existing networks. Impregnating the AI algorithms into the applications running on the device, IKIN's technology optimizes the holographic presentation based on available network connectivity. IKIN leverages a unique threading

[2] *5G: Time to Invest*, (Frost & Sullivan, December 2019).

technique to throttle the volumetric presentation based on network connectivity and the optical requirements to produce the visual imagery for two retinas to perceive the hologram.

IKIN makes a distinctive choice to regulate the volumetric axes of the display based on the network data available, down to the millisecond of data traffic. IKIN uses the phone's core processor to serve as the immediate neural network connection, only going to the cloud to consolidate the information needed to display the necessary aspects for two retinas. IKIN takes much of the translation processing onto the device itself, rather than a cloud-based system. Thus, the system cuts down on the superficial data, throttling the X-axis and Y-axis and increasing the Z-axis for volume. This technique consolidates bandwidth, enabling the ability to perform over 4G networks as a result of the throttling capacity. The roll-out of widely anticipated 5G coverage will truly unleash IKIN's holographic capacity.

When 5G networks become available, the increased capacity will grant the ability to preload (solid-state substantial loading) to websites effectively and run the hologram frame-by-frame on a relational database server with an imperceptible lag because of the power and speed of the network. Developers will have a new arena to produce content never seen previously. IKIN's platform with 5G enabled-networks will add an exponent of three to the ability to present a threaded image. Frost & Sullivan is confident IKIN's system will intelligently evolve with 5G capabilities, i.e., in tagging visual processing power from other individual devices within their communication system and effectively sharing the processing power by changing the type of information sent frame by frame. Impressively, IKIN has a product roadmap for these evolutions and intends to enhance the resolution and display size as 5G matures.

RYZ, an Easy to Deploy Hardware and Software Package

IKIN brings to market the RYZ platform, consisting of the RYZ Framework software (for developers); the RYZ Accessory hardware (attaching to the phone and at an easily reachable price point); and the RYZ App (for Android and iOS operating systems). The company concentrates on the user experience and allows developers to create impressive visual imagery on a user’s device. Attached to their smartphones and comfortable with the operating systems, users resist clunky external devices and headsets. IKIN expects to launch the RYZ platform commercially in 2021 to work with every brand of smartphones, with a roadmap for tablets and PC as well.

The RYZ framework equips developers with an intuitive interface and resource to build a rich holographic solutions portfolio they can deploy and monetize. Designed for simple use, the Framework and holographic application program interface (hAPI) makes developing for holographic apps as easy as drag and drop into the environment. The RYZ Accessory is an external attachment (magnetic and detachable) onto the phone, that flips up and down for an optical holographic display area. With the RYZ Accessory, users gain a

second, holographic screen and the ability to see all messages, notifications, emails, and applications in the RYZ field. In the RYZ field, users gain the full functions of their phone in the holographic space. The RYZ App, currently under development, will include some in-house build applications, gaming options, specialized emojiis, and options to turn video and pictures into holograms.

Utilizing the phone's central processing unit and operating system, the RYZ Accessory includes an independent battery and consumption throttling for extended holographic use. Similar to the network optimization, IKIN's system passes through the phone to draw from the Accessory battery as an energy source without impacting the phone. The RYZ Accessory can provide up to 20 hours of charge to the mobile phone itself.

A Flexible Light Field Display on Any Smartphone

The company uses a patented design for a nano-frequency condensed light field and a distinctive type of polymorphic lens, which reacts with the particular frequencies of light emitted from the projection system to create the holographic presentation using only the mobile device and the RYZ folding display accessory. This unique hardware allows IKIN to create a much denser optical field than other technologies. The holographic content displays in ambient light, with everyday lighting systems, and with everyday occurring in the background, for publicly and easily consumable content, i.e., no need to don dark lenses in a darkened room.

Further, the RYZ platform uses a secondary processing function to indicate and express a three-point touch on the hologram touchscreen as well as on the phone. Users can effectively manipulate the phone in the actual holograph space and interact with the holographic imagery with three-point touch for pinch, zoom, scrolling as well as swipe. In the AR process, the IKIN technology takes the density readouts of the shape of objects in the AR display, and the holographic field interacts with the environment so that manipulating physical objects change the course and interact with the holographic objects in view.

Catalyzing an Ecosystem and Robust Developer Community

IKIN's flexible technology and open platform cater to the market of application developers, large and small, with a new universe of opportunities to create use cases across a variety of verticals. Fostering the developer community, IKIN prioritizes ease of use on the RYZ system. Encouraging the market to drive applications in any vertical and partnering with the broad developer community, IKIN makes its software development kit (SDK) and open APIs uniquely easy to generate and deploy content.

The ease of publishing content for the RYZ platform is a key enabler for IKIN and developers, who need not learn a new programming language or environment. The hAPI SDK makes it easy to convert content to volumetric holograms, with drag and drop development tools in the Unity app development platform. Developers can simply download the SDK and drag files to the icon—propelling the IKIN AI to immediately thread

the imagery and create the readout needed for two human retinas to perceive the object in volume. With the hAPI functioning on a smartphone (accepting video signal and touch input) equips any approved application to use the RYZ software systems in the environment to convert signal data and translate volumetric dimensions to interactions with the holographic image.

Conclusion

While 5G has the potential to change how we think about connectivity radically and trigger an array of growth opportunities across industries, the lack of tangible use cases to drive adoption hinder industry progress. When the last generation of wireless technology—4G LTE—debuted in 2009, no one could predict the changes that would follow. The most exciting and disruptive use cases due to 4G LTE were not envisioned—at least not in their entirety—before the widespread availability of 4G. Frost & Sullivan believes, similarly, the true impact and advancements from 5G will not be clear until after the fact.

IKIN leverages a collection of unique and proprietary technologies (27 patents filed) to deliver a truly innovative volumetric hologram on smartphone devices. With artificial intelligence engines designed to throttle the data consumption based on network capacity, IKIN's RYZ platform serves up a compelling volumetric hologram display. IKIN's RYZ system presents the necessary perception of volume for a hologram in the x, y, and z axes based on optimal millisecond bandwidth data, and what two human retinas can perceive. The company's hardware accessory operates in everyday light, and without the need for a headset, it simply magnetically attaches onto the user's smartphone. Built for an open and expansive ecosystem, IKIN makes developing for RYZ easy—to create future market growth and demonstrate a real, at-present use case that will only improve with 5G coverage.

With its pioneering approach and novel technology, IKIN earns Frost & Sullivan's 2020 Global Technology Innovation Leadership Award for holographic mobility solutions.

Significance of Technology Innovation Leadership

Technology-rich companies with strong commercialization strategies benefit from the increased demand for high-quality, technologically-innovative products. Those products help shape the brand, leading to a strong, differentiated market position.

Understanding Technology Innovation Leadership

Technology Innovation Leadership recognizes companies that lead the development and successful introduction of high-tech solutions to customers' most pressing needs, altering the industry or business landscape in the process. These companies shape the future of technology and its uses. Ultimately, success is measured by the degree to which a technology is leveraged and the impact that technology has on growing the business.

Key Benchmarking Criteria

For the Technology Innovation Leadership Award, Frost & Sullivan analysts independently evaluated two key factors—Technology Leverage and Business Impact—according to the criteria identified below.

Technology Attributes

Criterion 1: Industry Impact
Requirement: Technology enables the pursuit of groundbreaking ideas, contributing to the betterment of the entire industry.

Criterion 2: Product Impact
Requirement: Specific technology helps enhance features and functionalities of the entire product line for the company.

Criterion 3: Scalability
Requirement: Technology is scalable, enabling new generations of products over time, with increasing levels of quality and functionality.

Criterion 4: Visionary Innovation
Requirement: Specific new technology represents true innovation based on a deep understanding of future needs and applications.

Criterion 5: Application Diversity
Requirement: New technology serves multiple products, multiple applications, and multiple user environments.

Future Business Value

Criterion 1: Financial Performance
Requirement: Potential is high for strong financial performance in terms of revenues, operating margins, and other relevant financial metrics.

Criterion 2: Customer Acquisition
Requirement: Specific technology enables acquisition of new customers, even as it enhances value to current customers.

Criterion 3: Technology Licensing
Requirement: New technology displays great potential to be licensed across many sectors and applications, thereby driving incremental revenue streams.

Criterion 4: Brand Loyalty
Requirement: New technology enhances the company's brand, creating and/or nurturing brand loyalty.

Criterion 5: Human Capital
Requirement: Customer impact is enhanced through the leverage of specific technology, translating into positive impact on employee morale and retention.

Best Practices Recognition: 10 Steps to Researching, Identifying, and Recognizing Best Practices

Frost & Sullivan Awards follow a 10-step process to evaluate Award candidates and assess their fit with select best practice criteria. The reputation and integrity of the Awards are based on close adherence to this process.

	STEP	OBJECTIVE	KEY ACTIVITIES	OUTPUT
1	**Monitor, target, and screen**	Identify Award recipient candidates from around the globe	• Conduct in-depth industry research • Identify emerging sectors • Scan multiple geographies	Pipeline of candidates who potentially meet all best-practice criteria
2	**Perform 360-degree research**	Perform comprehensive, 360-degree research on all candidates in the pipeline	• Interview thought leaders and industry practitioners • Assess candidates' fit with best-practice criteria • Rank all candidates	Matrix positioning of all candidates' performance relative to one another
3	**Invite thought leadership in best practices**	Perform in-depth examination of all candidates	• Confirm best-practice criteria • Examine eligibility of all candidates • Identify any information gaps	Detailed profiles of all ranked candidates
4	**Initiate research director review**	Conduct an unbiased evaluation of all candidate profiles	• Brainstorm ranking options • Invite multiple perspectives on candidates' performance • Update candidate profiles	Final prioritization of all eligible candidates and companion best-practice positioning paper
5	**Assemble panel of industry experts**	Present findings to an expert panel of industry thought leaders	• Share findings • Strengthen cases for candidate eligibility • Prioritize candidates	Refined list of prioritized Award candidates
6	**Conduct global industry review**	Build consensus on Award candidates' eligibility	• Hold global team meeting to review all candidates • Pressure-test fit with criteria • Confirm inclusion of all eligible candidates	Final list of eligible Award candidates, representing success stories worldwide
7	**Perform quality check**	Develop official Award consideration materials	• Perform final performance benchmarking activities • Write nominations • Perform quality review	High-quality, accurate, and creative presentation of nominees' successes
8	**Reconnect with panel of industry experts**	Finalize the selection of the best-practice Award recipient	• Review analysis with panel • Build consensus • Select recipient	Decision on which company performs best against all best-practice criteria
9	**Communicate recognition**	Inform Award recipient of Award recognition	• Announce Award to the CEO • Inspire the organization for continued success • Celebrate the recipient's performance	Announcement of Award and plan for how recipient can use the Award to enhance the brand
10	**Take strategic action**	Upon licensing, company is able to share Award news with stakeholders and customers	• Coordinate media outreach • Design a marketing plan • Assess Award's role in future strategic planning	Widespread awareness of recipient's Award status among investors, media personnel, and employees

The Intersection between 360-Degree Research and Best Practices Awards

Research Methodology

Frost & Sullivan's 360-degree research methodology represents the analytical rigor of our research process. It offers a 360-degree-view of industry challenges, trends, and issues by integrating all 7 of Frost & Sullivan's research methodologies. Too often companies make important growth decisions based on a narrow understanding of their environment, leading to errors of both omission and commission. Successful growth strategies are founded on a thorough understanding of market, technical, economic, financial, customer, best practices, and demographic analyses. The integration of these research disciplines into the 360-degree research methodology provides an evaluation platform for benchmarking industry players and for identifying those performing at best-in-class levels.

360-DEGREE RESEARCH: SEEING ORDER IN THE CHAOS

About Frost & Sullivan

Frost & Sullivan, the Growth Partnership Company, enables clients to accelerate growth and achieve best-in-class positions in growth, innovation and leadership. The company's Growth Partnership Service provides the CEO and the CEO's Growth Team with disciplined research and best practice models to drive the generation, evaluation and implementation of powerful growth strategies. Frost & Sullivan leverages more than 50 years of experience in partnering with Global 1000 companies, emerging businesses, and the investment community from 45 offices on six continents. To join our Growth Partnership, please visit http://www.frost.com.