Trend Analysis Report:

Mixed Reality

IMT 500 : Team 10

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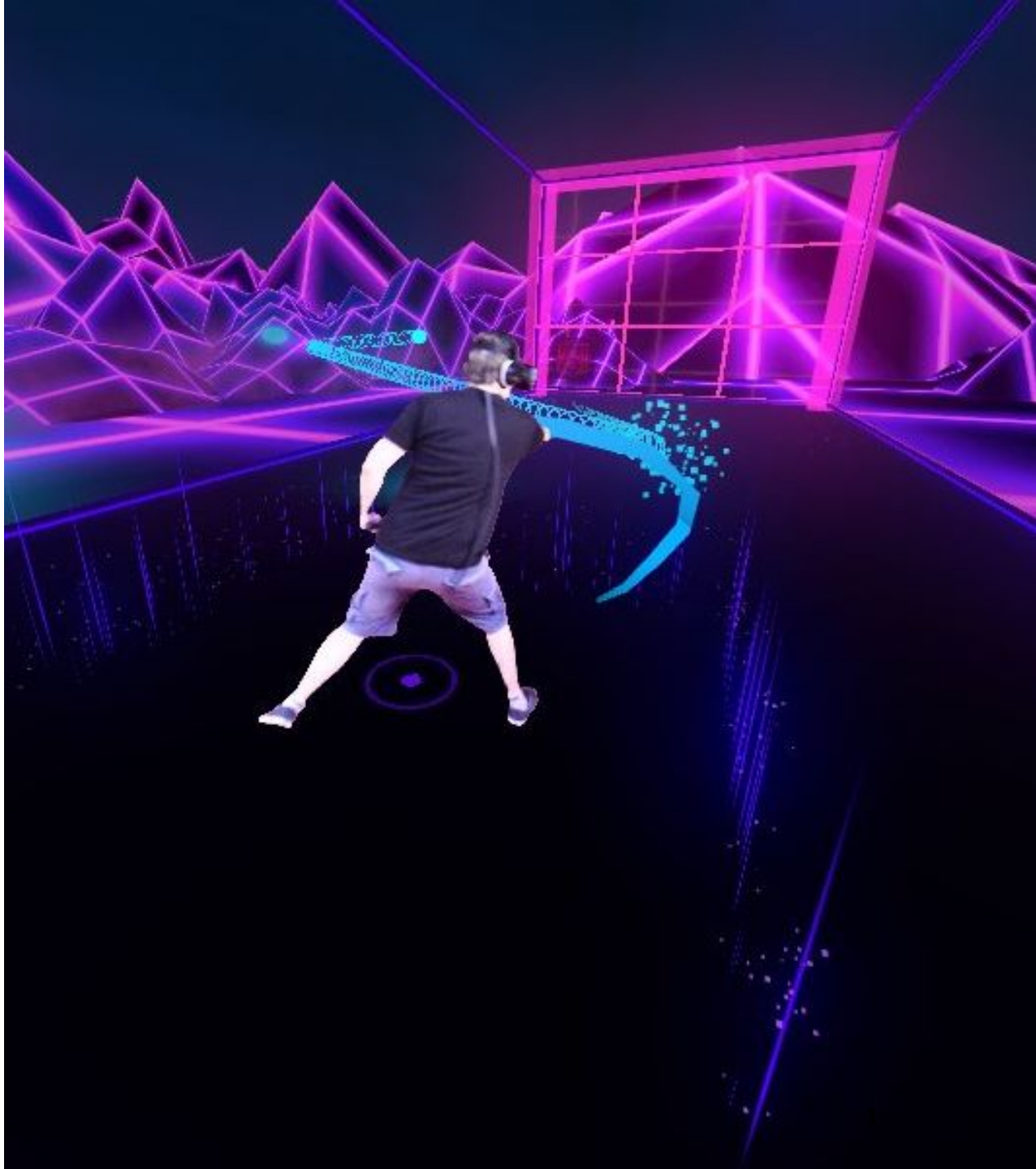


Agenda

Executive Summary

- What is Mixed Reality, and why is it important to me ?
- The concept of mixed reality, and its differences and unique selling points is something that is still unclear to a lot of people, given the similarities Mixed Reality has with both Augmented Reality and Virtual Reality technologies.
- This report aims to outline and simplify what Mixed Reality technology is about, and the way its impact can transform virtually every industry. Mixed reality has large implications not just in the way it will impact the digital world as we know it, but also in the deeper applications of how the technology can be used.
- Mixed reality is where the digital world is blended with the physical world, through immervice technological experiences. Currently, the most common mixed reality products are mostly in the form of head-mounted displays, however, there is also research and innovations being made in this space, like developing completely immersive experiences with mixed reality incorporated, and incorporating mixed reality into real-time operations including manufacturing, surgery, aviation, etc.
- In this report, we talk about a brief overview of mixed reality and the reason why we chose this fascinating topic. We also talk about the current relevance of mixed reality to information management, and the MSIM specializations taught at the University of Washington. We also address the impact of this trend on the future of information management, relevant trends that are present, and round it off with some bold predictions we have for mixed reality in the near future.

In conclusion, Mixed Reality combines the best of both virtual and augmented reality, because of its ability to mix the best of both worlds. This trend is still only maturing, but the current market predictions forecast a growth rate of 71.6% for the mixed reality industry from 2018, to reach $5,362.1 million (USD) by the year 2024. This indicates that the best days of mixed reality is yet to come.

Division of tasks

Responsibilities of each team member :

Step 2

The research and the material were then discussed and combined to produce the schematic report and presentation, Each team member participated fully in all aspects of planning, designing and preparing the presentation and the schematic report.

Group 2 - Bhagyashri & Ajinkya

Researched about the impact on the future of information management, prediction of the trend's future and more relevant information about the trend.

Group 1 - Remya & Yue

Researched about general aspects of the trend, summary and implications, relevance to information management, MSIM and the specializations.

Step 1

For ease of development of the report and presentation, the team was divided into groups of 2, and the research work was distributed equally amongst all the team members.

What is Mixed Reality ?

In 1994, Paul Milgram and Fumio Kishino selected the term **mixed reality** and defined it as "...anywhere between the extrema of the *virtuality continuum*.", where the Virtuality Continuum extends from the completely real through to the completely virtual environment with augmented reality and augmented virtuality ranging in between :

Virtuality Continuum(VC)

In this context, the term 'Mixed reality' is used to refer to the spectrum (or continuum) of all possible variations and compositions of real and virtual objects.

However, the more commonly understood definition is that of mixed reality as an independent concept. Here, Mixed Reality is the hybrid reality that merges reality with virtual reality through immersive technology, incorporating both augmented reality and augmented virtuality. That is, it takes place in both the physical world and virtual world, where physical and digital objects co-exist and interact in real time.
Or, as Microsoft defines it, mixed reality is the result of blending the physical world with the digital world.

The first version of mixed reality, which was an immersive system, providing enveloping sight, sound, and touch was the Virtual Fixtures platform developed at the U.S. Air Force's Armstrong Laboratories in the early 1990s.

Mixed Reality Summary

Mixed Reality is currently a topic with a lot of hype attached to it, due to its potential in a huge variety of areas like:

Education - Mixed reality can be used to provide Simulation based learning, Special Needs education, immersive classroom training, etc

Healthcare - Mixed reality can be used in pre-operation planning, surgical preparation, diagnosis, etc

Post-traumatic medical care

Military training, etc.

There have been huge advances made by companies in the field of Mixed Reality, specially by Microsoft, who is a market leader with its HoloLens Mixed Reality headset. According to Microsoft's research, the highest value workflows in Mixed Reality, particularly with their Hololens, are around remote assistance, space planning, training and development, product development collaboration, and access to spatial data from IoT devices.

Other big companies like Google, Amazon, Samsung, etc are also jumping on the Mixed Reality bandwagon, and heavily investing in Mixed Reality research and applications. Currently, the most common mixed reality products are mostly in the form of head-mounted displays, however, there are also many innovations being made in this space, including using Mixed Reality technologies for purposes like neurorehabilitation, for patients suffering from a neurological accident (as is being done by the firm Mindmotion).

Reason for choosing MR

Mixed reality is also currently highly impacting and influencing the field of information management, and will continue to do so in the future. Mixed Reality is the next frontier in Human-Computer Interaction and Human-Centred Design, offering a complete and immersive experience with roots in the real world. For instance, development is currently ongoing for a virtual assistant that appears in the avatar of an actual person. This is the next logical step, Given the potential of Mixed Reality and its potential ubiquitousness in daily life in the near future, it isn't hard to imagine that virtual assistants we all heavily rely on now (eg Amazon's Alexa, Apple's Siri, etc.) can be personified by an avatar, and brought to life via MIxed Reality technology. There is a goldmine of potential here specific to information management (both in information needed to produce MR, and information produced due to MR), and there is a huge possibility for cyber risk in this technology as well. As future information management professionals, this technology is of particular interest to us.

However, one of the first precursors to a Mixed Reality product, which was Google Lens, didn't find success. However, there were factors like the following:

1. Highly promising but overhyped Mixed Reality companies that do not yet produce profits,
2. Mixed Reality products that do not live up to its hype (Magic Leap, as an example)
3. Lack of commercially viable and affordable products which are accessible to a population from diverse economic backgrounds,

Due to these factors, the adoption of Mixed Reality headsets has been slower than expected. There is also general consensus that commercial Mixed Reality offerings, as it currently exists, promises a compelling future but does not yet meet the hype. Due to this, Mixed Reality is nearing the end of the Peak of Inflated Expectations on the Gartner Hype Cycle 2018, and is sliding into the Trough of Disillusionment. However, major players are still interested in, researching and investing in Mixed Reality, due to which the Slope of Enlightenment and the Plateau of Productivity is still ahead of this trend. There is also significant media coverage around the potential of MR, which continues to buoy its image.

Current Relevance

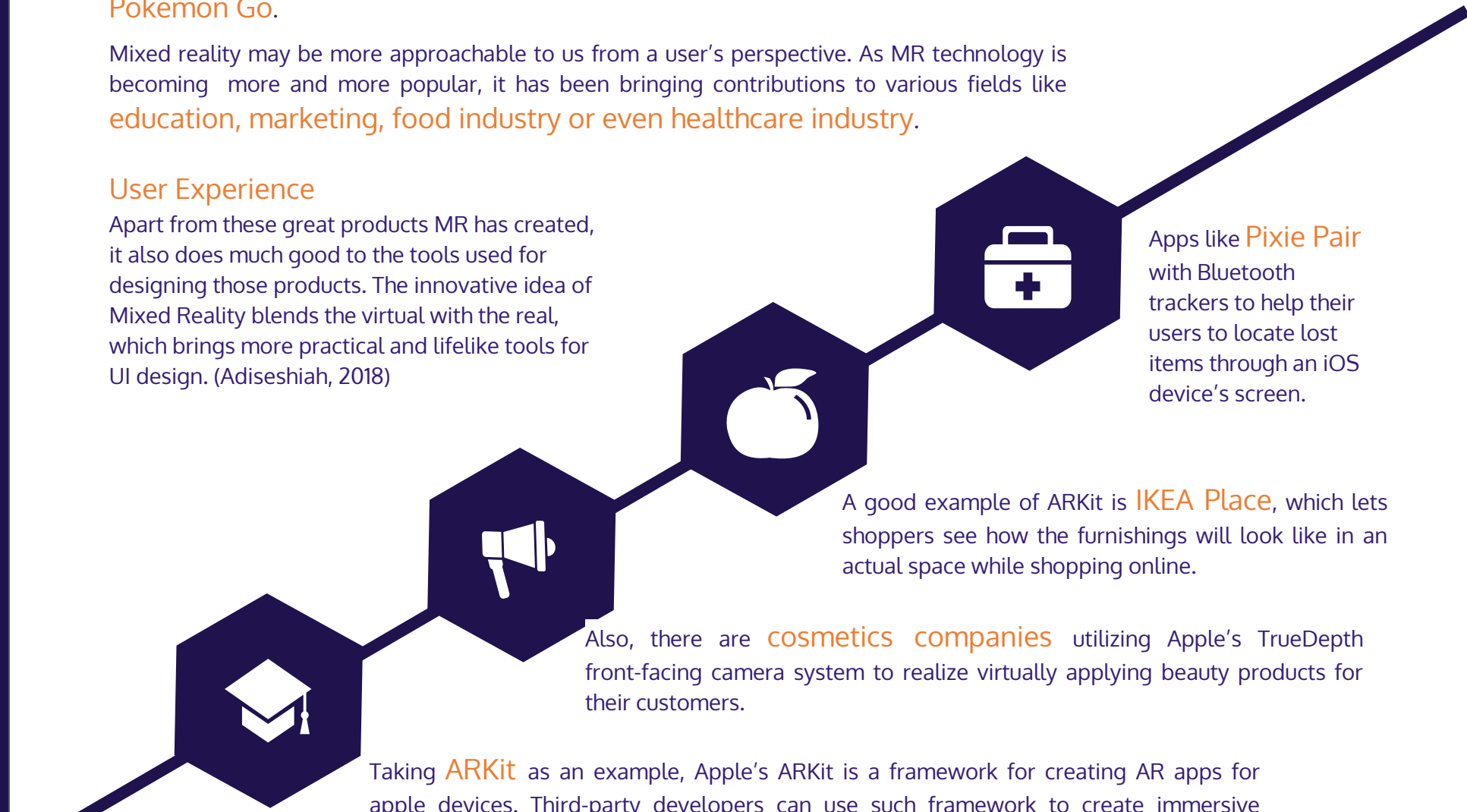
Relevance to MSIM and specializations

When Mixed Reality was first introduced to the market, early MR products and experiences were usually mobile and electronic products such as Google Glass, Snapchat or Pokémon Go.

Mixed reality may be more approachable to us from a user's perspective. As MR technology is becoming more and more popular, it has been bringing contributions to various fields like education, marketing, food industry or even healthcare industry.

User Experience

Apart from these great products MR has created, it also does much good to the tools used for designing those products. The innovative idea of Mixed Reality blends the virtual with the real, which brings more practical and lifelike tools for UI design. (Adiseshiah, 2018)



Apps like Pixie Pair with Bluetooth trackers to help their users to locate lost items through an iOS device's screen.

A good example of ARKit is IKEA Place, which lets shoppers see how the furnishings will look like in an actual space while shopping online.

Also, there are cosmetics companies utilizing Apple's TrueDepth front-facing camera system to realize virtually applying beauty products for their customers.

Taking ARKit as an example, Apple's ARKit is a framework for creating AR apps for apple devices. Third-party developers can use such framework to create immersive experiences for their end users to interact with virtual objects against the backdrop of their own environment.

Current Relevance

Relevance to MSIM and specializations

User Experience

Li & Fessenden (2016) point out that MR technology provides us with a type of noncommand user interfaces. In that way, users can interact with computing machines through contextual information collected by the computing system so that they don't have to give explicit commands. Comparing with command UIs, MR technology helps the User Experience in the following 2 ways:

1. Comparing with a non MR User Interface, both explicit actions to access the information and devices for interaction are saved, thus reducing the interaction cost when performing a task

2. Since the user doesn't have to learn the commands and the information is displayed automatically. No external memories are needed. User's cognitive load is reduced as well.

Current Relevance

Relevance to MSIM and specializations

Information Architecture & Information Security

Mixed reality is becoming more prevalent throughout the web. With people's acquaintance with augmented reality, information architects shall adapt this new technology to the field of information architecture as well. What's more, when adapting the mixed reality technology, the designer is also supposed to take user experience into his consideration. Specifically, MR technology can make it easier when navigating to relevant locational information. Anyone with a smartphone can discover content that is relevant to them, whether it is a local restaurant or a nearby shared.

Here an example where information architecture design using MR technology make great contributions to the field of education. Nearpod VR uses MR technology to give educators the opportunity to take their students on virtual field trips to different landmarks through its VR headsets. What's more, educators can also add quizzes, polls, and open-ended questions to gather real-time feedback from students. Nearpod VR let students virtually visit locations that they cannot visit physically with enhanced engagement and increased immersion.

However, there are potential security issues and this lead to its relevance to information security. Fineman, B., & Lewis, N. (2018) reveal that with this sharing static public information, students' virtual tour is potentially exposed to inappropriate content. The complexity of the overall system, along with the unclassified data, there are multiple servers and devices connected to the network and all of them need to be secured.

Current Relevance

Relevance to MSIM and specializations

Business Intelligence & Data Analysis

Mixed Reality also promotes much progress in the field of Business Intelligence and Data Analysis.Considering many modern computational technologies like Ai and NLP, VR is currently having a huge impact on these two fields. Problem that are complex to solve manually and may be much time consuming are completed quickly using augmented analytics. It cleanses and prepares the data automatically while providing efficient and advanced models and AI algorithms.

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Impact

Potential impact of Mixed Reality on the future of Information Management

Replacing smart phones

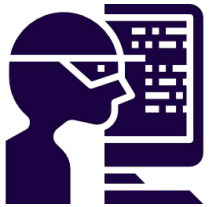
All brands / companies / startups will try to find other vectors to interact with consumers, real time 3D graphics will become the way we interact with the world.Applications are invisible and invisible things are forgettable, MR devices will eventually replace mobile phones and mobile apps And with Apple's ARKit available in all iOS devices, and Google's ARCore in Android devices, the transition from smartphone to full-fledged MR device has already begun.

Training education and learning

AR and VR can be used to onboard new employees and develop existing talent by immersing them in highly realistic, virtual work environments that feature both educational information and interactive problem-solving challenges. They also make it possible for supervisors to review video recordings of training sessions to monitor progress and tailor lessons to specific employee needs

Changing functional mockups and UX

Rapid prototyping or early trial and test methods, since designers are able to preview prototype designs at scale and reconstruct these previewed 3D models. This form of rapid prototyping will probably lead to an increase of quality in products, relatively lower R&D costs and improved efficiency.



Cyber Implications

VR, AR, and IoT introduce new and different intellectual property with sensitive information requiring controls for security and privacy, regulatory and compliance issues, and detailed tracking of property and equipment location and controls. Associated beacons, sensors, and connected footprints need appropriate protection, from encryption and rights.In MR environment, this can be challenging.

Bold Predictions

Immersive Workplace

Obsolete Offices: Virtual reality and augmented reality may soon accomplish what static and flat mediums for knowledge exchange failed to do: Replace real, one-to-one human interactions and the surrounding environment as well. MR can change how the business and its employees report and share information and take action. Employees can just teleport to meetings instead of physically travelling. In an extreme case, offices might be obsolete (Peyton, 2018). According to Jay Latta, Emerging Technology Strategist, the future of work will center on a private, virtual workspace that immerses the user in a 3D desktop customized to provide the ideal working environment.

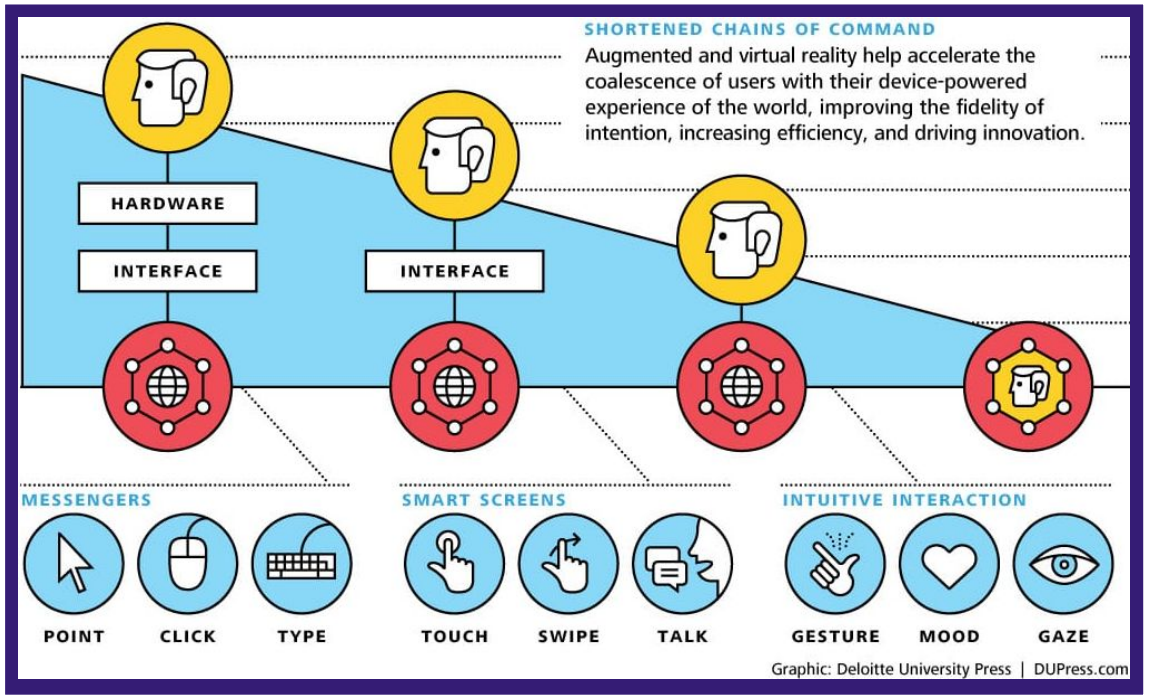
Smart Planet

Global Collaboration Network: According to Paul Sweeney, VP and GM for DAQRI International, “immersive technology will enable collaboration between vast distributed teams, across languages, time zones and geographies thereby connecting large populations to rich digital information, in the physical world.” The implications for this type of knowledge network are robust and could help solve global challenges related to geographically isolated populations and shortages of natural resources. Ultimately a global knowledge network powered by AI could “optimize” the planet to ensure resources are distributed to sustain the global population.

Bold Predictions

Human-Computer Integration

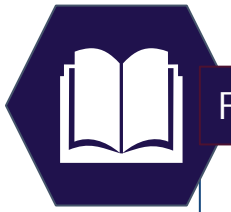
Our interactions with machines are moving towards integration. Deloitte (Kunkel et al. 2016) has shared an infographic showcasing the evolution of human interactions with machines and its trajectory in future. MR technology which facilitates intuitive interactions will pave the way for a more futuristic integrated approach. As computers are becoming smaller and more powerful, an MR machine can be made to fit in a lightweight wearable such as contact lenses. Companies like http://www.emacula.io/home/technology are pioneering this research. An ambitious convergence of bio-enhancements and mixed reality can be MR-enabled bionic devices replacing existing sensory organs and enhancing our experiences with technology in unbelievable ways.



Bold Predictions

No more pain and suffering

Pain and suffering is a thing of the past: VR and immersive technology are poised to put an end to both physical and emotional pain (Peyton, 2018). According to Chimeren Peerbhai, Global Digital Product Management Lead for GlaxoSmithKline, "VR as a distraction therapy during difficult treatments; such as those administered to cancer patients or burn victims has proven to be quite effective. Furthermore, research is starting to show some effective mental health treatments using VR Exposure Therapy in the treatment of PTSD, anxiety and addictions."



Future of Education

Personalized, Distributed and Immersive Education: MR can revolutionize education industry. Students of the future will be able to experience their learning material. We can expect learning to be a holistic experience, for example, learning history by a virtual and an immersive visit to ancient ruins of Greece or learning biology through direct interaction with virtual body parts. Currently platforms like Edx and Coursera offer e-learning courses from various Universities and students can design their own curriculum, MR can take this same concept to next level - students of the future will be able to attend courses of their choice at their preferred universities as if they are sitting in class, of course, supplementing the immersive learning capabilities of MR and attain degrees by taking courses across countries.

Relevant trends

VR gaming and technology

most recently the announcement of the new HTC VIVE Pro. Most interestingly, the new model has a wireless adapter. the cable management alone has thus far been a puzzle game in itself, detracting from the immersive enjoyment that VR represents. Combine with other top brands entering the space like Microsoft and their Hololens, we can see how and where Mixed reality will be applied in our lives in the near future; gaming, creative endeavors and work productivity just to name a few.

Mixed Reality In The Media:

With the technology improving and opening up to a wider audience, VR has earned it's placed in pop culture as a leading 'futuristic' experience. Most recently, "Ready Player One" and "Kiss Me First" have bought VR/AR into the psyche of the masses. People who are not gamers, still have avenues to explore this medium.

Mixed reality in blockchain:

New projects in this field such as VU (Virtual Universe) are utilizing blockchain technology by implementing digital utility tokens as a way to further advance a players experience. Furthering the application of digital tokens in the "world" and generating an even playing field for those who wish to participate in virtual economies. Mixed reality gaming on the blockchain offers something different from the real world — a chance to be a part of a different kind of economy.

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