

Virtual Reality:

Measuring User Experiences, Providing a Justification for Investment

a white paper by

isobar

The value of immersive experiences is widely recognized, but brands hesitate to invest without a way to measure effectiveness and justify the cost. Isobar, in collaboration with the MIT Media Lab, has developed a way to capture and analyze behavioral and biometric data, and understand emotional states created by virtual, augmented, and mixed reality experiences. Suddenly, brands have precise, sensitive methods that measure success. Companies working with us can know consumers better than they know themselves, in the moment, like never before.

Virtual, augmented, and mixed/merged reality have already begun to transform our world.

New standards are being set in gaming and entertainment. Education is creating more effective ways to teach. Retailers are using virtual, augmented, and mixed/merged reality to experiment with new store layouts. They're also using consumer-facing applications to let people try clothing, makeup, and new paint colors on their walls.

New digital experiences are making life more interesting, but also creating confusion and apprehension for brands. They're struggling to justify the cost and complexity without a way to measure effectiveness — and account for the changes that will impact the market in the next few years.

Virtual reality has traction. But like all new media formats, it has a chicken-and-egg problem.

In 2016, sales of VR headsets fell shy of original forecasts. The total number of units (not including their smartphone cousins) are estimated at 1.2 million — much less than the 2 million predicted. However, by 2021, CCS Insight expects sales of dedicated VR headsets to grow to 22 million units, an 800 percent increase over 2017¹. Ultimately, Internet users are waiting to buy headsets because they're expensive, and VR content is scarce and of low quality².

This same thing happened with HDTVs, as consumers waited years for adequate HD content, and it's back again with 4K TV. There isn't much broadcast, cable, or satellite TV in 4K yet, but Amazon and Netflix are steadily adding 4K movies and original content to their streaming services.

Most estimates put VR's mass-market tipping point six-to-eight years away. Worldwide revenues for the augmented reality and virtual reality market are likely to reach \$13.9 billion in 2017, an increase of 130.5% over the \$6.1 billion spent in 2016³. And VR, as we know it today, could be displaced by innovations like Osterhout Design Group's R-9 glasses, the secretive Magic Leap, META, Microsoft, and others working on merged/mixed reality headsets.

A lot of brands are simply waiting. They have serious business considerations outside of just brand recognition, from the size of the addressable market to the effectiveness of the experiences in leading to revenue.

It's a new interaction channel and an immature market with underwhelming content.

Right now, VR is in Gartner's Hype Cycle "Trough of Disillusionment"⁴. After a period of innovation, early publicity, and inflated expectations, interest drops off for a time.

Some argue that VR only makes sense for gaming, education, and experiential products and services like cars and travel. But filmmakers and other storytellers are trying to figure out what VR might mean to them: can you combine the controlled-narrative, forward-motion of film with the immersive, self-directed exploration of VR?

There is also a new laboratory for immersive entertainment from Lucasfilm, Industrial Light & Magic, and Skywalker Sound called ILMxLAB. It made a series of shorts for Google Cardboard released before *Star Wars: The Force Awakens*, and recently worked with Google Daydream to recreate a scene from *Rogue One* that can run on a phone, and is as detailed and immersive as the original.

Facebook created Story Studio to make VR short films and animations, and push the market beyond gamers shortly after it acquired headset Oculus Rift for \$2 billion. The company's hires came from entertainment giants like Pixar. In May 2017, Facebook closed Story Studio and said it would "support more external production."

The key for content creators: put ideas through the kind of careful, expert vetting that will help one-time users want to come back for more.

How to start thinking through your brand's first steps in creating VR content.

VR is not just for big budgets. Because the market is still in its infancy, content production seems very expensive — but the fact is, it's elastic. Think about app production, where budgets can go from five figures to six, depending on the answers to fairly standard questions. Similarly, VR production can range widely. How ambitious is the experience? How many days will it take to build assets? What is the delivery platform?

As Hollywood has learned, estimating the cost of digital effects and computer animation

is complicated and quite often inaccurate. Capturing and creating high performance, good looking, and scalable VR content is its own challenge. The race is on by software vendors and hardware manufacturers to improve the ways we capture physical spaces, objects, and motion while also reducing the technical proficiency required to do so.

Until then, which is years out, experts like the teams at Isobar and our collaborators in the MIT Media Lab Fluid Interfaces Group are reducing risk and pioneering new ways of working and shaping the content-creation pipeline.

In addition to content creation, virtual experiences require that we design and develop gameplay and game mechanics along with all of the intricacies of building out secure, scalable software platforms that work as expected, time after time.

What constitutes great VR content?

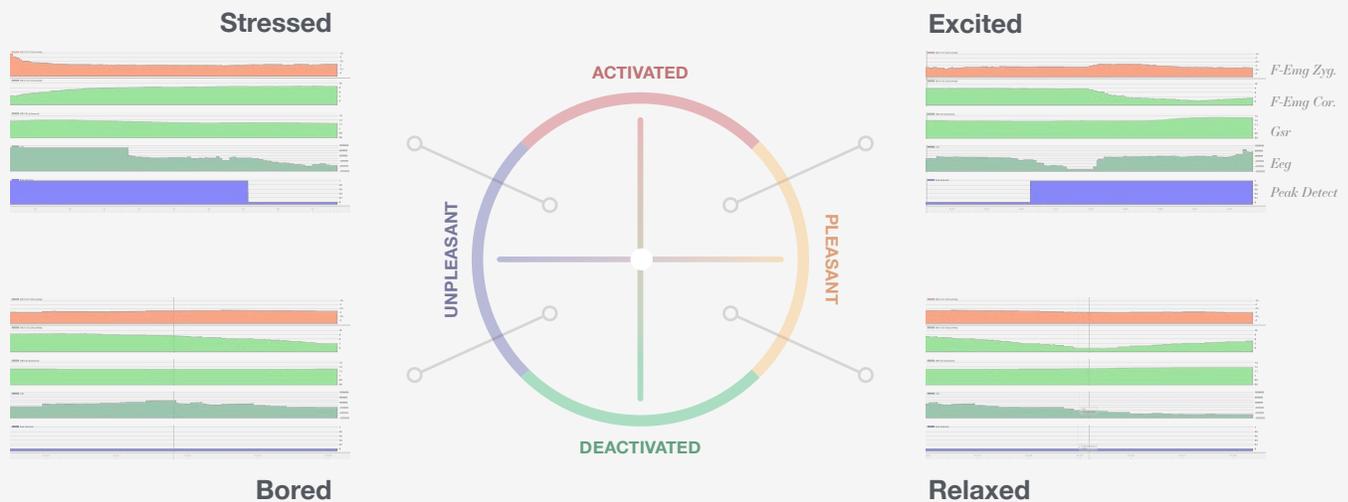
Great VR content starts with at least two of the following five characteristics:

- **Engaging:** The content delivers, high quality, immersive, engaging experiences.
- **Connective:** It affects the user on an emotional level and provides new experiences.
- **Episodic:** With incremental access to content over time, it captures the user's imagination.
- **Interactive:** The user is the protagonist, shaping their own experience.
- **Non-linear:** Rich content provides the user with a unique personal experience.

Content creators then have to choose a storytelling method. It can be contextual, putting the user in an environment; empathetic, allowing the user to see through the eyes of another; or imaginative, allowing the user to interact with objects, even make new objects.

The immersion scale is another choice. A VR experience can be passive, taking the user on a linear journey with 360° views. It can be moderately immersive with sleek mobile integration, and the consumer in control of some aspects of the experience. Or it can be fully immersive with live-rendered interactive environments and total user control.

Depending on business goals, brands can create low-complexity VR available to everyone, or move up the scale to high-complexity, big-impact experiences targeted at a few.



The time to talk about performance measurement is now, because existing protocols fail.

Healthcare is a big early adopter of VR, using it to train surgeons for difficult new procedures and make rehabilitation more effective. NASA trains astronauts for a walk on Mars someday. The military VR-trains soldiers before certain deployments. In these narrow uses, it's fairly easy to understand how well VR "works."

Effectiveness for brands is another matter.

User experience testing is not helpful. Users talking step-by-step about what they're doing is inherently rational, not emotional, and it would interrupt the VR experience. The whole point of VR is that it transports the user to a different reality. When people talk to the user about it, it breaks the experience.

Traditional copy-testing approaches also fail. While the cost of producing VR experiences is elastic, it is too expensive to create test versions for A/B splits. This kind of testing also measures overly rational variables like stopping power, recall, how well the message was communicated, and purchase intent. Most important, this testing can't identify key moments that cause delight or frustration. VR needs a second-by-second readout.

Even standard biometrics fail. Facial coding — Affdex, Emotient, RealEyes — doesn't work because the webcam can't see most of the user's face under the VR headset. Google's mixed

reality Daydream is a simulation of a face, not the real face. Designating areas of interest for eye tracking is difficult in an open-ended, dynamic 3D environment which users explore at their own pace and direction. And inputs like body language and posture are critical to understanding what a user is thinking and feeling.

Pattie Maes, head of the MIT Media Lab's Fluid Interfaces Group said, "The pace at which AR and VR technologies are evolving has picked up and, outside of academia, companies are now looking to adopt them. As that begins to happen, ways to quantify the impact of the experiences enabled by these new platforms are needed. Our collaborative work with Isobar has accomplished this and we look forward to continuing this research."

For VR to power anything, including commerce, we must measure in-the-moment emotions.

Emotions provide the energy behind virtually every behavior people engage in, every day of our lives. And emotions are tricky to measure.

Researchers have always asked consumers to self-report feelings. While consumers can reliably report what they do, they are notoriously unreliable about why they do it and how they feel. When asked about purchase decisions, they always claim to be guided by a rational analysis of their choices. But the fact is, emotions drive most purchases.

Consumers are drowning in choices today, and nearly everyone competes with Amazon. It's no small thing to understand a consumer's moment-to-moment behavior and emotional reactions, to know when to step in and close a sale, or to offer the test drive, the financial advisor meeting, or the vacation booking.

Measuring VR requires creating something entirely new. So we did.

The questions about emotional engagement have been hard to answer, especially as it pertains to virtual, augmented, or mixed/merged reality. What's the emotional arc across the experience? What's the duration and cadence of that engagement? The emotional peak and the emotional finale? Does it continue to motivate further exploration or quitting? Are there points of frustration or confusion in the experience?

Isobar has been at the forefront of VR, working across industries to help define strategic roadmaps for the next wave of training, education, productivity, and consumer-facing digital experiences. We're pushing the limits of non-linear storytelling with collaborators in the music and entertainment industries. Working with Firstborn, an experiential and VR/AR specialist that recently joined the Isobar network, we continue to build VR experiences that build on the success of projects already completed for Mountain Dew, Chevron, Wyndham Worldwide, General Motors, and Patron Tequila.

“Isobar is pushing the boundaries of customer experience and digital content by doing some really amazing things on the Unity platform. Their ability to replicate ‘real life’ environments with exceptional photorealism is setting a new bar for virtual reality experiences and opening up a new space for brands to create immersive room-scale digital experiences. Consumers love it, and it is smart work like this that shows how the Unity platform can be used to create new and exciting business opportunities.”

Danny Lange

VP of AI & Machine Learning at Unity Technologies

Our Isobar Marketing Intelligence practice is also key to creating the world's first VR measurement and analytics tool. Our proprietary MindSight® accesses the emotional brain — the brass ring researchers want and never get. MindSight® is academically accepted and grounded in applied neuroscience. It defeats the powerful “editor” all consumers have when asked questions about their feelings, and uncovers the forces that motivate behaviors.

Isobar also brought in a biometric research platform from iMotions 6.3: the world's first objective, non-intrusive, reliable software to measure human emotional response to visual stimuli. The software uses eye tracking, electroencephalography (EEG), galvanic skin response (GSR), electrocardiography (ECG), and facial electromyography (EMG).

Finally, we added to the team MIT Media Lab product designers, data-visualization experts, industry researchers, and pioneers of computer interfaces. Isobar is the only North American agency member of MIT Media Lab. We work side-by-side with them to invent — and reinvent — how humans experience, and can be aided by, technology.

“Isobar has been interested in our work on room-scale VR since June 2016. When we started to exchange ideas, they saw potential applications for our research into understanding immersive learning experiences. There were three key ideas: (1) multiple users in a same-time, same-place setting sharing a virtual and physical space, (2) using recordings to gain qualitative insights into the user experience, and (3) actually having the analyst view these recordings in VR. The power of physiological sensing is something that we both caught onto at the same time, and it's incredibly gratifying to see how our research can make an impact in the world, growing into something greater when applied in ways we never intended, and combined with others' innovative ideas.”

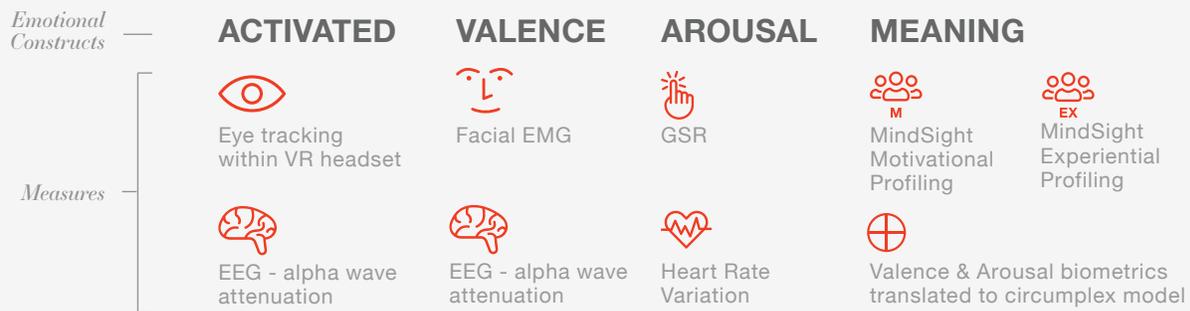
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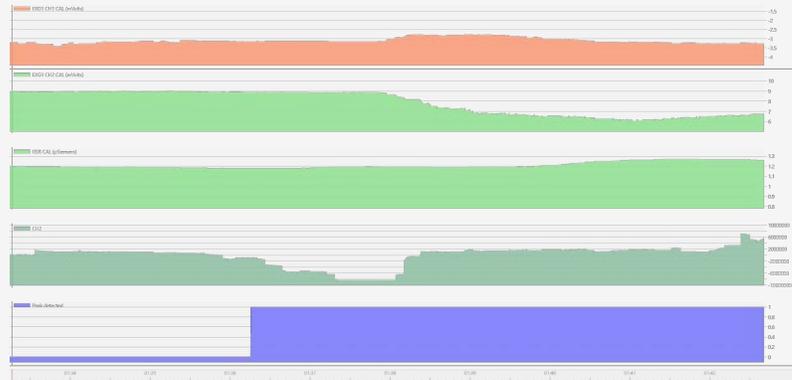
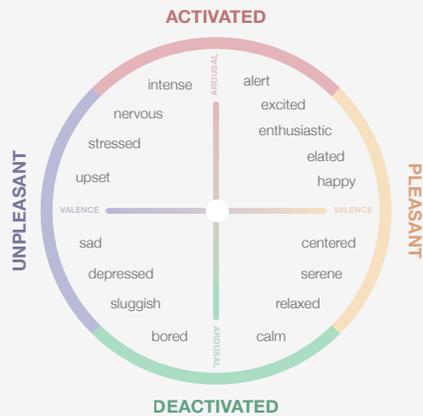
Fluid Interfaces Group / MIT Media Lab

We brought this collaboration together in Isobar NowLab, our own proving ground for new concepts and technologies where we gain a deep understanding of their capabilities and can then recommend commercial applications with reduced risk.

Now with VR, brands can observe and understand consumers like never before.

Users engaged with VR show changes in the electrical resistance of their skin, a physiochemical response to emotions. On their faces, muscle fibers contract and generate tiny electrical impulses. Heatmaps follow what they do and where they go.





Elation Pattern
(From Top To Bottom Respectively):

1. Increasing Zygomatic Contractions (Increased Smiling)
2. Decreasing Corrugator Contractions (Decreased Frowning)
3. Increasing Electrodermal Activity (Increased Arousal)
4. Increasing Left-Hemisphere Skewed Frontal Alpha Asymmetry (Associated With Approach Motivation)
5. GSR Peak Detected (Increased Arousal)

Stress Pattern
(From Top To Bottom Respectively):

1. Decreasing Zygomatic Contractions (Decreased Smiling)
2. Increasing Corrugator Contractions (Increased Frowning)
3. High Flat Electrodermal Activity (Arousal)
4. Increasing Right-Hemisphere Skewed Frontal Alpha Asymmetry (Associated With Avoidance Motivation)
5. GSR Peak Detected (Increased Arousal)

Isobar’s testing and analysis protocol integrates VR hardware and software with an emotion-sensing biometric research platform. It permits passive measurement of immersive experiences so the natural flow isn’t interrupted, and provides moment-to-moment sensing that lets developers pinpoint elements that enhance or detract from the experience.

“Biometrics provide an unbiased mechanism for determining exactly what draws and maintains a user’s attention. This is an essential question in any form of content, but doubly so in VR. Today’s VR content creators are faced with a formidable challenge, but have the opportunity to be pioneers in the space. The arena is largely empty, and the first creators to put forward a high-quality, high-value experience will gain a substantial advantage over all subsequent players. Biometrics will provide an invaluable tool to design and optimize all content going forward.”

Peter Hartzbech
Founder & CEO, iMotions

Brands that invest in VR now can have precise and sensitive methods that measure stumbling blocks and success without depending on self-reporting, language, cognitive effort, memory, even users' willingness to give an honest answer. With behavioral analytics and biometrics, brands can infer things about consumers.

Insights are gained from real-time data visualizations and co-presence capabilities that provide unprecedented understanding.

Before each session, we capture metadata on users like demographic info, VR experience level, preferences, and answers to survey questions. We then run the users through the VR application, following the location of controllers and the headset, and performing eye tracking and facial EMG sensing (since facial coding isn't feasible under VR goggles). We can attach EEG, ECG, and GSR sensors. The platform is open, and we'll work with new sensors, cameras, and other means of measuring physiological responses, including ones we may invent.

In the initial platform release, the analysis and insight services are robust, but still require human intervention.

We've created three different ways to interact with and gain insights from the data we are capturing.

1. During testing, we get real-time visual feedback on user emotions using an Isobar-designed data visualization dashboard as well as an array of colored LED lights that represent different assignable data points. This allows our design team, analysts, and clients to understand how a user is feeling during the actual VR testing session.
2. After we've collected a more significant set of data across a group of users, we can review and notate stored-session data, looking for specific areas of interest, including where we think users might be experiencing some level of friction in the experience or to validate key calls-to-action or interactive elements and how users respond to them. This also happens within the dashboard application.

3. And finally, as a way for our team to really dive deeply into the stored session data, we have developed an interface to the captured session data that runs within the Unity game engine and is experienced in VR. This experience allows an Isobar analyst, UX and visual design team members, clients, or other stakeholders to put VR headsets on and “go into” the same VR application that was employed by the user group to view their sessions and associated biometric and behavioral data, along with the emotional state as we’ve determined it. We can view each session along a linear timeline or as it relates to specific interactions inside the VR experience.

This last option is extremely rich and immerses our team members inside the experience. Analysts meanwhile can interact with a visual navigation system and have a means to filter user sessions and other controls that allow for the playback of individual sessions inside the virtual environment.

Analysts and other participants can then watch a user’s avatar interact with content and follow them through their experience. One goal of our initial testing was to determine how to improve our own design process through a better understanding of how people interact with objects, and if elements of storyline or game-play were intuitive and frictionless. The influence this had on the design of our data capture and analysis platform was definitive, allowing us to set markers on places or objects inside the experience. Furthermore, we are able to jump forward from scene to scene as we seek out how users are interacting with these designated “things” inside the application.

The next step: machine intelligence and our dataset can create personal VR experiences.

Our reputation as experts in data-driven insights, strategy, and design comes from a cross-disciplinary, hybrid, collaborative approach that transforms business problems into digital products and services, campaigns, and next-generation experiences. Having the ability to know emotional responses and reactions to VR content, we then asked how machine learning could be used to further enhance the work.

With the advent of machine learning and related hardware, as well as the adoption of AI tools by companies such as Unity, we can now fully leverage all of our captured behavioral and biometric

data. With the addition of user demographic and survey information, this data is fed into algorithms. Apps become smarter and more aware of the intricacies of user preference and impressionability based on a wide range of factors.

Just a few years ago, many of the things that we've been able to do seemed purely conceptual and far out in the future. With the advancements in GPU/CPU hardware, AI frameworks, and biometric sensing, we are now able to capture and analyze both behavioral and biometric data. This leads to new ways of understanding users and designing experiences that appeal to them on a neurological level.

The last several years have seen various technologies advance and intersect. The cost reduction in sensors (EEG, ECG, GSR, etc.) and the increase in computing (CPU/GPU) power along with AI, allow us to design and build the next wave of digital experiences: ones that are smarter, more engaging, and appealing to users in once-impossible ways.

“The form factor of VR/AR/MR hardware is changing rapidly, as are the physiological sensors that can capture insights into users' subjective experiences. We're excited to see in application the work we've done with Isobar on their modular development approach. We think the impact of this collaborative work will also increase as sensors are increasingly integrated into end-user products, eliminating the need for special-purpose equipment to gather data.”

Scott W. Greenwald

Fluid Interfaces Group / MIT Media Lab

The road ahead: technology will continue to drive the art of the possible.

The work we've done with the MIT Media Lab Fluid Interfaces group began as a way to understand how users behave in virtual environments by applying our own processes, protocols, and intellectual property. Now we're delivering a better understanding of how digital experiences impact user emotions. This thinking can be applied to internal-facing applications for training, education, and productivity as well as outward-facing applications for consumers interacting with a brand's content, products, or services.

Isobar is well-positioned to help clients stay ahead of the challenges they face and take advantage of emerging trends and technologies. We've been named a leader in Gartner's 2014,

2015, and 2016 “Magic Quadrant for Global Digital Marketing Agencies.” Forrester listed Isobar as a Top 10 Innovation Agency and scored us with the highest ranking across all vendors for our current offering in “The Forrester Wave™: Digital Experience Service Providers, Q4 2015” report.

As new types of displays enter the marketplace, machines become smarter and their interfaces become more natural, new experiences will reshape the world in which we live — from commerce, to education, to the arts, to science. As this transformation accelerates, count on Isobar to figure out fast and first what makes sense for businesses and consumers.

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