



CODEx OF THE
FUTURE
SERIES

THE FUTURE OF SPORTS 50 THE NEXT YEARS

UNLIMITED THINKING . EXPONENTIAL POTENTIAL

BY MATTHEW GRIFFIN

ABOUT THE AUTHOR

Matthew Griffin, an award winning futurist and author of the Codex of the Future series, is described as "The Adviser behind the Advisers" and a "Young Kurzweil." Matthew is the Founder of the 311 Institute, a global Futures and Deep Futures advisory, as well as the World Futures Forum and XPotential University, two philanthropic organisations whose mission it is to solve global inequality and the world's greatest challenges.

Regularly featured in the global media, including AP, BBC, CNBC, Discovery, Forbes, Netflix, RT, ViacomCBS, and WIRED, Matthew's ability to identify, track, and explain the impacts of hundreds of exponential emerging technologies and trends on global business, culture, and society, is unparalleled.

Recognised for the past six years as one of the world's foremost futurists, innovation, and strategy experts Matthew is an international advisor and speaker who helps many of the world's most respected brands, governments, investors, and institutions, explore, envision, build, and shape the future of global business, culture, and society.

BE BOLD. MAKE FIRST CONTACT.

mgriffin@311institute.com
www.311Institute.com



PROUDLY BUILDING THE FUTURE WITH ... & MANY OTHERS

accenture

AIRBUS

Bloomberg

citi

Disney



HM Government



Legal & General

RSA

SAMSUNG

AON

ARM

BCG



centrica



DECATHLON

Deloitte.



 **interdigital.**

KPMG

Linked in

McKinsey
& Company



Qualcomm

T Mobile™



**Willis
Towers
Watson**



A LETTER FROM OUR **FOUNDER** MATTHEW GRIFFIN

WE LIVE in extraordinary times, in a world where individuals, organisations, and technology can impact the lives of billions of people and change the world at a speed and scale that would have been unimaginable just twenty years ago.

We also live in a world full of challenges, and a world where all too often negative news gets amplified at the expense of good news, and where tales of hope, inspiration, and positivity get drowned out and lost in the noise. It's no wonder therefore that today more people are more anxious about the future than ever before. And, arguably, a society which believes it's marching towards the darkness, rather than the light, has a poorer future than one that doesn't. Hope, however, is all around us and it's our purpose to light the way so all of us, people and planet, can prosper.

TESTIMONIALS

THANK YOU EVERYONE!

#FUTURENOW

EXTRAORDINARY!
Peter K., EMEA Managing Director
Accenture

ASTOUNDING!
Peter B., COO
Aon

AMAZING!
Abdessamad K., Head of Derivatives
Bloomberg

SIMPLY GREAT!
Isaac H., Country Manager
Google

BLOWN AWAY!
Nicola P., Global Procurement Director
Lego

EXCEPTIONAL!
Robert D., Global Strategy Director
Qualcomm

VISIONARY!
Catherine C., Managing Director
WIRED

INSPIRING!
Jay C., CHRO
Dentons

ESSENTIAL!
Christina L., Director
Her Majesty's Government, UK

WORLD CLASS!
Ana C., CMO
LinkedIn

BLOWN AWAY!
Mark R., Director
Willis Towers Watson

OUR MISSION.

FOR PEOPLE & PLANET: BUILDING A BETTER FUTURE

OUR MISSION is to be a driving force to help solve the world's greatest challenges, help organisations build sustainable and lasting legacies, and democratise access to the future so everyone everywhere, irrespective of their ability or background, can benefit from it.

We do this by surfacing essential future-focused insights and open sourcing our content, by amplifying inspiring stories and voices, and by bringing people together.

OUR BRANDS.

UNLIMITED THINKING . EXPONENTIAL POTENTIAL

OUR BRANDS compliment one another and align with our core mission, they include:

311 INSTITUTE

Our **globally renown** Futures and Deep Futures advisory working with the world's most respected brands, governments, and investors to explore, co-create, and shape the future of global business, culture, and society.

WORLD FUTURES FORUM

Our **philanthropic organisation** working with the United Nations and other world leading institutions to find solutions to the world's greatest challenges including all 17 UN SDG.

XPOTENTIAL UNIVERSITY

Our **philanthropic university** working with academia, governments, and regulators to create and deliver accessible future focused curricula and educational content for business executives and students from around the world.

**“LIFE’S A GAME AND IN THE FUTURE
EVEN OUR IMAGINATIONS WON’T
HOLD US BACK.”**

- Matthew Griffin, Founder

311 Institute
World Futures Forum
XPotential University

EXPLORE MORE

WANT EVEN MORE
INSIGHTS INTO THE
FUTURE AND DEEP FUTURE?



Explore More

BLOGS • BOOKS • EDUCATION • EVENTS • KEYNOTES
NEWS • PODCASTS • SHOP • VIDEOS & More ...

www.311Institute.com
www.WorldFuturesForum.com



CODEX OF THE FUTURE SERIES _FUTURE PROOF YOUR BUSINESS CODEXES:

FUTURE PROOFING your business has never been harder. So we've made it easy for you.



HOW TO BUILD EXPONENTIAL ENTERPRISES.

Exponential technologies have accelerated the global rate of disruption, now it's your turn to disrupt the quo.

CODEX OF THE FUTURE SERIES EXPLORE MORE



LEADERSHIP LESSONS FROM ORGANISED CRIME.

Explore the techniques Organised Crime groups use to grow despite being subjected to huge “competitive” pressures from governments.



THE FUTURE OF EDUCATION AND TRAINING.

Explore how we prepare our children and society for a future where Science Fiction becomes Science Fact.



THE FUTURE OF EXPONENTIAL DISRUPTION.

Explore the forces accelerating global disruption and how close we are to disrupting industries in just a day.

CODEx OF THE FUTURE SERIES

EXPLORE **MORE**



THE FUTURE OF INNOVATION AND CREATIVITY.

Explore what happens when creative machines and not humans are the dominant creative force in the world.

XPOTENTIAL UNIVERSITY

**UNLEASH YOUR
EXPONENTIAL
POTENTIAL**



Explore More

FUTURES EDUCATION FOR STUDENTS AND LEADERS

www.311Institute.com



CODEX OF THE FUTURE SERIES _FUTURE TECH & TRENDS CODEXES:

WITH HUNDREDS, thousands, of emerging technologies and trends it can be hard to identify them all and understand their implications. So we put them all right at your fingertips.



311 TRENDS CODEX.

Explore the hundreds of megatrends and microtrends impacting and shaping your world and everything you care about.

CODEX OF THE FUTURE SERIES EXPLORE MORE



EXPONENTIAL TECHNOLOGY CODEX.

Explore the hundreds of exponential technologies that are emerging in detail and learn about their implications for global culture, industry, and society.



THE EMERGING TECHNOLOGY STARBURST COLLECTION.

Use our Griffin Emerging Technology Starbursts to explore the future and find new ways to disrupt the status quo.

CODEX OF THE FUTURE SERIES _FUTURE DEEP DIVE CODEXES:

OUR DEEP Dive Codexes explore the future of individual topics in depth. So now you're the expert.



THE FUTURE OF THE CONNECTED WORLD.

Explore the future of the technologies and trends that will connect everything and everyone and shape our connected future.

CODEX OF THE FUTURE SERIES EXPLORE MORE



THE FUTURE OF GAMING.

Explore the future of gaming and what happens when the simulations become people's new reality.



THE FUTURE OF INSURANCE.

Explore the future of insurance, and the dangers of a future where global risk becomes systemic.



THE FUTURE OF SMARTPHONES.

Explore the future of smartphones and smartphone formats, and discover what's around the corner.

CODEX OF THE FUTURE SERIES

EXPLORE MORE



THE FUTURE OF SPORT.

Explore the technologies and trends shaping the future of sport and sports performance.



THE FUTURE OF SYNTHETIC CONTENT.

Explore the technologies and trends revolutionising how content is made and consumed.

CONTENTS

Second Edition published Jan 2022. To request this Codex in an alternative language please contact the author.

22	...	EXECUTIVE SUMMARY
24	...	INTRODUCTION
26	...	DECODING EXPONENTIAL DISRUPTION
36	...	MEGATRENDS AND STARBURSTS
		Get a birdseye view of the latest Megatrends and Exponential Technologies re-shaping our world.
42	...	THE HUMAN MACHINE
		Explore the future of the Human Machine and how technology will affect human kind.
88	...	FUTURE ARENAS AND EXPERIENCES
		Explore the future of sports arenas and discover what happens when our imagination is no longer the limit.
120	...	INNOVATION AND CREATIVITY

124	...	THE ERA OF CREATIVE MACHINES
		Explore the impact that a new generation of Creative Machines will have on innovation.
148	...	FUTURE SPORTS
		Explore the future sports that future technologies will help us create.
158	...	CONCLUSION



EXECUTIVE SUMMARY



FAST. DECENTRALISED. DIGITISED. PERSONALISED.

MANY PEOPLE have enough trouble trying to see the near future, let alone the deep future. That said though the future has its roots in today's innovations and technology developments. As the rate of change accelerates, at every level, cultural, industrial, and societal, summarising it and its impact, especially over a long timeline, is difficult. So here we go ...

THE RATE OF INNOVATION

The rate of innovation and the rate of disruption are inherently linked. The emergence of Creative Machines that can design and innovate digital content as well as digital and physical products, and thereby cut product development times down by up to 99% and cut time to market down by up to 90% means the rate of both will increase exponentially very soon. Additionally, in the future these same creative machines will in time be capable of using big data to identify customer frictions and problems to solve, and then innovating and producing increasingly sophisticated and tailored products to address them in real time.

THE TIME TO DISRUPTION

As the rate of innovation moves to real time, and as the world becomes more interconnected the time it takes to get products in front of customers will reduce from years and months to days and hours. In the case of digital products we are already at the point where hundreds of millions of people can download an app and in one day disrupt the status quo of a global industry. Furthermore, as whole industries continue to digitise industry boundaries are evaporating which means your companies will see new competitors enter their market from adjacent industries, accelerating the rate of disruption even more.

SUPPLY CHAIN DISRUPTION

Advanced manufacturing technologies such as 3D and 4D printing will allow companies to manufacture increasingly sophisticated and personalised products on demand anywhere. Not only will this eliminate inventory but it will also help collapse supply chains. This decentralisation of manufacturing is

an unstoppable trend but also offers new product innovation and community collaboration opportunities.

DISRUPTING THE QUANTIFIED HUMAN

This is a literal statement, not a figurative one. Exponential developments in AI, computing, electronics, materials, and sensors will mean we have new ways to quantify health and mental wellbeing, and in time as our ability to manipulate the genetic code improves, and as we continue to see developments in technology, we will see a point in time where technology moves from being near us, on us, and in us, to being us.

PLAY ANY SPORT ANYWHERE

Creative Machines and advanced manufacturing technologies will let us create new digital and physical arenas and constructs on demand anywhere, and when combined with new AR, MR, and VR technologies this will mean your imagination, the world, and beyond, will be your literal playground.





INTRODUCTION

THROUGHOUT THE annals of time there have been very few human activities capable of overcoming even the most deeply entrenched societal and political divisions as effortlessly as sport so it's little wonder that it holds a magical place in people's hearts and minds, whether those people are amateur or professional sportsmen and women, or simply ardent on lookers and fans.

Founder

Sport's reach is also so broad and so all encompassing that it's impossible to talk about it as a singular topic in isolation to everything else. Furthermore, when you consider the fact that as we ourselves and the world around us continues to change at an increasingly furious rate all these changes ultimately allow us to re-write the rules of the game, every game, in ways we never previously imagined.

From the arrival of new, intelligent opponents that are nothing more than digital ether through to the transformation of the human condition and development of increasingly amorphous and smart arenas that span everything from neighbourhoods and the globe to the stars beyond sport has a bright and exciting future ahead of it.

Explore more,

MATTHEW GRIFFIN

DECODING EXPONENTIAL DISRUPTION

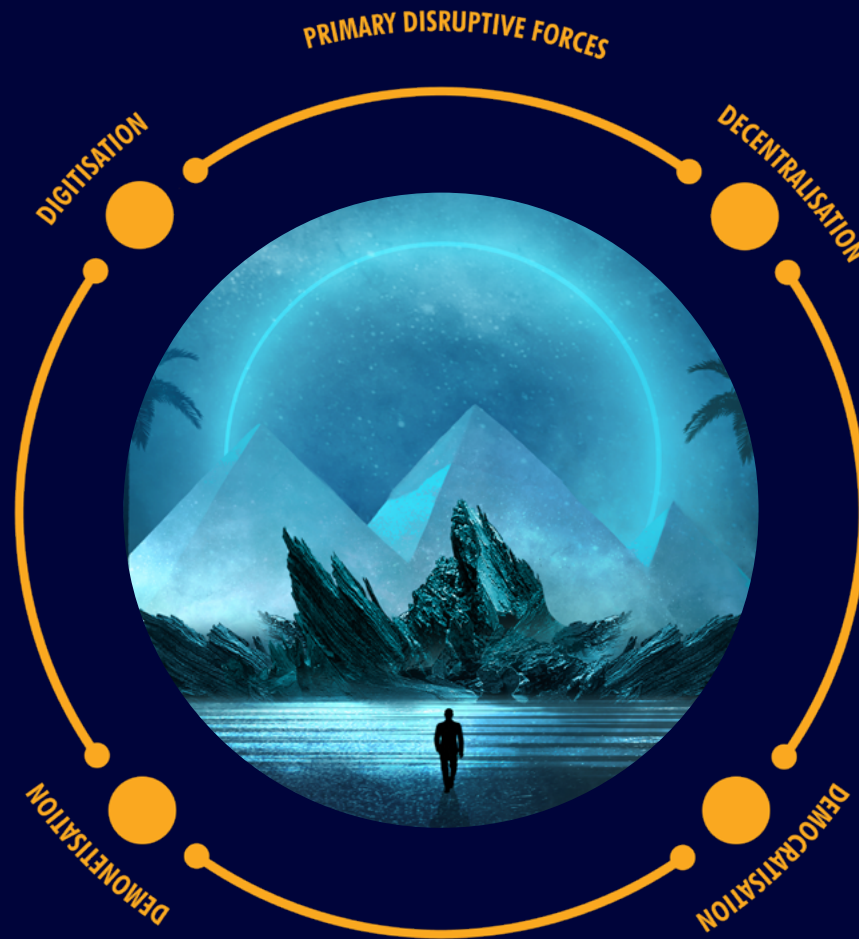




IF YOU step back a decade or so ago the word on everyone's lips was innovation and, frankly, if you didn't have it thrust into your face at least thirty times a day by every executive or ad man or woman you met then it's likely because you were in a coma. Or dead. Or both.

Fast forward to today and now they have a new buzz word - Disruption. But is disruption today as commonplace and accelerating as quickly as people will have us believe, or is it just hype and a word that executives and eager Silicon Valley startups throw around with impunity in the vain hope of convincing people that they're innovating at the bleeding edge and pushing boundaries?

Well my friend, let's take a journey together. Let's cut through the marketing fog, summit the hype cycle, and crack open an genetically modified beer while we raise cynical eyebrows and take a deeper look at the world that's unfurling around us.



YOU ARE THE MOST POWERFUL YOU HAVE EVER BEEN

The emergence of increasingly powerful exponential technologies that are increasingly decentralised, democratised and demonetised, now means that individuals have more power than ever before to create exponential products that change the world at an increasingly furious rate.

YOUR POWER AND POTENTIAL. MAGNIFIED.

DISRUPTIVE TECHNOLOGIES are nothing new. After all, the wheel was disruptive, and even the humble screwdriver was disruptive in its own right, let alone the myriad of other technologies we could spend a lifetime discussing. But when it comes to discussing the speed and impact that new digital and physical products can have on the world at large today it's very different from the times of old.

Today, for example, it is easier than ever before for a single individual to find problems to solve and innovate, produce, and distribute their products at global scale at a speed that would have been unimaginable even just a decade ago, and in doing so have an out sized impact on the future. However, this is all just the beginning, especially when you then consider that the products themselves are infinitely more capable and powerful than ever as well.

As a consequence of all these factors as all these powerful innovations and technologies become increasingly democratised, decentralised, digitised, and demonetised, in short become

cheaper and simpler to access and use, we are also seeing the power that individuals have to transform the world become magnified as well.

The result of all this is that today, and then even more so tomorrow, that not only will the rate of change continue to accelerate, in old fashioned cyclical terms, but that the impact of those individual changes will continue to be magnified as well. The combination of these two factors, especially as they continue to be further amplified and magnified over time, will then have titanic consequences on our society, for better and worse - consequences that, arguably, we're not prepared for.

A POWERFULLY HEALTHY EXAMPLE

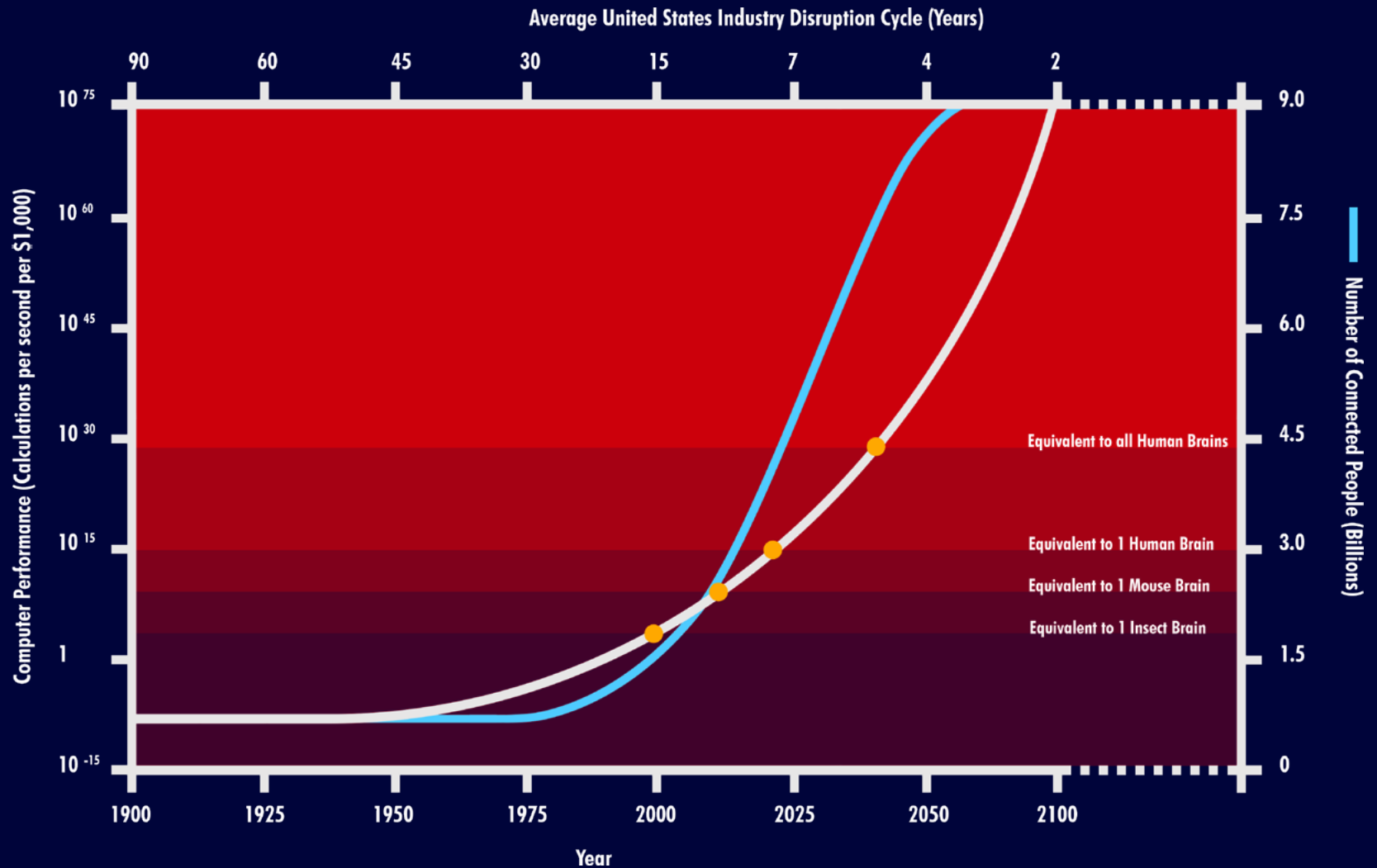
In order to demonstrate this point, that individuals can increasingly change industries at global scale for increasingly paltry sums of money, let's run through an example, just one of possible millions.

Traditionally if you'd wanted to give the billions of people on the planet

who don't have access to primary or secondary healthcare access to potentially life saving services you would have had to have built out expensive infrastructure and hired professional staff at the cost of many billions of dollars.

Today, however, suitably skilled students can access one of the world's most powerful AI platforms for free, develop an algorithmic model in just a few weeks, integrate it with the camera and sensors on an internet connected smartphone, and now, all of a sudden, you have a smart device that can diagnose everything from ADHD, cancers, and disease, as well as the onset of dementia, diabetes, heart disease, and PTSD for free with above a 90 percent accuracy.

That's revolutionary, and now just think of the impact of that - access to free healthcare, albeit in particular niches for now, anywhere on Earth on tap. And that is just one of the millions examples of how today individuals, not just corporations, are changing the world we live in for the better by using increasingly powerful technologies and tools.



TECHNOLOGY FUELLED DISRUPTION IS ACCELERATING

As increasingly powerful exponential technologies emerge and are democratised, with computing power being just one example, and as the world becomes increasingly digital and connected industry disruption times plummet.

THE ACCELERATING RATE OF DISRUPTION.

THE CORRELATION is obvious, but it's worth discussing nevertheless. If you want to disrupt the status quo, or an individual organisation or industry, it's not just good enough to have the technologies, tools, and resources that you need to bring your idea to life, but you also need to be able to get it into the hands of as many consumers as possible as fast as possible.

Historically when products were predominantly physical, not digital, and the only markets that entrepreneurs had easy access to were local ones, trying to disrupt anything at speed and scale, let alone a global industry, was not only an immense challenge but it also took an inordinately long time and cost a staggering amount of money to achieve. The consequence of this was that ultimately the rate of disruption was quite slow.

Today, however, increasingly digitised products and an increasingly connected society now means it's easier than ever before for entrepreneurs and organisations alike to take their idea global - in the blink of a digital eye.

Just like their forbears though today's entrepreneurs still have to be skilled enough to discover customer frictions and valuable problems worth solving, but unlike their forbears they now have access to technologies, tools, resources and finally markets that are a match for their lofty ambitions.

As a consequence it is now easier than ever before for one individual to disrupt the status quo faster than ever before, and as more of the world's population goes online, and as technologies and tools become even more powerful, this is a trend that is only going to accelerate which is why, over the past century the average time that it takes to disrupt a global industry has fallen from 90 years to just a few years.

However, as we'll see in the next section, soon disrupting a global industry within just a few years will seem slow ...

CODEX

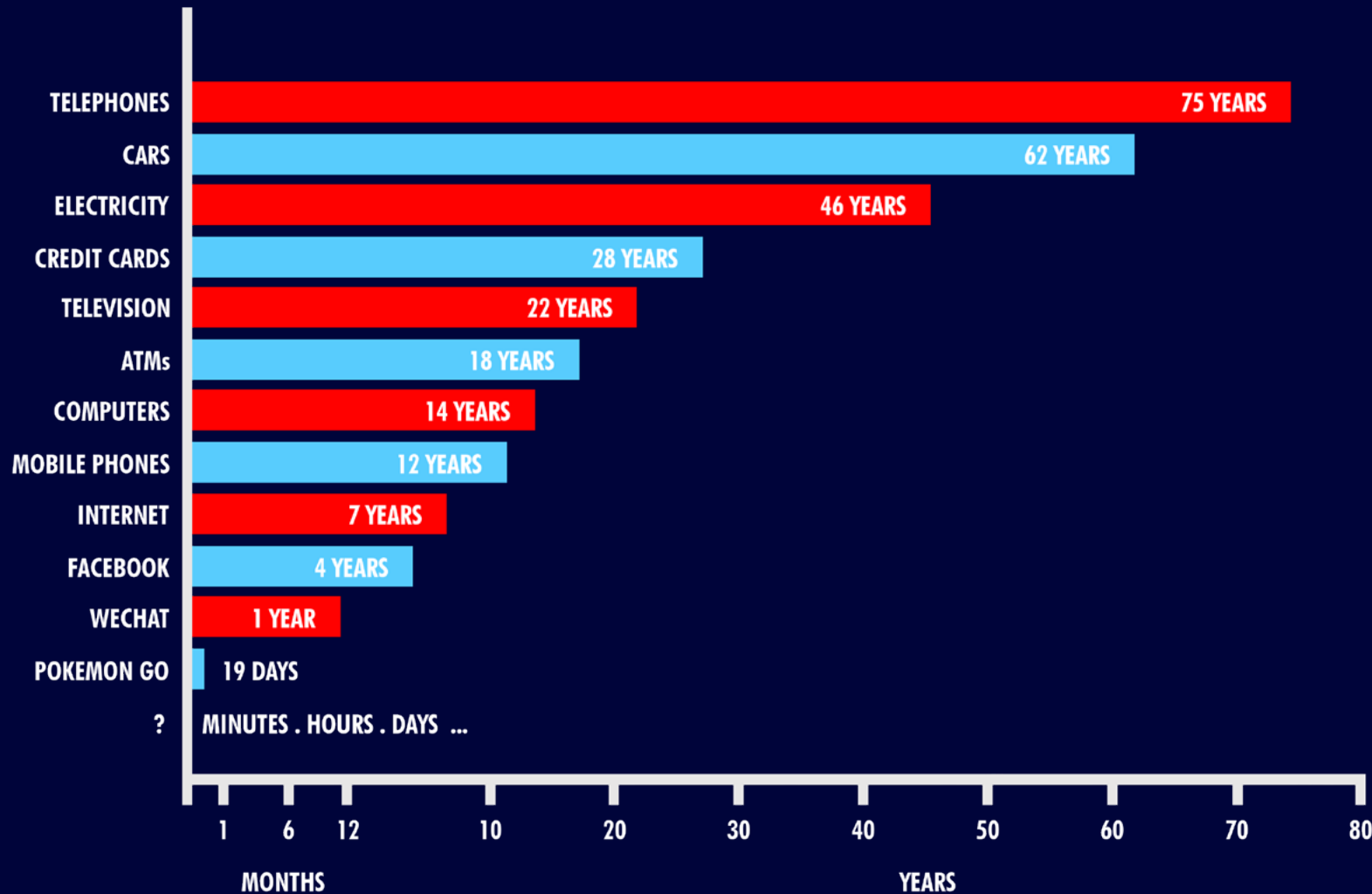


FREE DOWNLOAD



**THE FUTURE OF
INNOVATION
AND CREATIVITY**

CREATE . BUILD . LAUNCH



THE TIME TO REACH 50 MILLION USERS DROPS TO HOURS

As industries become increasingly digitised and as the world becomes increasingly connected it's only a matter of time before we see an industry disrupted in a day and a multi-billion dollar enterprise built and launched in hours or minutes - a trend that is further accelerated by the emergence of Creative Machines.

GLOBAL DISRUPTION IN A DAY. EVERY DAY.

TODAY OUR increasingly connected and digital society makes it possible for entrepreneurs and organisations to market, distribute, and sell new products to a global audience at just a fraction of the cost and time that it used to take.

The upshot of this is that new products and services can be adopted and taken up by millions, tens of millions, hundreds of millions, or even billions of people in or near real time which consequently means we have already reached the point in time when global business, culture, and society can be disrupted and transformed in just a single day.

To highlight this point it took 75 years for 50 million people to adopt the telephone. It then took just 19 days for Pokemon Go to hit the same milestone and just 6 days for 100 million people to adopt Call of Duty.

Then, to crown it all and to really drive the point home, when Facebook launched its cryptocurrency Libra in June 2019 had the regulators approved it then in the words of the chairmen of the Bank

of England, European Central Bank, People's Bank of China, and the US Federal Reserve, it would have "changed the state's control of money and the global financial system overnight."

Languishing on those statements for a moment, and to put this new disruptive world reality into perspective, Facebook could have launched Libra in the morning and could have had hundreds of millions, and possibly billions of people, using it - their new product - come the evening.

In fact, the only reason why this didn't happen was because the central banks, governments, and regulators didn't trust Facebook. But, as they said at the time, while the organisation behind it was "flawed" the technology and the concept itself was sound.

Accelerating the rate of global disruption in this way is one thing, however, new technologies - Creative Machines - are emerging that let us extend this paradigm to hardware as well and cut the time it takes organisations to go "from concept to shelf," as they say, by up to 99% or more.

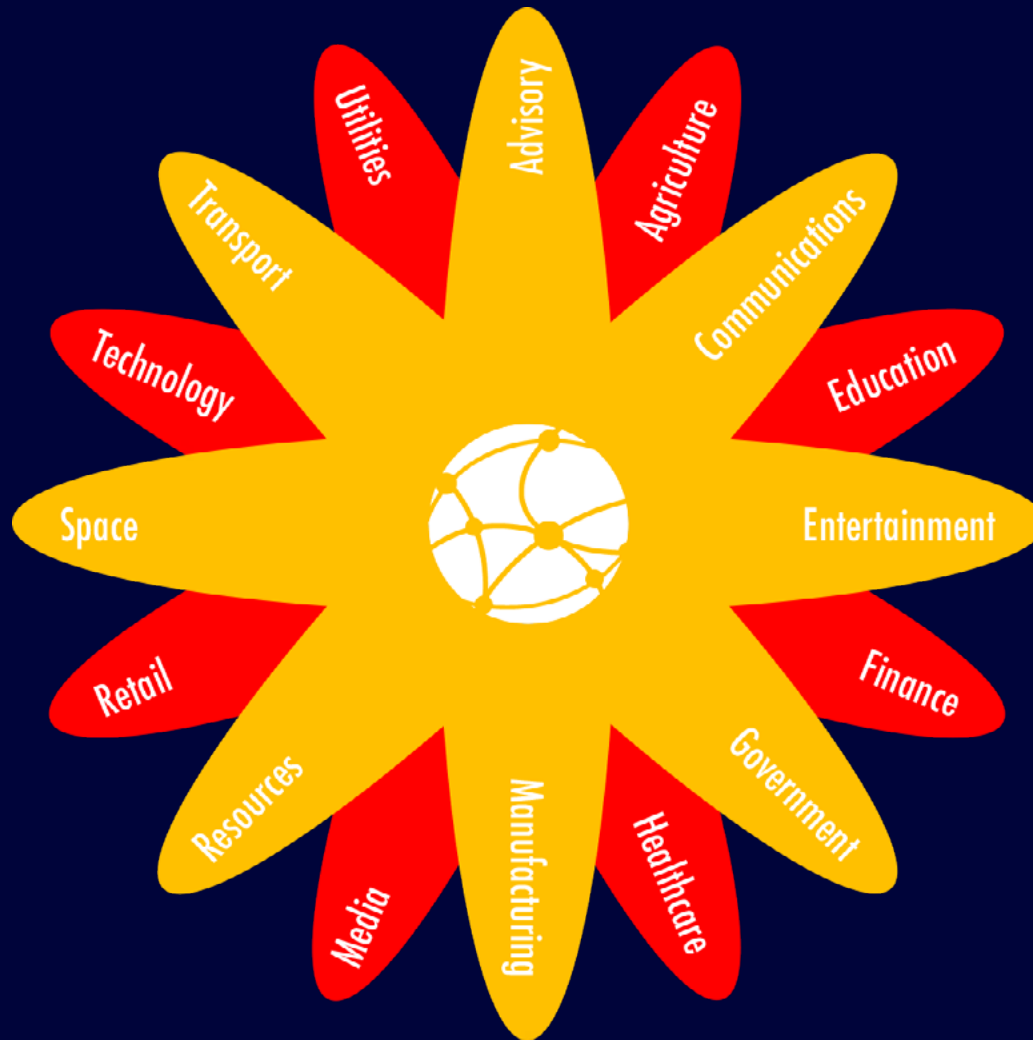
THE RISE OF CREATIVE MACHINES

Creative Machines - Artificial Intelligence "machines" that can design and innovate new products in virtual simulation, and then via 3D printing manufacture them in real time on demand - have arrived. And they are already accelerating the rate of hardware innovation by up to 99% or more.

Capable of designing, innovating and producing new digital and physical products, from content and software, to batteries, cars, clothing, computer chips, and pharmaceutical drugs, and much more, in real time Creative Machines are truly game changing.

AUTONOMOUS ORGANISATIONS

But it doesn't end there. Now add in the emergence of fully autonomous organisations and all of a sudden you have an ever accelerating virtuous cycle of disruption - all operating at exponential speed.



INDUSTRIES WITHOUT BORDERS

All industries are connected with one another and as digitisation erodes the borders that kept them all distinctly separate not only do changes in one affect the others faster but it's also now easier than ever before for organisations in one industry to enter and disrupt other industries, thereby accelerating the overall rate of disruption.

NO MORE INDUSTRY BORDERS.

AS THE global rate of disruption accelerates towards real time, as I've discussed, we have yet another force at play which, in its own way, also helps accelerate the overall rate of disruption.

While it has always been the case that changes in one industry would eventually ripple out and affect other industries, when it comes to accelerating the rate of global and industry disruption digitisation simply adds rocket fuel to the already white hot fire.

As organisations and industries accelerate their own rates of digitisation one of the most significant impacts of digitisation is the erosion of the individual borders and boundaries that previously kept all of these industries separate and distinct from one another.

Today we see this effect manifesting itself time and time again, where companies who've traditionally only operated in one industry sector are now able to branch out easier and faster than ever before to capitalise on market opportunities in other sectors.

The best and most obvious examples of this trend today are in the technology sector where companies in the so called FATBAG collective, or Facebook, Alibaba, Tencent, Baidu, Amazon, and Google, now seem to be able to develop new products and services that cross previously unassailable industry boundaries with impunity.

Amazon, for example, was primarily a E-Tailer, but now the company has interests in everything from finance and healthcare to entertainment. Google meanwhile was originally just an advertising and search engine organisation, but now has interests in everything from communications and energy, to finance, healthcare, and transportation. And so the story goes on for all of the other companies in this collective.

Born in the digital era these so called Digital Natives were unencumbered by the need to produce and sell physical products so their companies were afforded a level of adaptability, agility, and flexibility that their legacy peers, encumbered by physical assets

and products, and the associated long development cycles and capital restrictions thereof, simply couldn't match.

Now though those legacy players are spending hundreds of billions of dollars digitising their own organisations and trying to catch them up, and once their transformation programs are complete then they too will be able to move into and disrupt adjacent industries with increasing impunity, and as a result the pace of disruption will accelerate even further.

MEGATRENDS AND STARBURSTS



EVERY YEAR I publish a new Griffin Exponential Technology Starburst and update this codex and the complimentary the 311 Institute Trends Codex that you can download and explore on the following pages - all of which are designed to help you envision, shape, and lead the future.

Today, it's plain for everyone to see that every aspect of global business, culture, and society are being disrupted and transformed faster than ever before thanks to the relentless, and some would say furious, rate of change that's made possible by giant advances in technology and the megatrends it helps create and drive.

As this rate of change accelerates exponentially in time we will see the technologies we think of as powerful today being complimented and superseded by even more powerful and capable exponential technologies - many of which we can see today, circling above us like the stars in the Heavens, just biding their time, waiting to fall to Earth where their impact will be total and irreversible.

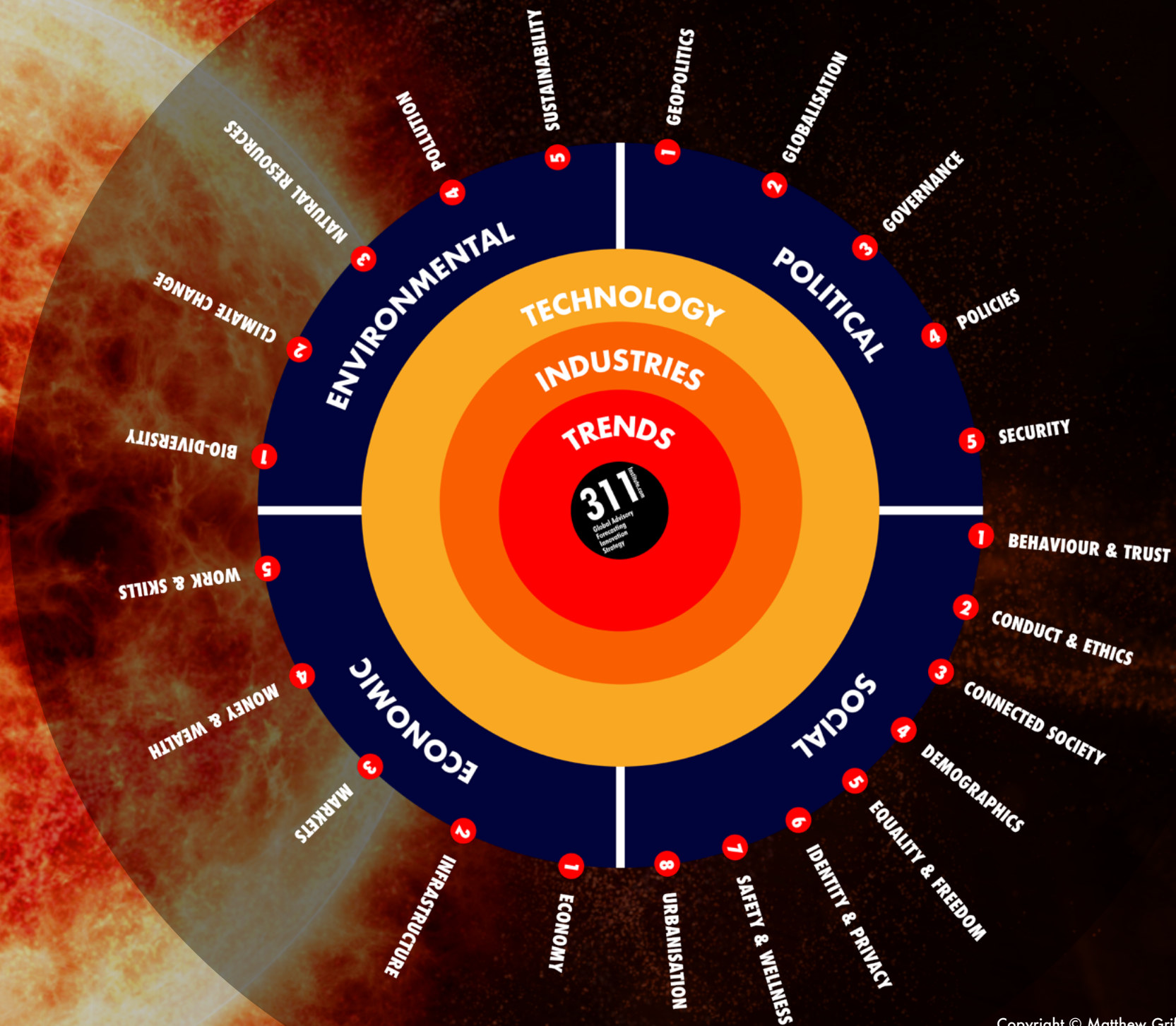
While this might not be a surprise though, what might be a surprise is the number of new exponential technologies that are appearing - over 600 by my latest count,

with on average of more than 60 being added every year.

In the right hands every single one of these so called "Blank Slate" technologies, so named because until someone innovates on top of them they are just that - blank slates - has the potential to transform either just a part of our global business, culture, and society or all of it.

As powerful as all these individual technologies are though it's when they're combined - to form what I call "Exponential Combinations" - that the real magic happens and their power to transform everything is magnified many times over.

That future is what I invite you to dive into and explore which is why I've made all this content available to you - so you can join the dots, harness and combine together interesting megatrends and exponential technologies, and use them to envision and shape your own fantastic future.



MEGATRENDS STARCHART AND CODEX

MEGATRENDS ARE powerful, transformative forces, backed by observable and verifiable data, that have the power to shape the future of global business, culture, and society, and they have been shaping the way we live for centuries - just think about the automobile, electricity, or the internet. And they will continue shaping our society until the end of time or human existence - whichever comes sooner.

Examining megatrends and their impacts plays an integral role in helping corporate foresight teams contemplate and envision different versions of the future. They also indicate a general direction of change, and can themselves be comprised of several different trends, with their evolution often being influenced to a degree by their past - although not entirely.

Megatrends are also not surprising - they're often familiar things, changes that are already happening now and that are highly likely to continue happening into the future.

To use an analogy you can think of

megatrends much like you think about the ocean - a large unstoppable force that seems to have a mind of its own and that only seems to travel in one direction despite some of your best efforts to disrupt or divert it. The sea is the megatrend, and if you get caught in it try as best you can to fight against it it's going to sweep you in one direction.

Within this ocean though there are other smaller forces, or microtrends, at work - currents, eddies, and vortexes. And, as the megatrend sweeps you in one overall direction it's often these microtrends that snare you and determine your final eventual destination - your future state.

Trends are just as important as the technologies that help create and drive them, and as part of my mission to democratise access to the future and help you envision, shape, and lead it I created the 311 Trends Codex to compliment the Exponential Technology Codex you're reading right now. And it's yours to download and explore for free ...

CODEX



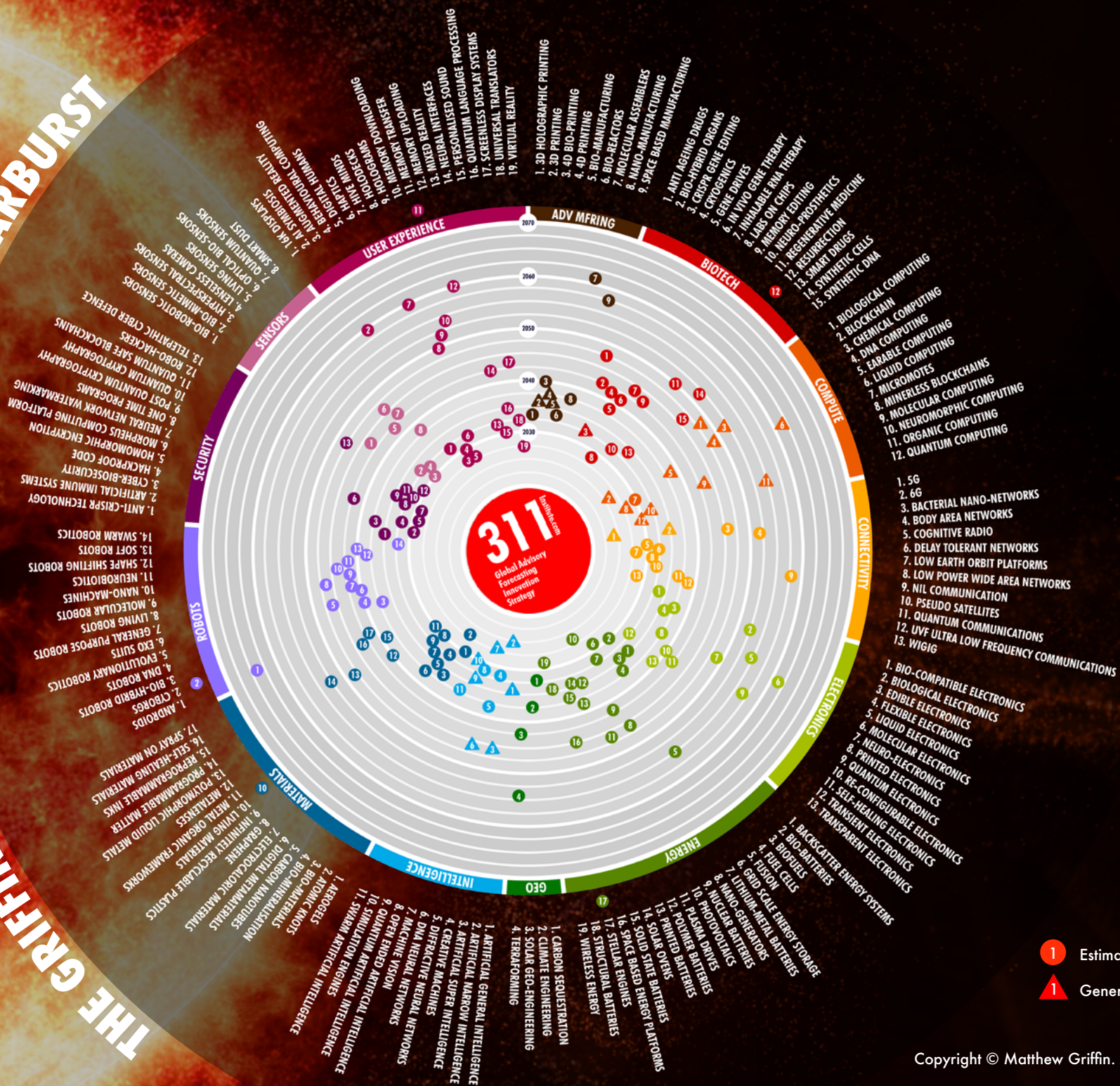
FREE DOWNLOAD



**311 TRENDS
CODEX**

EXPLORE HUNDREDS OF TRENDS

THE GRIFFIN EXPONENTIAL TECHNOLOGY STARBURST



1 Estimated Wide Spread Use
1 General Purpose Technology

GRIFFIN EXPONENTIAL TECHNOLOGY STARBURST

THIS YEARS Griffin Exponential Technology Starburst timeline spans the next fifty years and tracks the development of 167 of the most significant emerging exponential technologies across 13 major categories.

together to help you meet new market needs and solve problems, create next generation customer experiences, as well as new products and services, and make our world a better and fairer place for everyone.

“SEE THE NEXT 50 YEARS OF TECHNOLOGY.”

It also visualises 24 General Purpose Technologies which will drive and accelerate continuous innovation and disruption across entire economies and sectors and, needless to say, you can find every exponential technology listed on this year's Starburst, as well as previous years Starbursts, covered in detail in this codex.

Collectively these technologies will disrupt and transform every corner of global business, culture, and society, at an accelerating rate. Consequently, I strongly suggest you and your organisation's stakeholders explore them in depth, and more importantly, understand how they can be combined

CODEX



FREE DOWNLOAD



**EXPONENTIAL
TECHNOLOGY
CODEX**

EXPLORE EXPONENTIAL TECHNOLOGIES

THE HUMAN MACHINE



CHAPTER SUMMARY.

HUMANS HAVE been developing tools and technologies for millennia, but today the rate of technology development is faster than ever before and it's accelerating in many different directions, many of which will be surprising to people. Historically technology has been near us, but over time it has gotten closer and closer to us, more proximal to us, on us, and in us. And it time we will be the technology. But there's more so let's summarise the next fifty years.

QUANTIFIED SELF

The development of increasingly small, but increasingly sensitive, sophisticated, and powerful AI, brain machine interfaces, computing platforms, electronics, machine vision systems, and sensors that can be easily embedded into and integrated into devices and materials that are proximal to the user, as well as in and embedded into their bodies, will let us monitor people's physical health and mental wellbeing, as well as the effects of their exposure to environmental factors, such as pathogens, and pollutants, at an increasingly granular

level - even down to the cellular and genomic level. These rich datasets will then be able to be used to create solutions that help improve their overall wellbeing.

REINVENTING THE HUMAN

The development of increasingly sophisticated biological and DNA based computing platforms, gene editing tools, and in vivo gene therapies mean we already have the capability to turn the human body into a biological supercomputer that can run not one but two genetic codes in parallel, as well as identify disease and bio-manufacture treatments in vivo.

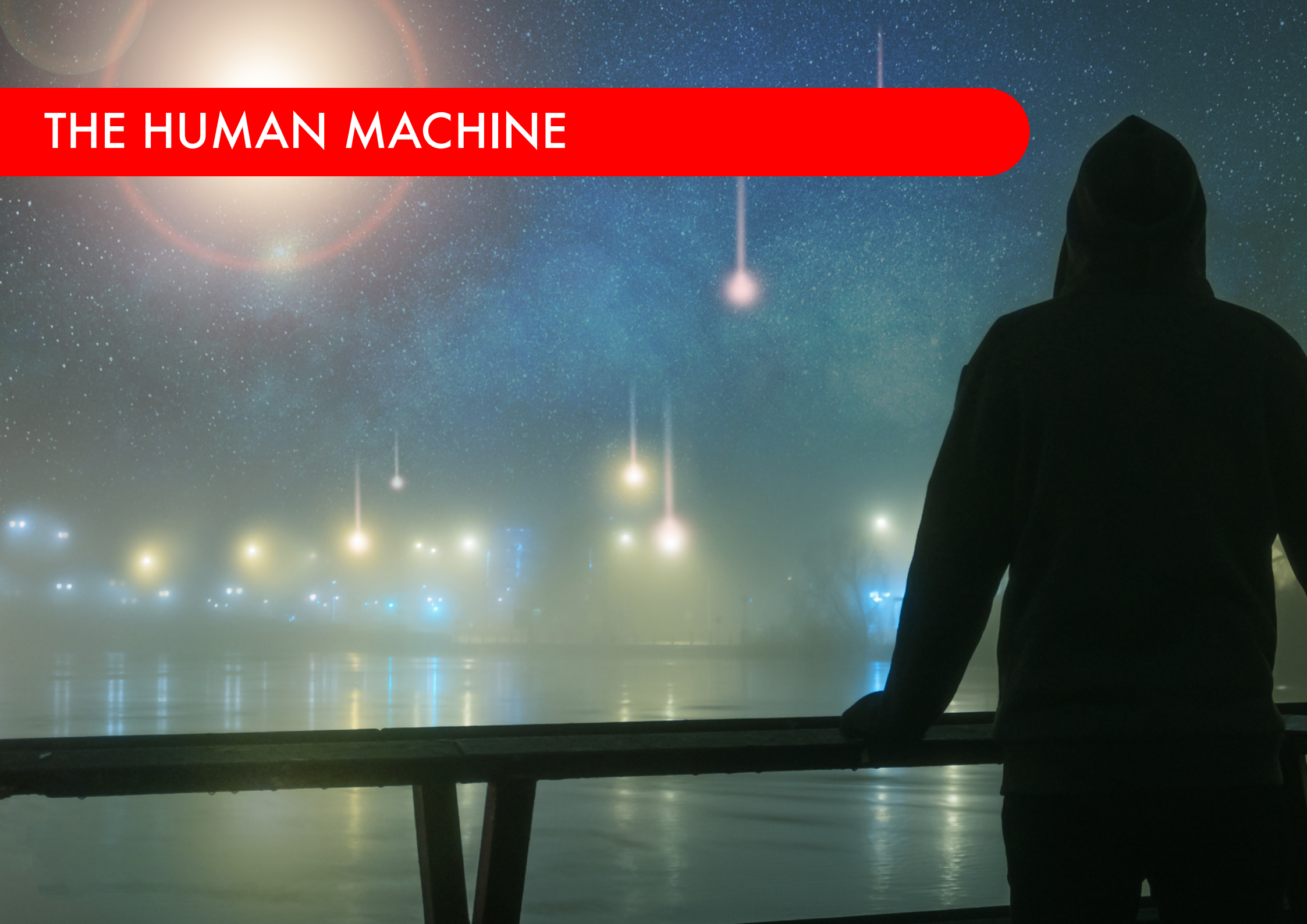
BE THE BEST YOU


Our ability to diagnose ill health, in all its forms, and help people improve their wellbeing during this period will increase exponentially, which will help us help people live healthier happier lives.

NEW COMPETITORS

Human versus AI versus robot.

THE HUMAN MACHINE





WHILE NOONE likes to think of themselves in the same vein as machines, which are often simply regarded as being unemotional mechanical automatons, as technology continues to take a leading role in our society and moves to the forefront of everyone's minds it shouldn't be any surprise that people around the world are increasingly expressing their opinions that humans are the most sophisticated machines in the universe. And that DNA is simply life's software.

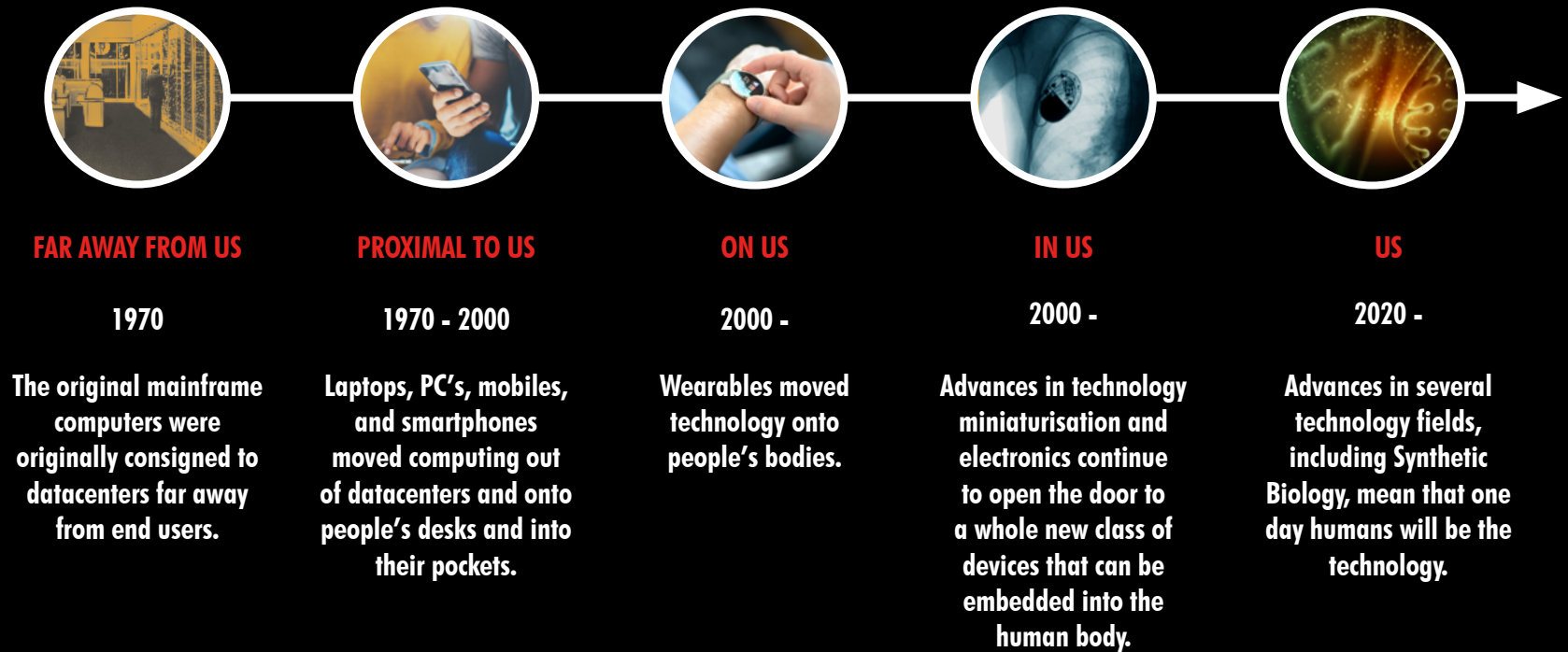
Furthermore, as the boundaries between mechanical and biological technologies continue to blur, where robots are now just as likely to be made out of DNA as well as aluminium and steel, and where even the future of computing and electronics is increasingly looking like they will be biological based and inspired it should probably be unsurprising that people are starting to come round to this way of thinking.

After all, technology is simply a tool, albeit an increasingly sophisticated and complicated one, and everything is a tool in one way or another, provided that is you can understand and harness it for your own ends - from the raging star at the center of our universe whose energy we will one day be able to replicate with fusion energy, and harness using Dyson

Spheres, through to the code of life itself which in time will open doors that many of us didn't even know existed.

Today, for example, we have already designed synthetic DNA that has opened the door to creating new 4, 6 and even 8 base pair life forms, turned bacteria into sophisticated computing devices, performed in vivo gene therapy in living patients, and laid the foundations to turning humans into insanely powerful biological supercomputers. And that is all just the beginning.

So whether we call humans the most sophisticated machines in the universe or not as we figure out new ways to harness our own biological machinery for whatever ends in the future the only thing that will be certain is that people will split hairs about terminologies, and that the regulators will have a fit.



BECOMING ONE WITH TECHNOLOGY

The further in time we step back the further away from us technology was, but as technology continues to develop it is clearly visible for all to see that technology is getting closer and closer to our bodies, until one day we will merge with technology, in an event referred to as the Singularity, and that after that we will become the technology.

MAINFRAMES AND HUMAN SUPERCOMPUTERS.

OF COURSE technology is everywhere. It's the car you drive, the microwave in your kitchen, the smoke detector in your house, the water cooler in your office, and, of course, the smartphone in your hand. In fact, almost everything in our world is some form of technology, right down to the wheel which, in its own way, would have been considered the bleeding edge technology of its time.

However, of all the technologies we interact with and use on a daily basis arguably the most impactful by far have been computing and electronics which now run everything from our social lives to our electrical grids, and everything in between. And just as we've seen in many other fields over the past decade the advances in these two fields have been accelerating exponentially.

Not only are these technologies getting more compact though, they're also getting substantially more powerful as we continue to see new platforms emerge. Computers, for example, are now moving from being based on silicon to being based on DNA and quantum

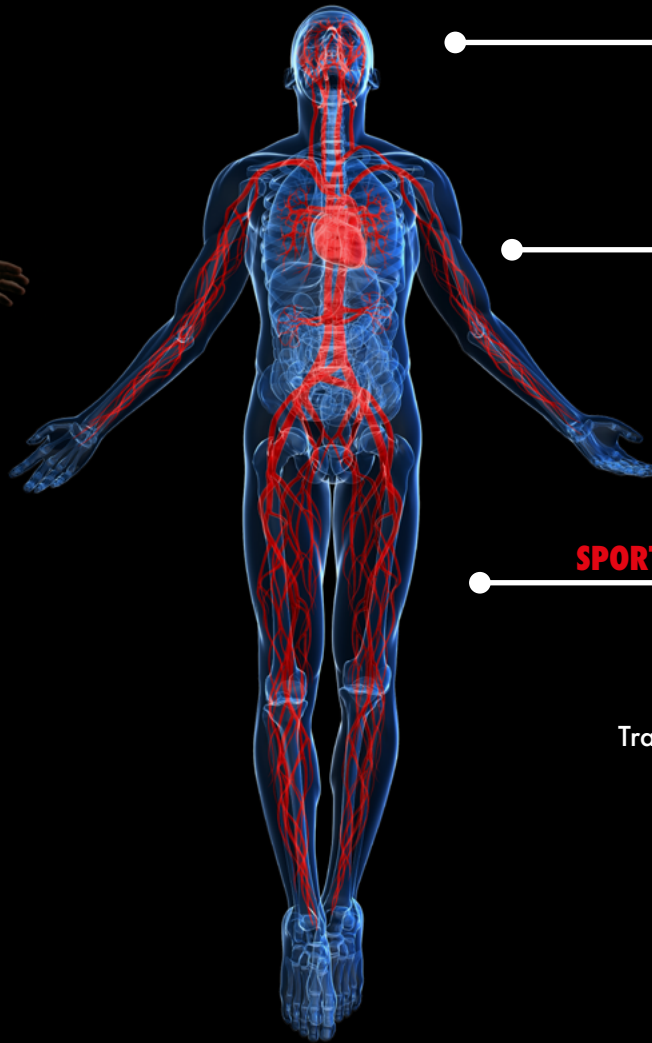
mechanics, and electronics are moving from being electron based to wave based while their form factors are moving from being purely static to being fixed to being biologically inspired, flexible, self-healing, and self-configuring. Among other developments of course - all of which I discuss in more detail in my separate Exponential Technology Codex.

One of the major impacts these advances, especially when it comes to miniaturisation is that they fundamentally help to change our relationship with technology, and therefore what we can do with it and how we consume and use it throughout our daily lives.

For example, step back a mere fifty years and the closest that any of us could have come to anything that remotely resembled a computing device would have been a mainframe in a government datacenter, but today we all have supercomputers in our pockets and mini ones on our wrists.

As technology continues to progress, and as we become increasingly inclined to embrace new technologies in time

we will see the ultimate transition where computers that used to be in datacenters and that were then proximal to us and on us then suddenly become part of us. And as we accelerate the timeline out we can already see how one day, with the development, for example, of new gene editing tools like CAST and CRISPR, a time when we turn human cells into dual core computing devices, and turn humans into biological supercomputers - at which point the circle will be arguably complete - we will then be the technology.



MENTAL HEALTH

- Augmentation - None
- Balance - Daily pressures, managed traditionally
- Environment - Relatively stable and most factors local

PHYSICAL HEALTH

- Augmentation - None
- Environment - Physical, limited control over it
- Exercise - Traditional forms dominate
- Nutrition - Balanced diet sourced locally

SPORTS PERFORMANCE

- Augmentation - None
- Clothing - Traditional apparel
- Coaching - Traditional techniques
- Equipment - Traditional, occasionally optimised
- Training Environment - Physical and mostly local

1. CLASSIC HUMAN

During this timeline technology, while prevalent, was nowhere near as accessible or prevalent as it is today, as a result athletes had to monitor and improve their performance and wellness in traditional ways using predominately human expertise.

CLASSIC HUMAN: PRE 2000.

FROM A sports perspective Classic Human can be thought of as those people who performed sports, at whatever level, in its rawest form - without the assistance of any of today's modern trappings. No aids, no enhancements, just mind, body, and spirit against the world working in harmony. Or not as the case might be, after all, everyone is entitled to a bad day now and again.

MENTAL HEALTH

When it comes to mental health it's true to say that people have always been subjected to pressures that can overwhelm even the best of us.

While we are all subject to pressures that can at times overwhelm us though, whether they're related to family, health, money, work, or a myriad of others, over the aeons the types of pressures we've all been subjected to have not only morphed in their own ways, but some have waned in their intensity while others have grown.

For example, depending on the times

our classic human was living in they may have felt pressures from work and the spectre of redundancy, or the pressures of food scarcity, or disease, or world war. And many others besides.

The omni-present nature of pressure means that, unfortunately, none of us will ever be free from its vagaries which is why it is absolutely vital that people have access to the support and help they need when they need it, and for our classic human this support primarily manifested itself in physical forms by way of conversations and interactions with family and friends, as well as local support networks.

PHYSICAL HEALTH

Withstanding the absence of much of today's advanced healthcare systems our classic human's physical health was very much in their own hands - as it is today. But depending on where they lived and the era that they lived in the vast majority of their nutrition would have been organic and locally produced, and subject to seasonal variations and supply.

And when it came to exercise it could be argued that the majority of exercise would simply be built into their daily routine as opposed to being an explicit activity.

SPORTS PERFORMANCE

To our classic human the word augmentation would have been a nonsensical word with no meaning whatsoever.

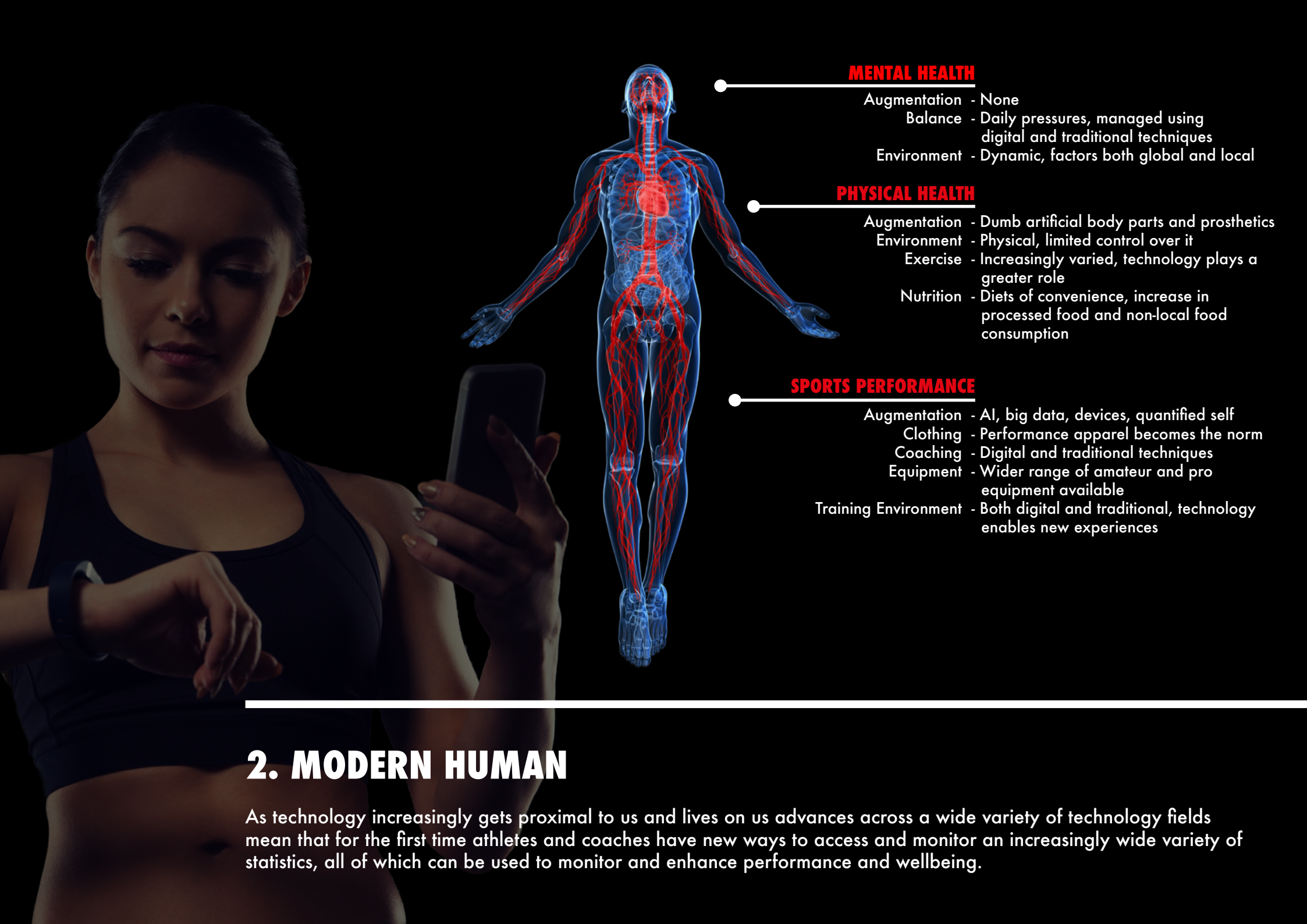
Their sports clothes, if they were lucky enough to have any, were made from traditional materials such as cotton and wool, that soaked up mud, sweat, and rain, often making exercise uncomfortable. And as for the equipment they used, well, that too would have been made from traditional materials such as leathers and woods, with only the richest people being able to afford fine, specially tailored equipment that gave them a performance edge.

Meanwhile, when it came to coaching, for those people lucky enough to have access to it, or skilled enough to require

Notes:

it, it would have been provided by coaches with suitable enough experience and skills who, in most cases, would have lived and breathed the sport themselves for years and decades.

Notes:



MENTAL HEALTH

- Augmentation - None
- Balance - Daily pressures, managed using digital and traditional techniques
- Environment - Dynamic, factors both global and local

PHYSICAL HEALTH

- Augmentation - Dumb artificial body parts and prosthetics
- Environment - Physical, limited control over it
- Exercise - Increasingly varied, technology plays a greater role
- Nutrition - Diets of convenience, increase in processed food and non-local food consumption

SPORTS PERFORMANCE

- Augmentation - AI, big data, devices, quantified self
- Clothing - Performance apparel becomes the norm
- Coaching - Digital and traditional techniques
- Equipment - Wider range of amateur and pro equipment available
- Training Environment - Both digital and traditional, technology enables new experiences

2. MODERN HUMAN

As technology increasingly gets proximal to us and lives on us advances across a wide variety of technology fields mean that for the first time athletes and coaches have new ways to access and monitor an increasingly wide variety of statistics, all of which can be used to monitor and enhance performance and wellbeing.

MODERN HUMAN: 2000 TO 2020.

DURING THIS period so called Modern Human has their first encounter with an increasingly diverse ecosystem of digital devices and platforms, that include everything from wearable devices and smart clothing, through to internet connected stationary bikes and smart footballs, that change the sports experience forever.

While the data sets that these platforms stream are a treasure trove of information compared to what was available just a decade or so ago they're still narrow by future standards, primarily because of the design of the devices and the limitations of the electronics and sensors that are packed into them.

As users discover that they have access to a wealth of increasingly democratised personal health and performance data that they can use to enhance their overall training experiences and wellness, wherever they may be and whatever they may be doing, this new reality piques their interest and the cultural revolution has started.

Despite the initial benefits though the

lack of product automation and the need for users to manually intervene and rely on their own personal experience to interpret the results often meant that users questioned the products effectiveness, impact, and ultimately their return on investment. The natural result of which meant that adoption of these platforms was more often than not the exception rather than the rule and that most of them were seen as indulgent training aids rather than the must haves they should have been.

All that said though this period represented the first significant encroachment of technology into mass sports and was the first wave of many that will continue to influence and shape the future of sports far into the future.

MENTAL HEALTH

During this timeline according to several charities and research organisations such as the Mental Health Foundation there was an increase in the number of people suffering with mental health issues with one in six adults suffering

weekly with conditions including anxiety and depression, and one in five having suicidal thoughts.

While the causes of mental health issues, as always, vary most experts agree that a healthy balanced lifestyle, which includes activity, can help alleviate the symptoms.

Good Samaritans

During this timeline though, primarily as a consequence of the rise of smart devices and digital platforms, we also saw an interesting uptick in the number and variety of different diagnosis and treatment options which as time goes on all became increasingly accessible and sophisticated as enterprises found innovative ways to leverage artificial intelligence and machine vision, as well as biometric, biomarker and sensor information to their advantage.

The combination of human ingenuity and these technologies and tools meant that it became increasingly possible to use what we've traditionally through as offline

Notes:

technologies such as cameras, CCTV, and even WiFi routers, to determine people's character, emotions, health, inclinations, moods, motivations, and even personalities with increasing depth and accuracy.

Meanwhile online it became increasingly possible to make similar assessments by leveraging artificial intelligence to analyse and monitor people's biometric cues, conversation, interaction, and keystroke patterns, and screen scrolling rates - to name but a few.

And then, of course, there's the motherload as enterprises discovered new ways to mine the treasure trove of information captured by our smart devices, especially our smartphones, and found new ways to tap into their sensors in order to determine people's posture, and by association their emotional state, as well as, for example, using the device's microphones to analyse speech patterns for signs of depression, PTSD, and suicidal tendencies, and even the onset of neuro-degenerative disorders such as Alzheimers.

If all these developments weren't enough for you, and if you prefer a more traditional way of diagnosing your mental health issues this timeline also saw the emergence of the world's first

artificial intelligent counsellors.

The upshot of all this is, of course, that firstly you should never underestimate what enterprises can do with your data, even what you might think of as relatively unimportant obscure data such as the way you hold your phone, and secondly this is also the point where I feel compelled to use the #TechForGood hashtag rather than the obvious #BigBrother one because, just as there are privacy downsides to all of this data mining, there can also be significant upsides and under the right circumstances it can help improve and save lives.

PHYSICAL HEALTH

It's probably fair to say that users have likely lost count of the number of times they've been told they're responsible for their own health with the obvious emphasis on diet, exercise, and a healthy work-life balance, and while the majority of people are more than capable of gauging their own overall health and wellness during this timeline we saw the emergence of new platforms and technologies that gave users more information to work with than ever before.

Quantified Self

The spread of smart devices and wearables packed with sensors that included everything from accelerometers and GPS, all the way through to barometers, gyroscopes, and heart rate sensors, meant that for the first time in history people had access to a proliferation of actionable data that they could use to support their own ambitions and observations.

However, while all of this new health data was in most cases welcome it then gave rise to another issue - the issue that most people aren't trained health experts which meant that everything was open to interpretation and that users health conclusions were often misguided and inaccurate. This issue was then often further compounded by the fact that while users had access to more valuable data than ever before the design of the devices, user error, and the immaturity of some of the sensing technologies meant that the information they generated could be sometimes be inaccurate.

As a result critics of the new quantified self craze seized on these datapoints and went to great lengths to highlight the technology's weaknesses. Not only that though they also took aim at the narrowness of the data these devices

captured and therefore their overall lack of use-fullness for anything other than just basic health monitoring. And they kind of had a point.

All this asides though, love or hate them, over time these devices will improve significantly in terms of design and capability, and users will be verily flooded with data that with the right due care and attention means we'll be able to put many of these issues behind us and use them to our advantage.

SPORTS PERFORMANCE

When it comes to coaching you'll now be very hard pressed to find anyone in the world that doesn't firmly believe in the impact that big data and technology platforms have on helping improve sports performance and the role they play in helping take an athlete from good to great. And as these platforms, many of which, for example, Bio-feedback platforms and Neuro-feedback platforms, were only originally accessible to the world's top athletes, became increasingly democratised during this timeline all of a sudden athletes of all calibres discovered new ways to unlock their potential.

However, during this timeline there were developments not just in the platform

Notes:

space but across a wide variety of fields that collectively made this a very interesting and exciting space indeed to be a part of.

AI-See-You

One of the fields that began emerging during this timeline included the development of new Artificial Intelligence and Machine Vision platforms that meant that all of a sudden amateur and elite athletes alike all of a sudden had a way to monitor and track their form and performance using nothing more than a smartphone with a camera.

However, the real innovation came about in the form of new AI models that not only monitored the athletes form, without the need for traditional motion capture technologies, but was then able to analyse it and compare it with the form of top athletes and make suggestions on how to improve it.

Inside Your Head

The doctrine was established long ago that you can do everything to train and prepare your body, but if you're not mentally prepared for an event then you could still be setting yourself up to fail.

In short, body and mind have to be in harmony.

Furthermore, while it's needless to say important that this harmony helps improve an athletes overall performance it's only one part of an increasingly complex equation that now, essentially, gets us to the point where we are opening up Pandora's Box and really starting to get into athletes heads.

Visualisation has always played a significant role in an athletes training but during this timeline coaches and researchers really started to dig into the mind-body connection and try to discover new ways to unlock even more potential. As a result there was a significant up tick in the use of neuro-feedback and neuro-training technologies that had all sorts of benefits, from helping improve athletes concentration, emotional intelligence, and mind-fullness, as well as having a significant influence on muscle memory that helped give athletes an even greater edge.

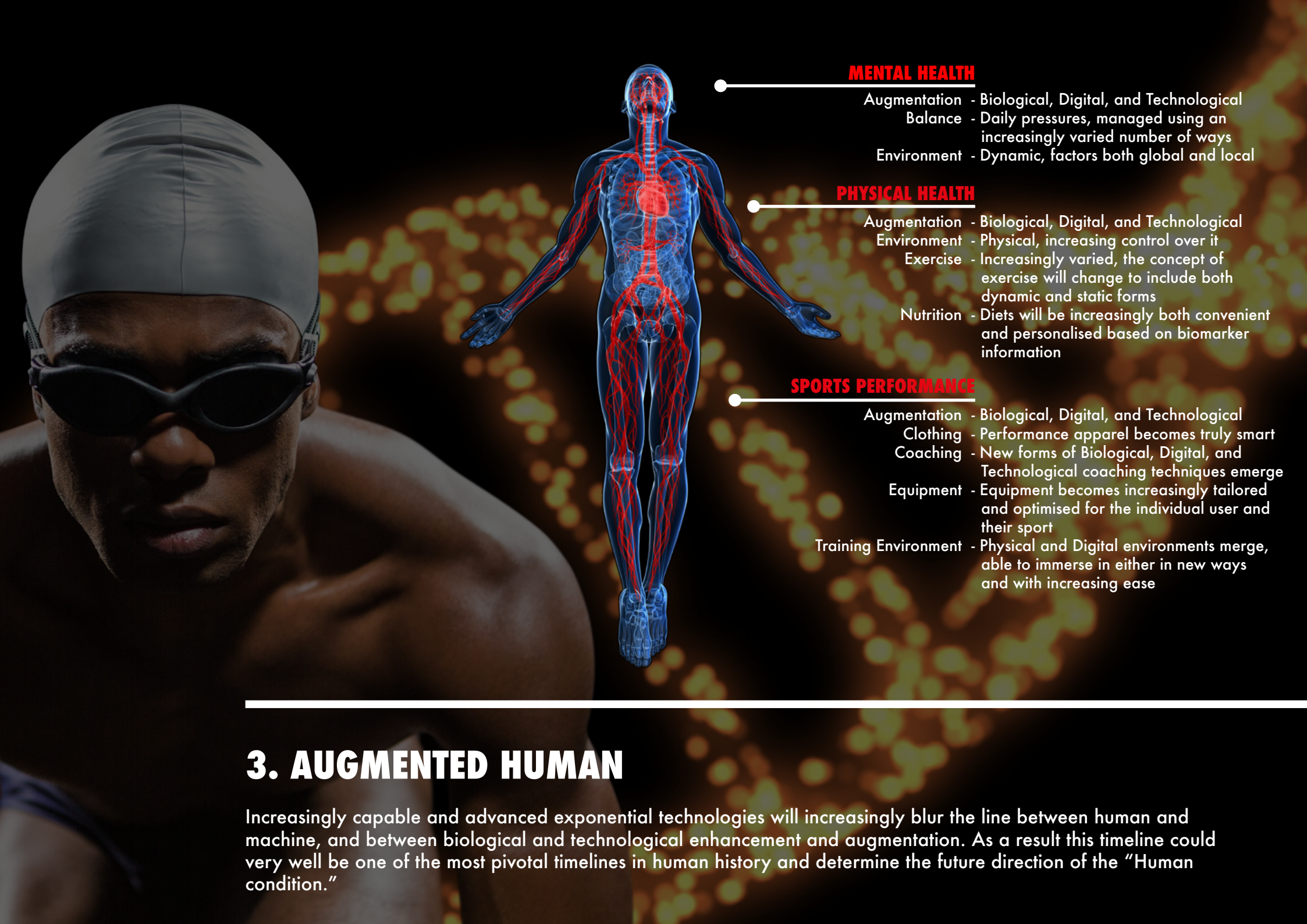
Virtual Training

Having users visualise an event in their minds is one thing, but it's an entirely different matter to be able to mentally and physically teleport them into it time

Notes:

and time again so they can not just see it first hand but experience every twist, turn, and play first hand too.

This was the promise of new simulator based and virtual reality training techniques whose accuracy and faithfulness to real events increased significantly during this timeline. In fact, as coaches began to adopt bigger and better rigs and systems, and as haptic technologies started to creep into the experience, in some cases the fact started to dawn on coaches that not only were these virtual environments providing a real, tangible training benefit, but that they also helped them eliminate the cost and need for travel. And as a result even air pressurised rooms made an appearance for altitude training during this timeline.



MENTAL HEALTH

- Augmentation - Biological, Digital, and Technological
- Balance - Daily pressures, managed using an increasingly varied number of ways
- Environment - Dynamic, factors both global and local

PHYSICAL HEALTH

- Augmentation - Biological, Digital, and Technological
- Environment - Physical, increasing control over it
- Exercise - Increasingly varied, the concept of exercise will change to include both dynamic and static forms
- Nutrition - Diets will be increasingly both convenient and personalised based on biomarker information

SPORTS PERFORMANCE

- Augmentation - Biological, Digital, and Technological
- Clothing - Performance apparel becomes truly smart
- Coaching - New forms of Biological, Digital, and Technological coaching techniques emerge
- Equipment - Equipment becomes increasingly tailored and optimised for the individual user and their sport
- Training Environment - Physical and Digital environments merge, able to immerse in either in new ways and with increasing ease

3. AUGMENTED HUMAN

Increasingly capable and advanced exponential technologies will increasingly blur the line between human and machine, and between biological and technological enhancement and augmentation. As a result this timeline could very well be one of the most pivotal timelines in human history and determine the future direction of the "Human condition."

AUGMENTED HUMAN: 2020 TO 2040.

AS THE capabilities and the development of the exponential technologies at our disposal during this timeline continue to improve at an exponential rate this timeline will potentially be one of the most transformative when it comes to determining humanity's future direction because this is the timeline that not only will technology be increasingly capable of being a part of us, but it's also the timeline when advances in genetic engineering and synthetic biology will start to mature and become commercialised.

The net result of all these developments mean that not only will humans be able to augment and enhance themselves with technology, but that they'll also be able to biologically and genetically augment, enhance, and hack themselves as well. And that opens up Pandora's Box.

Ultimately this timeline will be one of the most pivotal in human history and society will be forced to ask the question: What does it mean to be human?

Most worryingly though, perhaps, is that

the wide spread adoption and use of many of the new technology capabilities that emerge during this period will be dictated by insurance companies and regulators, many of whom are significantly behind technology's bow wave and many of whom are ill equipped to see, and let alone debate, the implications of these technologies until it is too late and they've already been adopted and commercialised en masse - especially digital technologies.

MENTAL HEALTH

During this timeline athletes and individuals will be exposed to more things and more stresses than ever before as their digital world continues to swamp them with information from any and every source on the planet, for better and worse, and as the technologies they are exposed to and draw on become increasingly invasive and pervasive, and encroach on their lives and livelihoods, as well as their own humanity, in new and unfathomable ways.

Furthermore, and to compound matters

even more, we will be entering a new phase of humanity that none of our ancestors had to experience or even contemplate which means that it will be down to us and us alone to try to understand it, navigate it, and manage the transition.

As a result, it will be more crucial than ever before that as individuals and as a society we are more empathetic and supportive of one another - irrespective of our abilities or background - after all, there will be no reset button, and we cannot leave anyone behind.

When it comes to helping people through these daily stresses and tensions though, besides from the need for an increasingly broad and deep support system, individuals will have access to a wide variety of new mental health facilities and tools - both directly and indirectly. And some of these tools will come from unexpected sources.

Big Brother our Spy and Advisor

As mentioned technology will become

Notes:

increasingly pervasive in helping us monitor and manage our mental wellbeing, and the technology that is proximal to us and on us, from the CCTV systems in our shopping malls that are embedded with machine vision to our smartphones and smart tattoos packed with sensors, and the online platforms and tools we use to go about our daily business, will be both spies and potential saviours. Which though, spy or saviour, will depend on who, or what, runs them and their motivations.

When it comes to mental health we all know we all give off cues but while some people might be superb at hiding those cues from friends and family trying to hide them from the machines, and technology, will in time become increasingly difficult.

For example, and just for starters, the sensors in all your smart devices will be streaming data about your behaviours, your conversations, interactions, posture, and even typing patterns and speeds back into the cloud to be analysed.

Furthermore, all of this information will be further augmented by the other sensors in your devices such as the accelerometers, cameras, and microphones that will be busy picking up the faintest biometric and biomarker

cues, and when all of this information, is combined there'll be no hiding place for your emotions and everything will be laid bare, from your faintest facial movement to the faintest change in resonance in your voice, and when even a couple of these data points are combined, let alone the full litany of them enterprises will be able to determine your emotions so well that even your family will be envious.

Seeing inside your mind

But there's more. As the sensors around us continue to miniaturise and become more powerful the same is going to be true of the sensing systems used in today's Brain Machine Interfaces (BMI).

Today, these sensors aren't very sensitive, which is why they have to be placed in soft caps that are worn against our skulls, but during this timeline, as we're already seeing, we'll continue to develop new non-invasive BMI sensor systems, that are, for example, based on Near Infra Red light, that can read your brainwaves from an increasingly large way away - and this is where we begin to really get inside your head to literally get the real picture of what you're thinking about.

And if you think I just happened to use

Notes:

the words “real picture” for dramatic effect then you’ll have to think again because thanks to advances in AI and neuroscience we’ve already reached the point where we can stream and visualise your thoughts, in the form of sentences and text, as well as imagery and video, directly from your brain to everything from your smartphone to YouTube.

Living in the Age of AI

As the devices and technologies around us, in all their forms, become increasingly adept at extracting and sensing more information about us all Artificial Intelligence will inevitably be the technology that makes sense of it all and extracts meaning from it. It will also be the technology that increasingly chips away at the mask we all wear on a daily basis in order to get to the ground truth about how we’re really feeling.

When these big data platforms are combined with increasingly sophisticated user interfaces, including behavioural computing platforms and conversational AI, during this timeline we’ll increasingly find that our support networks not only include human counsellors, but AI ones too, but unlike human counsellors, whose availability is finite, their AI counterparts won’t suffer any such restrictions and

will be available on demand anywhere and anywhere at a fraction of the cost, and the so called democratisation of a hitherto walled industry will have begun in earnest.

PHYSICAL HEALTH

As wonderful as technology might be, depending on your point of view, when it comes to exercise and sports let’s face it not everyone wants to get off the sofa they’re on and go for a mad run around a rainy park in the middle of winter time.

In the past though getting someone off of said sofa would either come down to their being pestered off of it by a family member, or their own guilt taking over and spurring them on - neither of which are very attractive propositions.

As the devices and technology around us though continue to sense and gather more information on us all, and as enterprises find new ways to gamify the data and experiences, and to connect us all together in new ways, we’ll now have a third entity trying to motivate us - our devices.

Increasingly these devices will have the upper hand, not only will they know your schedule for the day and know when

Notes:

you're free, they'll also know all of your behaviours, habits, and personality traits - and along with them your weaknesses which they'll be able to exploit to get you off that sofa.

But there's more. Armed with all your data and vital statistics they'll be able to call on a raft of alternative information, and they'll be able to baseline your health statistics with the other billion or so people who are plugged into their system, and then they'll be able to up the ante every time you try to resist in new ways.

Imagine, for example, your devices starting off with a mild call to action, such as "It's a nice day for a run, I plotted a gentle 2km route for you, and John said he's free to join you," that you obviously ignore, and then slowly ratcheting up the rhetoric every time you ignore the calls to action until they get to "95 percent of people with your vital signs die of a heart attack within three weeks, get off the sofa."

Let's face it, that'd be harsh, and you'd be right that the enterprise behind that platform should have a word with it's customer experience teams, but armed with data and connected to databases populated with the information of billions of people and trillions of data points this

reality is already emerging.

Static Exercise

The concept of getting all of the benefits of exercise but without having to actually do exercise has been around for a long time. While it's largely been peddled by snake oil salesmen today we've reached a point where we now have enough information and sophisticated enough tools to re-engineer your genetic code using nothing more than an IV drip or an injection containing a virus that acts as the carrier for sophisticated genetic engineering tools.

The result is that during this timeline, as these tools and techniques develop, and as regulators allow, we'll increasingly be able to modify the human genome to boost our metabolic rates and hormone production levels, alter our fast twitch to slow twitch muscle fiber ratios, and many more things besides - all in order to give us that extra edge and finally realise at least some of the benefits of exercise without having to exercise.

Or at least that is the promise of technology, but let's face it, the regulators won't allow that kind of behaviour for decades to come, so sorry to shatter the dream for you but while we

Notes:

have the technology you'll likely have to wait some decades yet before you can buy it off some digital shelf.

Technology Augmentation

During this timeline we will see the emergence of a new era in electronics, complete with entirely new classes of electronics. And furthermore, society will have to change its definition of technology.

After all, let's face it when I talk about "technology" I'll wager that even now, this far into this codex, you're still thinking of technology in bits and bytes terms, complete with devices that run traditional software on top of traditional computer platforms and traditional electronics. But the fact of the matter is that all that couldn't be further from the truth - not in this timeline.

During this timeline the term technology has expanded to include everything from traditional computing and technology paradigms to completely new ones including biological, chemical, DNA, molecular, and neuromorphic computing, and let's not forget quantum computers. And transistors are no longer just silicon, they're atomic sized and based on anything and everything from electrons

and photons, through to acids and bases, molecules, polymers, and synthetic DNA double helices. So if you thought technology was weird before just you wait until you see what this timeline has in store. And all that's just for starters.

And as for electronics, well, say hello to a wide variety of new classes including bio-compatible and biological electronics, all the way through to new forms of flexible, liquid, re-configurable, transient and even transparent electronics.

Therefore, bearing in mind that computing and electronics have utterly transformed society I would now hope you can appreciate the sheer scale of the changes we'll witness during these two decades. So with those foundations laid let's walk through things, so hold on it's going to be a ride.

As we dive into this wormhole one of the first points to note is that the way we will interact with and use technology during this timeline will change significantly - much more so than it has in the last twenty years.

Technology won't just be on us, it'll be in us and a part of us, and as we start developing more biological and biologically inspired technologies in time, towards the end of this timeline, we'll be

Notes:

able to argue that we ourselves become the technology.

This then brings me to the second point - once technology crosses this boundary, this traditional technology-human divide everything will change including how we view our own humanity and our place in the universe. And that would be enough to shake any society, including ours, to the core, and yes there will be both advantages and disadvantages.

Before I discuss how we merge with technology and what that looks like let's first take a look at the technologies that will be proximal and on us.

SPORTS PERFORMANCE

When we look deeper into how individuals during this timeline, of all abilities and backgrounds, will be able to improve their sporting performances technology, from smart devices and sensor laden clothing and equipment, through to the massive datasets in the cloud, will play even more of a central role than they do today with the data broker behind it all, your own personal AI, increasingly playing the role of data gatherer, data scientist, and best friend.

In short it will be your all seeing all

knowing side kick a coach, counsellor, doctor, and nutritionist, all rolled into one - the ultimate implication of which will mean that access to the majority of expertise and insights that we have to queue up and pay for today will become increasingly democratised and in your hands.

Now imagine having all that power at your fingertips. Imagine being able to understand and quantify what your body is doing at the cellular level in realtime and how it's responding during training. And then imagine your side kick, that can draw on the aggregated experience and expertise of all the world's top coaches, counsellors, and doctors, wrapped into it in one package, that can not only critique your form and motivate you enough to improve your PB, but that can monitor you so closely that it can sense when you're de-motivated and getting ill before you do so it can perform interventions and help you take appropriate preventative action.

Smart will inevitably be the main matra during this timeline, and everything will be smart, but the smart sensor packed systems we think of today will be long gone, compute, electronics and sensing systems will be invisibly added to and integrated into everything around you, from the fabrics in your clothing through

Notes:

to the almost invisible nano-thin smart tattoos and patches on your body.

Furthermore, when it comes to clothing and equipment the complexity and cost of producing highly tailored and personalised goods will have plummeted significantly with everything made to order while you wait, and while another machine spits out a personalised nutritious beverage and snack that, based on your side kick's data, are perfectly aligned and tailored with your biochemical and genetic makeup, as well as your goals and mood.



MENTAL HEALTH

- Augmentation - Digital, genetic, and technological
- Balance - Daily pressures, but increasingly acute from global and local sources
- Environment - Highly Dynamic, includes physical and digital sources, and immersive sources

PHYSICAL HEALTH

- Augmentation - Genetic, Digital, and Technological
- Environment - Both physical and digital
- Exercise - Increasingly varied, includes physical but also increasingly digital and immersive exercise
- Nutrition - Diets are convenient, highly personalised, and our concept of food changes

SPORTS PERFORMANCE

- Augmentation - Digital, genetic, and technological
- Clothing - Adaptable, augmented, and smart
- Coaching - Bio and Neuro feedback is the norm, the old concepts of training vanish
- Equipment - Physical and digital equipment is smart and augmented, made on demand, and tailored to the individual user and sport
- Training Environment - Digital and immersive training environments become the norm, training is increasingly techno-centric, and physical environment becomes secondary

4. SUPER HUMAN

As our ability to hack the human mind and body accelerates it is no understatement to say that during this timeline we could literally see the emergence of the first super humans, loaded with augmented and enhanced intelligence and physical characteristics, and connected with technology in ways that bring about a whole new set of challenges.

SUPER HUMAN: 2040 TO 2060.

CRANKING THROUGH the decades humanity can really consider the 2020 to 2040 timeline as the transition period that saw us enter 2020 as Homo Sapiens, and exit it in 2040 as something more - obviously depending on your point of view and how you define "more." And if that sounds like it has overtones of the X-Men about it then frankly that's because as our ability to manipulate mind and matter accelerated during these two decades we finally began cracking the life's magic code.

However, while the advances during this earlier timeline were significant our ability to embrace the majority of them would have been held back by questions about ethics, liability, and regulations, as well as the cultural unease that goes with breaking our bodies own programming - irrespective of the benefits.

That said though, as technology increasingly enables humanity to enter the next phase of our evolution, whether it's by hacking our genomes or our minds, or both, there will be groups that embrace the changes and those that don't, and not only will this likely cause a

societal split, but the subsequent debates and discussions about the implications of it all will likely be among some of the most significant in human history as we increasingly face the prospect of being able to leave our old humanity behind and turn the page on humanity's next chapter.

As a consequence of all of this as I discuss the possible futures of this timeline for now we will conveniently leave some of these societal issues at the door to explore the art of the possible. But that said though, as I always advocate, we must step into this future cautiously and with eyes wide open, with ethics and society's best interests as our North Star - this should not be a rampant charge into the darkness.

Now that I've laid that out there, let's dive into the wormhole.

MENTAL HEALTH

During this period it is easily arguable that individuals will face some of the most challenging and transformative situations

of any era in human history that will test every aspect of their beings like never before.

Not only will they be subjected to the traditional local pressures we face today such as the pressure of friends and family, relationships, and careers, with, of course the added global twist of living in an increasingly connected and digital society where an event on the other side of the planet can have a detrimental impact on their moods, but they will also increasingly have to navigate challenges surrounding their own mortality and what it means to be human.

So let's break this down before we dig into how these challenges are tackled at an individual and societal level.

Exponential Pressures

In the past the problems that affected and influenced us were predominately linear and local. In the past, frankly, life was simpler. Fast forwards into the future and all of a sudden we're exposed to more events, more news, more opinions,

Notes:

and more voices than ever before from every corner of the world. And to compound all of this it's all just a click of a button away - we no longer even have to leave the comfort of our sofa's to experience it. Not only is life more connected and global, but it's also more convenient and in your face, and as a result this situation in itself creates more stress and puts more pressure on our mental faculties.

Then add on top of all of this that, thanks to the now ubiquitous presence of synthetic content, which includes being flooded with fake information as standard, and the increasing rise of robo-automation technologies that are increasingly automating large swathes of the workforce and you have what begins amounting to a pressure cooker of anxiety and stress.

But we're not finished yet. Not only are we living more of our lives online, and not only are we now experiencing more things from more places than ever before in new ways, and having to navigate career changes as deftly as we used to switch channels on an old fashioned TV, but we're also having to consider the fact that we're all going to live longer because of revolutionary advances in exponential healthcare and the impact that that has, while also trying to get our

heads around the mental gymnastics of being able to edit our own genomes and augment the human body, as well as our own consciousness in new ways.

As we continue to see the rise of bio-compatible electronics, invasive and non-invasive brain machine interfaces, as well as new forms of exoskeletons, neuro-prosthetics, as well as the rise of memory augmentation, downloading, editing, uploading, and transfer, just how will the individuals living in this time manage all of the above as well as coming to terms with the fact that hacking their own minds and genomes is as easy as ordering a kit off the internet?

And let's not forget that not only will they be able to live life in the physical world but that they'll also be able to live out portions of their lives in increasingly convincing and realistic immersive worlds, and, during this timeline that they'll also increasingly be able to connect their own minds and consciousnesses to AI, each other, and the machines in the cloud. Which then begs the additional question of just what are the mental implications of being able to communicate with other people and systems telepathically and via a Hive Mind?

As you can see just from this brief diatribe living during this timeline on the

one hand is going to be off the hook, but it's also going to challenge us mentally in ways we have never ever experienced before. Furthermore, where we're going there's no map or playbook, there's no one we can talk to from our past that can help us decompose and make sense of this insane future where science fiction is now our everyday.

That then begs the question, if those are some of the challenges we'll face, then what's the solution? And I'm glad you asked - let's dive in and look at what we can do to help the people in this timeline not only enjoy the benefits of all these new and, frankly, crazy things, but also enjoy it and have fulfilling lives and experiences.

Managing the Mind Minefield

Firstly and foremost let's not forget that we humans are amazingly adaptable and that we're also much more mentally agile than we give ourselves credit for. And the evidence of that is all around us - just think about how you manage you days now and then imagine what would happen if you'd dumped your average daily experience onto one of your great ancestors. Not only would their minds be blown but they'd probably retreat back into their house, close the door and hide

from you.

As we all go through this era of change we will all need one another more than ever, empathy and the sense of just being human and belonging will be more important than they arguably ever have been in the past, and the society of this time will need to do its best to work together selflessly and in harmony in an attempt to counteract and overcome many of the new challenges that will arise and that, for different reasons, could drive wedges through different parts of society.

During this timeline the number and type of treatment options that are available will increase substantially and include the everything from an individual's ability to choose a human only treatment plan all the way through to their being able to select an AI only treatment plan, or any combination of the two.

During this timeline systems will, arguably, be fully intelligent, and we'll see the emergence of the fabled Artificial General Intelligence - a type of intelligence that will transform society and challenge humans in ways we've never seen before, and that will open the door to a whole new raft of AI abilities and capabilities. When these intelligent systems are combined with

Notes:

an increasingly smart environment where everything, from the cameras and devices that are in us, on us, near us, and distant from us, are increasingly crammed full of intelligence and increasingly sensitive and sophisticated sensor systems that are streaming every type of data imaginable back into the cloud we'll truly start seeing a sea change in how mental health issues are detected, managed, and treated.

As a result these systems will be able to determine people's state of mind and their moods by monitoring everything from the inflections in their voices, the faintest skin flushes, and their posture, through to their activity patterns and behaviours in real time - all of which can be unified together to create an accurate portrait of their overall well-being. And once these systems have acquired up this corpus of data and come to a conclusion that something isn't quite right then they'll also be able to make timely interventions.

At first these interventions will be minor though, you can think of them as being small tactical prompts that just nudge the individual into a new pattern of behaviour, but if those don't work then those interventions will become more assertive and impactful.

One of the most significant changes these types of systems will bring about though is the ability to detect the onset of symptoms very early on, perhaps before even the individual knows they're there, and before they start having a significant impact on their lives, and yes, while these systems will be able to go full tilt and offer individuals deep one on one sessions if needed it might well be enough that the first small interventions they perform are enough to stave off more severe symptoms.

Mind the gap

Going even deeper into the wormhole though as our knowledge of how the human mind works and our ability to read and stream memories and thoughts, as well as download and edit them, improves this then brings us to a new form of widely available treatment during this timeline - the ability for counsellors and qualified professionals to make physical memory interventions that, as we're already seeing happen today, will let them edit or erase unfavourable memories, as well as upload new ones. And I obviously don't have to have a conversation with you about the Pandora's Box that will open.

Furthermore, when we consider that

Notes:

during this timeline we'll have the technology to bi-directionally connect people's minds, using either invasive or non-invasive Brain Machine interfaces, to the machines in the cloud and to other people, as well as then have the ability to create Hive Mind constructs, there is little to suspect that we wouldn't be able to perform these interventions remotely. And if you think that's crazy don't worry we'll edit that thought soon...

Going deeper the emergence of these new Hive Mind constructs themselves, whether they be human to machine or human to human, also means that we may be able to harness the collective intelligence and capabilities to help people in completely new ways.

PHYSICAL HEALTH

As mentioned this is the timeline during which there are more questions about what it means to be human, and humanity's place in the world, than ever before.

This is also the timeline during which we will see the birth and creation of more designer humans - a trend that first started during the previous timeline but only at a moderate level and only in medical settings and on the fringes.

However, as our understanding of the genetic code and our ability to manipulate it for gain improve during this timeline genetically engineering yourself will be as simple as using a computer to sequence a new gene, or even entire genome, complete with the traits you desire, printing it off using a bio-printer, and then inhaling it using nothing more than a nebuliser and an off the shelf mRNA delivery agent - genetic engineering yourself, and therefore genetic enhancement, will never have been so easy.

It obviously goes without saying that this is perhaps the ultimate augmentation, but also the ultimate Pandora's Box because this is a deeper wormhole than you think.

Decades ago, pause for a moment and note those two words, not only did we manage to figure out how to edit the human genome to allow us to improve and enhance everything from our cognitive and physical capabilities, from endurance and strength to intelligence and reflexes, but we also figured out how to turn human cells into multi-core computers and therefore turn the human body into a biological supercomputer capable of detecting disease biomarkers and manufacturing the appropriate treatments in vivo - as well as many other things besides. But that's not all, not by a

long shot.

We also found a way to run two genetic codes in one organism, so imagine the benefits and implications of that, found ways to make bacteria, and by extension humans, resistant to every known pathogen on Earth, and we even managed to improve on life's amazing code itself by creating new forms of synthetic DNA that has six and eight base pairs not the four that we have today. And if "life" managed to do all this with just four base pair DNA then imagine what we could do with eight.

And all of this is before we get anywhere near talking about the potential to turn the natural order on its head even more by being able to create semi and fully synthetic cells that combine different organic and inorganic elements together to create cells, and thereby organisms, that have no equals in nature. Furthermore, when you combine all these individual advancements together all of a sudden we reach a place where the living cells within our own bodies become the equivalent of factories, being able to churn out strange new synthetic proteins as well as new synthetic hormones and even treatments for disease on cue.

The result of all this is, of course, that as we crank through the timelines the

future will increasingly make even science fiction look tame, and for the very first time, and at the extremes, not only could we eliminate disease but we will also have the ability to create the world's first artificial humans, whose genomes are entirely synthetic and who are grown and incubated using artificial wombs without the need for biological mothers or fathers - at which point using these new tools to fight disease, cure inherited genetic conditions, and to improve our health and wellness, looks like a relatively modest proposition.

If you thought we'd finished though, well, there's more. Not only will we have access to increasingly powerful and democratised gene editing tools, but we'll also have new handy helpers in the form of nanobots and nanomachines that, while they and everything else in this timeline will no doubt give regulators kittens, will be able to move around our bodies autonomously hunting down and killing disease, clearing arteries of plaque, and performing basic house keeping duties that include the occasional in vivo surgery.

These nanobots and nanomachines have helpers too in the form of nanoparticles that, when combined with other technologies, will be able to heal cartilage and tendons, for example, in

Notes:

an hour or a day, not the months it takes us today. And then there's our ability to create custom made human organs, and while this is a different type of proposition to the apparent ease of just breathing in a super serum it's one that's going to be on the table.

After all, why have the organs you were born with when you can have enhanced organs, naturally this isn't something you're going to want to do yourself, but if you've been one of the unlucky people who's been knocked down by an autonomous vehicle during this timeline or dropped from a sky taxi then hospitals and treatment centers will have the ability to not just bioprint you a new organ, if you need one, but they'll also be able to print it out complete with electronics and sensor systems.

Imagine for example having enhanced adrenal glands that pump out more adrenaline, or an enlarged heart that monitors itself and restarts itself if you have a heart attack. And all of that is just the tip of the iceberg.

As you can see during this timeline the so called tools we will have in our kitbag so to speak that we're able to leverage in order to monitor our health, diagnose and treat illness, and to keep us living healthier lives for longer will be out of

this world. But they're just a few tools out of hundreds that we'll have at our disposal with other tools including the sensor systems around us and the idea of the quantified self, and much more.

SPORTS PERFORMANCE

As discussed we are now truly in the age where your cognitive and physical limitations are no longer exclusively determined by your background and environment. This is the age of augmentation - the augmentation of everything, right down to the genetic level. And provided it's legal and the regulators have given it all the green light then this will literally be the age where the latest must have won't be the latest smartphone or gadget, it'll be latest augmentation.

Augmentation comes in many forms though. Of course, as we've discussed there's genetic augmentation and augmentation at the cellular level, and then there's cognitive augmentation where you can be non-invasively plugged into the experiences and knowledge of hive minds.

Taking a step back from all of this for now though before we delve in deeper later, there's also the augmentation we

Notes:

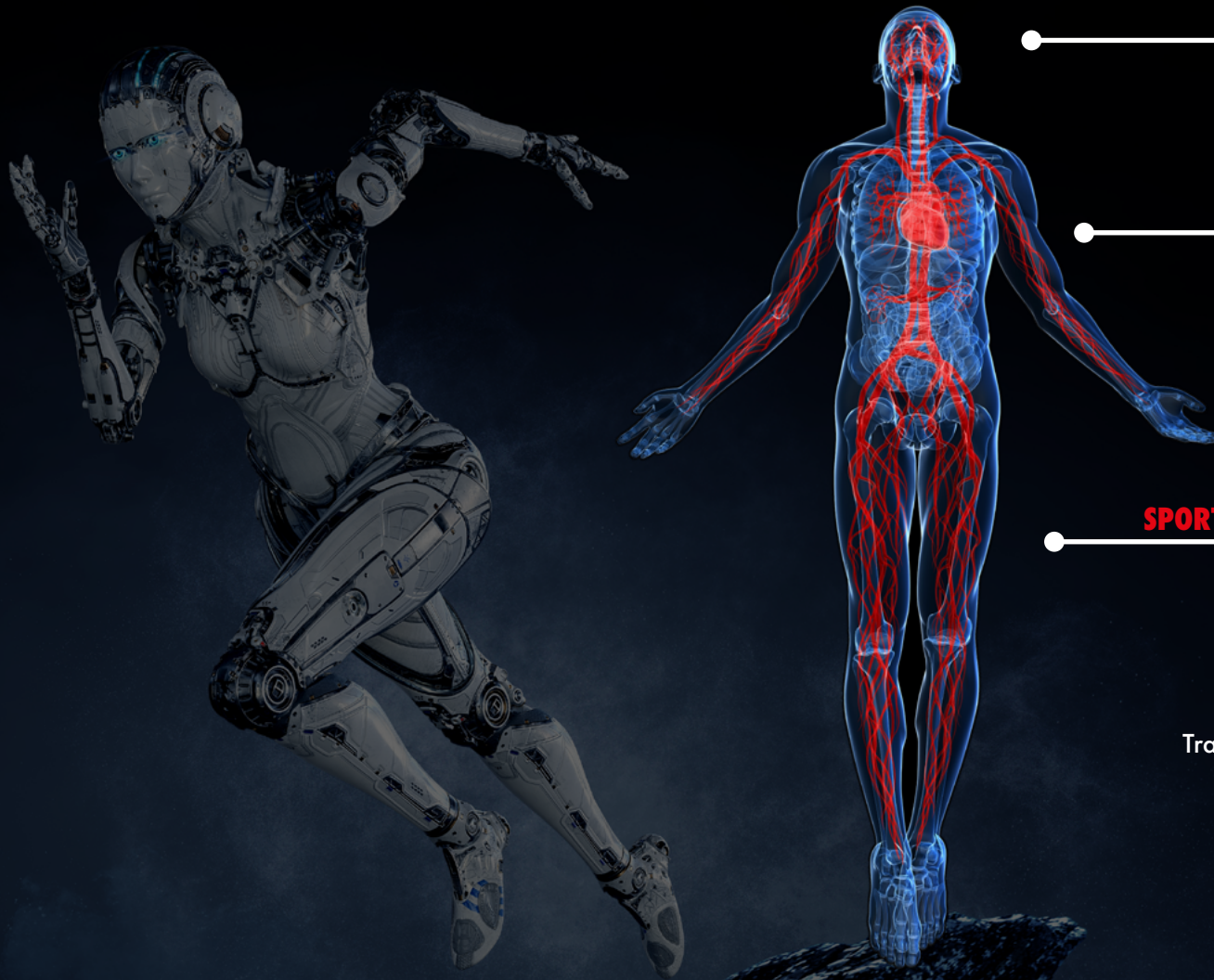
can achieve by using enhanced clothing such as soft exosuits that could let you bench a bus, not just bench 150 kilos, or the type of clothing that reacts to you and your environment, morphs, and uses electrical stimulation to optimally synchronise your muscle contractions to boost your speed and endurance - whether it's during training or during an event. And then of course there's the benefit gained from being able to manufacture custom sports apparel and equipment tailored to the individuals unique characteristics on demand.

From a genetic perspective, frankly, once we've mastered re-writing life's code almost everything is on the table, from enhanced reflexes and super intelligence, through to bodies that prioritise specific types of muscle growth and recover and self-heal in a fraction of the time they do today. And as for our cognitive faculties new memory augmentation technologies will not only help re-wire our brains and help improve the muscle-memory connection, but, if we want to, we'll also be able to tap into AI in new ways to help us devise new game winning strategies, as we saw decades ago with the first AlphaZero's, and get us in the right zone mentally.

Then, finally, we can bring all of these different developments together and

combine them with new immersive reality training techniques and digital experiences and platforms to do even more and go even further.

Notes:



MENTAL HEALTH

- Augmentation - Primarily technological
- Balance - Increasingly acute daily pressures
- Environment - Highly dynamic and intense, including digital, immersive and physical sources

PHYSICAL HEALTH

- Augmentation - Digital, genetic, and technological
- Environment - Digital, physical, with both being equally immersive
- Exercise - A huge range of options crossing the digital, immersive, and physical worlds
- Nutrition - Hyper personalised, new food production techniques become increasingly the norm

SPORTS PERFORMANCE

- Augmentation - Digital, genetic, and technological
- Clothing - Augmented, smart, hyper personalised
- Coaching - Full 360 degree feedback from digital and physical sources and hyper connected
- Equipment - Adaptable, augmented, hyper personalised, smart, and fabricated on demand
- Training Environment - A huge range of options crossing the digital, immersive, and physical worlds with more training being primarily techno-centric

5. ANDRO-HUMAN

As we move beyond 2060 we will have the technology and tools to move way beyond what we consider today's or even tomorrow's human proposition and the only thing holding back their adoption and use will be culture, ethics, and regulations. If, or rather when, these hurdles and objections are overcome then the future of the human race will radically transformed.

ANDRO-HUMAN: 2060 ONWARDS.

AS WE blow through the 2040's and the 2050's we now find ourselves in the 2060's, and there will be no precedent for us to base our experiences off of. As a result the society of this time will need to be more empathetic and unified than ever before with clear, equitable, and transparent leaders.

As I've said many times before exponential technologies are a rocket ship, and lest you forget almost all of the things that we considered science fiction in the late 1900's became fact, albeit at a basic level, in the late 2010's - a period in time that's now 50 years or so gone.

Additionally, and lest we forget that in 2001 some of the leading futurists of the time said we would see more technological progress made in the next twenty years that we had in the previous 20,000, and if the Cancer killing nanobot swarms that first emerged in the late 2010's don't convince you that that's a true statement then I don't know what will.

As for the reason why I'm laying all of

this out there for you and re-capping it's because, frankly, I think you're going to think that the content in this particular chapter is straight out of science fiction. Although, that said, let me assure you that science fiction has got nothing on what's coming, and I'm only going to be lifting the lid on and combining the

Click me to find out
more about the Science Fiction
technologies that are now Science
Fact.



exponential technologies that have already emerged and their descendants.

So, all that said, let's dive into the wormhole, and as we dive into it, for now at least I'm going to assume, likely incorrectly so, that the cultural, ethical, and regulatory objections that will hold

back and slow down the adoption of some of these technologies and concepts will have been overcome.

MENTAL HEALTH

I feel that I could comfortably argue that the stresses of this time on the human mind will be like nothing we've ever seen before and that those stresses could lead to the unravelling of different parts of society. I also feel I could comfortably argue that during this time we experience a period of mental balance and Zen unlike anything we've ever seen before. And I'll bet that that confuses you because it does me, so let's get into some details and look at some of the causes and some of the solutions.

Our mental wellbeing is, arguably, largely the result of many different influencing factors including, but not exclusively, our careers, our environment, our family and social relationships, our health, and our lifestyle, and during this period they are all being impacted in different ways for the better and worse, and to a depth and intensity we've never

Notes:

experienced before. As a consequence it seems to make sense to delve into them all one by one, but remember what I'm going to run through below are super summaries of what are increasingly complex and deep topics in themselves so if you're the curious type then consider buying me a molecular coffee. Yes, that's a thing, look it up.

Careers first. During this timeline Artificial General Intelligence (AGI) and General Purpose Robots should now both be firmly established, fuelled and powered by new materials, and new Biological, Molecular, Quantum, and Neuromorphic computing platforms that pack more computing power than the power of the universe into packages no larger than your average smartphone.

As a result the automation of both cognitive and physical jobs, across every industry, from finance to manufacturing, and every job type, from creative jobs and cyber security jobs, to research and science jobs, will have arrived in earnest.

Furthermore, fully autonomous companies and the speed of change as increasingly intelligent machines learn and automate more jobs and tasks faster, will simply add to the mental stress during this timeline as individuals have to lean more on the government

for financial assistance and adapt faster within the construct of an increasingly rapid changing jobs market. As onerous as all of this sounds though today we have some solutions that will help us manage and navigate all this, but as I mentioned this is a super summary.

Next up comes our environment. On the one hand our smart homes will be able to sense our emotions and moods and adapt our home environments to balance them, but outside, if climate projections are right, our front yards will be flooded while the trees are on fire. And thanks to our increasingly digital hyper connected world that's increasingly chock full of fake and questionable synthetic content we'll also be exposed to every experience and every news item, good and bad, irrespective of where it takes place on the planet and irrespective of which virtual world it takes place in.

Then comes our family and social relationships that will be affected by the confluence and emergence of all these new exponential technologies, as well as the disappearance of privacy - even though we will have new ways to anonymise ourselves and our activities.

On the one hand, when it comes to relationships, distance will be a non issue and you'll be able to feel hugs

Notes:

from people across the other side of the planet, while non-invasive neural interfaces could also project their emotions right into your head, while you all experience the same virtual reality world. And then on the other your social circle will also likely include affective digital humans, machines, and robots that aren't just limited to living life behind glass or plugged into your home's wall sockets, but that can, in the same way people during this timeline can - and much more.

Skipping next onto health, physical health, many of the developments we first saw emerge in the early 2020's, from our ability to print replacement human organs on demand and our ability to genetically edit and engineer people using nothing more than aerosol based gene editing tools, through to autonomous Robo-Surgeons, designer humans immune to every known pathogen on the planet, in vivo surgical nanobots, partial body regeneration, and much more, will now have passed regulators scrutiny to become mainstream.

The upshot of which means that not only will human life extension take a giant leap forwards, but so too will the amount of time we have to live longer healthier lives. And that's all before we discuss

being able to use details of someone's biology to create hyper personalised, nutritious, and delicious foods on demand using anything from 3D or 4D printers to Bio-Reactors and Molecular Assemblers.

As you can see from all of this, bearing in mind this is the super summary, our minds will have a huge amount to deal with and process, at both the individual and societal level, and then add in some nefarious elements and the occasional life changing situation and the pressure will ratchet up even more.

The balance to all of this though will be two fold, on the one hand communities and society will have to adapt and unite like never before, and meanwhile the people who find themselves under pressure will need to have access to the support of those communities and networks however and whenever they want. And in the future that means everything from being able to talk things through with an AI counsellor while walking and talking through problems in a virtual world, as well as connecting telepathically with another person, group of people, or a hive mind, on the other side of the world or maybe even next door. That is if next door didn't get flooded during the climate crisis...

PHYSICAL HEALTH

As I discussed during the last timeline the rapid development of new powerful and sensitive sensors and sensing systems that are infused with intelligence and combined with the emergence of new devices that are proximal, on, and in us, will let us and others quantify our physical and mental health with a level of granularity that today only doctors and hospitals can dream of.

However, when it comes to physical health, again, there are a number of different aspects to take into account, including diet, environment, exercise, genetics, and our own mental well being - something we dove into in the previous section.

Personalised diets on demand

So, diet first this time. As the sensors and intelligent sensing systems that are proximal, on, and in us, improve down the decades by this timeline we'll not only be able to tell what our heart rate was during a particular activity but we'll also be able to diagnose and monitor the tiniest changes in our biochemical and genetic make up, and pretty much everything in between - the implications

of which mean that we'll know precisely what nutrients and vitamins our bodies are deficient in. And as our ability to produce and manufacture individually tailored and personalised food on demand, of any type, and with any nutritional composition and taste, improves through the decades by this timeline the microwave oven in your kitchen will have been replaced with a Replicator based on the 3D and 4D printing, bio-reactor, and molecular assembler technologies that emerged at the start of the millennium.

The result of all this will, of course, be that no one needs to go hungry, agriculture in its current form starts vanishing, and that everyone has access to the high quality diets they need.

Personalised environments

As I covered in the previous section about mental health not only is this the timeline when many experts believe climate change will begin to bite, but it's also the timeline when over half of the world's energy, if not more, should be coming from renewable energy sources and the timeline when most modes of transportation, from aircraft and cargo ships, to cars and semi-trucks, have been electrified - all of which is a

Notes:

story in itself and something for another Codex. Despite these changes, as well as changes in manufacturing and consumption behaviours, it's highly likely that the people of this age are now living with the climate fallout from previous generations activities which, as we're continually told, will generally manifest itself as increasingly extreme weather events and rising sea levels, which will not only change where people live but also how they live.

The consequence of all this means that from a health perspective we may well be having to deal with a climate that, frankly, humans just weren't built for - including an increase in disease factors. All this said though never forget that we humans are ingenious and for every problem many of us see solutions.

Solutions that include re-balancing the planet's climate using increasingly affordable, powerful, and scalable technologies, such as the technologies we first saw emerge in the 2010's that could help us stop hurricanes before they form, as well as a myriad of carbon sequestration, climate engineering, decarbonisation technologies, and solar geo-engineering solutions, to name but a few.

However, while we may well have

to try and find new ways to manage the outdoor environment the smart indoor environments will all be hyper-personalised and perfectly balanced according to our own individual requirements and moods, and as everything becomes increasingly connected, from an indoors perspective at least, these personalised climates will be able to follow us wherever we go, whether it's at home, travelling in autonomous vehicles, or in the office - albeit that during this timeline that office will likely be just a virtual world that we inhabit while we're on the futuristic sofa.

A new dimension in exercise

During this timeline our mastery and understanding of how to edit and manipulate the genetic code has reached new highs, and ethics and regulators asides, we now have a way to modify the human genome in previously unimaginable ways using nothing more than an aerosol that include, but not limited to, changing hormone production, increasing our metabolic rates, changing our body's primary sources of energy, scrubbing plaque from our system, and fine tuning the ratio of fast to slow twitch muscle fibers. All of which will have a significant impact on health and performance.

Notes:

While there will inevitably be people who just opt to take what we call today the cheaters route and tomorrow we call tailored health services, there will still be a mass contingent of people who opt for the more traditional route and exercise in the old fashioned way. By which in this timeline I of course mean using smart morphing apparel packed full of sensors and compute that can flip between conventional modes, where your clothes simply monitor and pass data to your AI coach to analyse and process, and alternative modes that include their ability to switch states to become soft exosuits - for that extra boost when you need it.

I always talk about combinations though, so lets get deeper into that wormhole. In the late 2010's we saw the first examples of being able to turn living organisms into sensor systems at the genetic level that could detect everything from Infra Red and RF through to the faintest chemical signatures, so this is where now, during this timeline, our smart apparel and soft exosuits aren't only able to adapt to the situation but they can also communicate with our genome on a cellular level and command it to boost the production of adrenaline, increase oxygen absorption to counter lactic acid, and much more. Just think of that - body, mind, and

clothing in perfect sync.

But no commentary about exercise during this timeline would be complete without a foray into the virtual world. But these will be no ordinary virtual worlds. They'll be fully immersive, mentally and physically, and the synthetic content that makes up these worlds will be built procedurally on the fly by creative machines that are reading your thoughts in real time to re-create any and every type of world that you can, and as I'll discuss in later chapters, can't, imagine.

By this timeline we'll be able to simulate and emulate everything - from your ability to run, or with your exosuit, sprint a marathon in your own living room courtesy of electro-magnetic flooring, through to your ability to feel what's like to base jump off of Mons Olympus on Mars - that is unless you can't get there in person, something else that will just be starting to become feasible during this timeline.

The Genetic Superhuman

As covered throughout this Codex by this timeline our ability to manipulate the human genetic code is not just better understood it's simpler - as simple as breathing in an aerosol spray containing

Notes:

a gene editing tool that has been pre-programmed to track down, edit, and if need be replace whatever and whichever genetic sequences you like. But why stick with just a four base pair DNA helix when you can opt for a six or an eight base pair one, and why just run one genetic code when you can run two in parallel? And while you're at it why not turn your cellular machinery into powerful biological supercomputers that can not only make you immune to every known pathogen on the planet but that can also repair you, strengthen you, and clear out all the cellular junk to keep you as physically fit and capable as a twenty year old even though you're now pushing the ripe old age of a hundred and fifty?

This all sounds like science fiction doesn't it...? Well if it does then I can tell you one thing for certain, you haven't read my Codex or clicked on the big red sci-fi button at the start of this chapter. This then all begs the question - if all the above is now possible then what are you going to do with it all?

SPORTS PERFORMANCE

From smart morphing apparel made of digital metamaterial fabrics that can monitor an individuals body at

the cellular and genetic level and switch states so that one minute they're conventional, and the next they provide all the power and support of a soft exosuit, through to genetically engineered superhumans the future could be much wilder than you think. Which then begs the question just how do you coach individuals who can turn performance on and off, and who have access to a raft of exponentially powerful technologies that make science fiction look tame? Well, let's dig in.

Training for superhumans

By this timeline, again as we spin down into the wormhole, not only will coaches, whether they are AI or human, be able to monitor your bio-neuro and biological feedback at a granular level, and provide tailored coaching programs and then use neuro-stimulation technologies to boost and enhance your performance, but we'll also have the ability to upload knowledge to your minds, but not just knowledge, expertise and programs. Imagine, for example, being able to learn all about a sport in seconds, but not just that, acquire all the skills to play it in that same instance, and then being able to sync that with your physical performance and muscle memories.



6. ROBOTS: FRIEND. ENEMY. ULTIMATE COMPETITOR.

Robots are evolving. Your future team mates and adversaries are evolving. And they are evolving at an exponential rate. Are you ready to bring your game?

I, ROBOT: 2020 TO 2070.

WHEN YOU say the word robot most people instantly think of the hard form metallic automatons that all too often have all the dexterity and intelligence of a three year old child. But what they don't necessarily realise is that today a couple of these automatons are capable of doing parkour - as well as flying through the air in a way that even human gymnasts would goggle at. But that's not the whole story, not by a long short.

Today we have robots that, yes, are fully metallic, but we also have bio-hybrid robots that are part organism part robot, conscious robots thanks to an exponential technology known as Neurobotics, molecule sized robots, soft robots that can squeeze into, well, anywhere, and then perhaps one of the ultimate types of robots of all - Artificial Intelligence. And that's before we discuss common-a-garden drones or the arrival of General Purpose Robots that can self-evolve, manufacture and replicate themselves, that learn via intuition, and can exchange experiences and knowledge via AI powered cloud connected Hive Minds. So, if you thought a robot was just that, a

robot, think again.

As all these different forms of robots develop and evolve though, at an increasingly exponential rate, on the one hand we're going to be able to incorporate them into the world of sports in new ways, but whether they are digital or physical, or every kind of mix in between, they'll also increasingly become our team mates, and the ultimate opponents. In short you'll never have encountered any opponents like these - from shape shifting polymorphic robots that can update their skills on the fly through to AI fuelled adversaries that can upgrade and evolve themselves at a rate hundreds of billions times faster than humans can. Until that is we ourselves, in the 2060's are able to tap into some of these capabilities ourselves.

So, all that said, let's now quickly dive into the world of robots - your ultimate team mates and ultimate nemesis.

I, Robot

Robots are evolving. Physical robots I

mean, and by evolving I mean literally evolving, not metaphorically.

The advent of creative machines, new manufacturing technologies, new materials, and new sensor systems, as well as new code constructs and simulation platforms, mean that tomorrow's robots will look, behave, evolve, and learn in ways we've never seen before.

Packed full of sensors robots, like the ones I've already seen emerge will be able to generate and stream data about themselves to intelligent creative machines that, when given a goal, will run millions of virtual simulations a minute in order to design a better next generation robot before sending the new design off to a 3D printer to be printed, or a 4D printer where it can be printed and walk right off the printer bed without any human assistance.

Furthermore, thanks to a new field conveniently called Evolutionary Robotics, the code bases of multiple different robots, who might all be poorly suited to accomplishing a particular task,

Notes:

will be able to be merged, in the same way animals have merged DNA for billions of years to evolve into new forms of life, in order to become better versions of themselves that are better equipped to handle whatever's getting thrown at them.

Now throw in some shape shifting capabilities, swarm intelligence that allows these robots to not only team up but also combine together and transform themselves in a way that, literally, resembles a famous movie franchise that I won't mention, and add some polymorphic materials just like the ones in another deadlier movie franchise that let's liquid-like robots assume any shape they want and all of a sudden the robots you see zipping around your living room floor cleaning your carpets look rather quaint.

And all that's before we discuss connecting them all to the cloud and plugging them into the equivalent of a Hive Mind platform that lets them share experiences and learn from one another which then creates a virtuous cycle of near real time evolution and learning.

Robots that are soft

What applies to our typical hard form

robots, as well as our polymorphic future friends, also applies to the field of soft robots with the only exception being that unlike their cousins they've always been soft, and if we had to talk in evolutionary terms again soft robots are simply another branch of the robot family tree that, over time, will evolve along their own paths to create a veritable cornucopia of different robots that are as at home as they are on land as they are in water.

Robots that are software

Perhaps the pinnacle of robot evolution though are software robots. Sometimes called Assistants, Bots, or Robo's, they are all powered by AI, lack physical form, and live in the digital ether with the most advanced among now edging closer to the point in time when they are able to evolve millions of times per minute and able move around the planet at near light speed.

However, and let's get into some details here, while a physical robot, for now, cannot take the form of an AI robot running in the digital ether the reverse isn't true for software robots.

Thanks to developments in advanced manufacturing, creative machines, and

Notes:

simulation engines, that these AI's can not only use to help them design and innovate physical forms but manufacture them as well, we are now at the point where we can see a point in time where these types of robots can manifest themselves physically - a trend that's only reinforced when you consider that today thanks to multi-material 3D printing, for example, we can print soft robots complete with embedded electronics and sensors in a single run. Extrapolate these technologies out and by 2030 these robots will be able to manifest themselves in increasingly complex and sophisticated physical forms.

So, bringing it home, now imagine that the AI adversary that you're facing off against in your E-Sports or virtual game can not only create a real world likeness of itself, or a counterpart, but also use these same advanced technologies to design and manufacture physical functioning equipment that it can control, from drones to vehicles and beyond. But, we're not done there, not by a long shot.

Today most of the advanced manufacturing technologies we're developing will let us realise the future I've just laid out, where the products these robots can create are made out of traditional, albeit increasingly futuristic, materials that over time include

everything from Digital Metamaterials, which could be used to create products that can turn themselves invisible, as well as futuristic shape shifting Polymorphic materials. However, when you swap these more traditional forms of exponential manufacturing technologies out and replace them with Bio-Manufacturing technologies all of a sudden we unleash a completely new level of weirdness because as we fast forwards beyond 2040, they'll also be able to design and manufacture their own organic products... and synthetic lifeforms. And that's a whole new story, and one that's already coming true today, let alone in several decades time.

Combine all of this weirdness with creative machines that can procedurally imagine and generate new virtual games, sports, and worlds on the fly and you now have, frankly, an insane new mixed reality world, in the truest sense of the phrase, where almost anything and everything is possible.

FUTURE ARENAS AND EXPERIENCES



CHAPTER SUMMARY.

ANYTHING AND anywhere can be a playground or an arena where we come together to play against one another and enjoy sport, and while today there are a huge number of options available to people tomorrow the number of and the variety of digital and physical arenas they can enjoy will be infinite.

These arenas will range from the purely digital to the purely physical, to the mixed, to the on world, to the off world, and eventually even people's minds will become the new play space.

GO DIGITAL

As people's ability to create new digital worlds and arenas improves increasingly we'll be able to use Augmented Reality and Mixed Reality technologies to create new arenas, and then play in them using AR and MR devices, glasses, and headsets, smart contact lenses, and increasingly sophisticated and realistic haptic feedback systems - imagine, for example, playing virtual "unlimited" basketball indoors or outdoors where you feel and experience everything.

BUILD IT THEN MIX IT

New manufacturing technologies such as 3D and 4D printing, autonomous robotic manufacturing, and, in time, Molecular Assemblers and Synthetic Biology, will eventually let people build new physical arenas of increasing complexity and size, and augment existing physical spaces, cheaply and on demand. They can then combine these with new digital overlays.

NEW COMPETITORS

In the future we won't just be competing against ourselves or our friends, but in digital arenas we'll be competing against AI powered foes, and in the real world we'll be competing against everything from drones to robots, and beyond.

IMAGINATION WITHOUT LIMITS

Use Brain Machine Interfaces to turn other people's minds into play spaces, and as Creative Machines, that can innovate and produce digital content, as well as new digital and physical products, emerge they will be able to design new amazing arenas on demand.

FUTURE ARENAS AND EXPERIENCES





WHEN WE discuss the future of arenas, the places where people as well as future machines and digital entities go to play and compete with one another, even our human imagination isn't going to be the limit because increasingly these arenas, whether they're physical, mixed, or virtual, are going to be ideated not just by humans, but also by increasingly imaginative and innovative Creative Machines - the same machines we're seeing emerge today and that I'll discuss in more detail in the following chapter.

Furthermore, as increasingly powerful exponential manufacturing technologies continue to arrive our ability not to just create and imagine digital arenas will improve over time, but our ability to quickly build, adapt and even morph physical arenas, whatever their form and wherever they are, will also exponentially improve over time as well.

In short, if it can be imagined, we'll be able to bring it to life, and that includes everything from the places and entities and even entirely new digital and biological lifeforms. And when these two worlds, the physical and digital worlds merge, which they inevitably will, then not only will our experiences become more intense but our relationship with reality will change too.

Ultimately then, as we enter this new world of exponential arenas and exponential experiences we then have to ask ourselves: What happens when our imagination is no longer the limit, and will we humans, in our current form, be able to handle these increasingly intense mental and physical experiences that these new systems could expose us to? So let's find out.



VIRTUAL ARENAS

Delivering increasingly intense, interactive, and sophisticated Cyber-Physical experiences.



MIXED REALITY ARENAS

Delivering increasingly sophisticated Cyber-Physical experiences.



AUGMENTED REALITY ARENAS

Delivering increasingly sophisticated interactive cyber experiences.



PHYSICAL ARENAS

With or without Cyber or Cyber-Physical augmentation, delivering increasingly varied and interactive experiences.



HIGH INTENSITY

In time different technology combinations will be able to deliver increasingly intense experiences Cyber-Physical experiences.



MEDIUM INTENSITY

Technology combinations including BMI, Haptics, Sensors, and wearables, will make the virtual feel increasingly real.



LOW INTENSITY

Low intensity experiences will or will not rely on technology combinations depending on the experience required.

BREAKING REALITY ...

Increasingly our concept of reality is going to change as our physical and digital worlds continue to merge in new and extraordinary ways until we reach a point where one is difficult to distinguish from the other.

... AND SWITCHING UP INTENSITY

... But that's not the only thing that is going to change in the future. The intensity of the experiences in all of these different arenas and realities will also increase until they are on a par with one another.

EVERY MIND AND WORLD IS YOUR PLAYGROUND.

HAVE YOU ever heard of the saying “The world is your playground?” Well, as we race headlong into the future we’re going to have to amend that saying to include the digital realm, and switch out the singular word “world” and replace it with “worlds,” because where we’re headed “Every world is your playground.” And that’s awesome. Furthermore though, as we see neural interfaces rise to prominence in the future we can also see a day when someone else’s mind could be your playground too - just strap yourself into your fully immersive gaming rig and jack into the playscape of someone else’s consciousness.

Today we already know that everything and anything can be an arena, from our back yards to our kitchen tables, from the largest stadiums in the world to everything above and below the open skies, with the primary differences between them all being the space, spectator capacity, and experiences they deliver.

As the technologies we develop continue to advance and mature though the

sheer variety of arenas that we can create and experience will explode, and physical, mixed reality, and virtual reality arenas, and any combinations thereof, will become our new playgrounds. Furthermore, technology advances will eliminate the boundaries between them all, and we’ll be able to push the limits to unexpected new highs.

FUTURE ARENAS

Ostensibly, just as there is today, in the future there will be three main types of arenas, namely physical reality, mixed reality, and virtual reality arenas, and in time they will all increasingly merge together in new and unexpected ways - all of which I’ll discuss in more detail later in this chapter.

Built in new ways

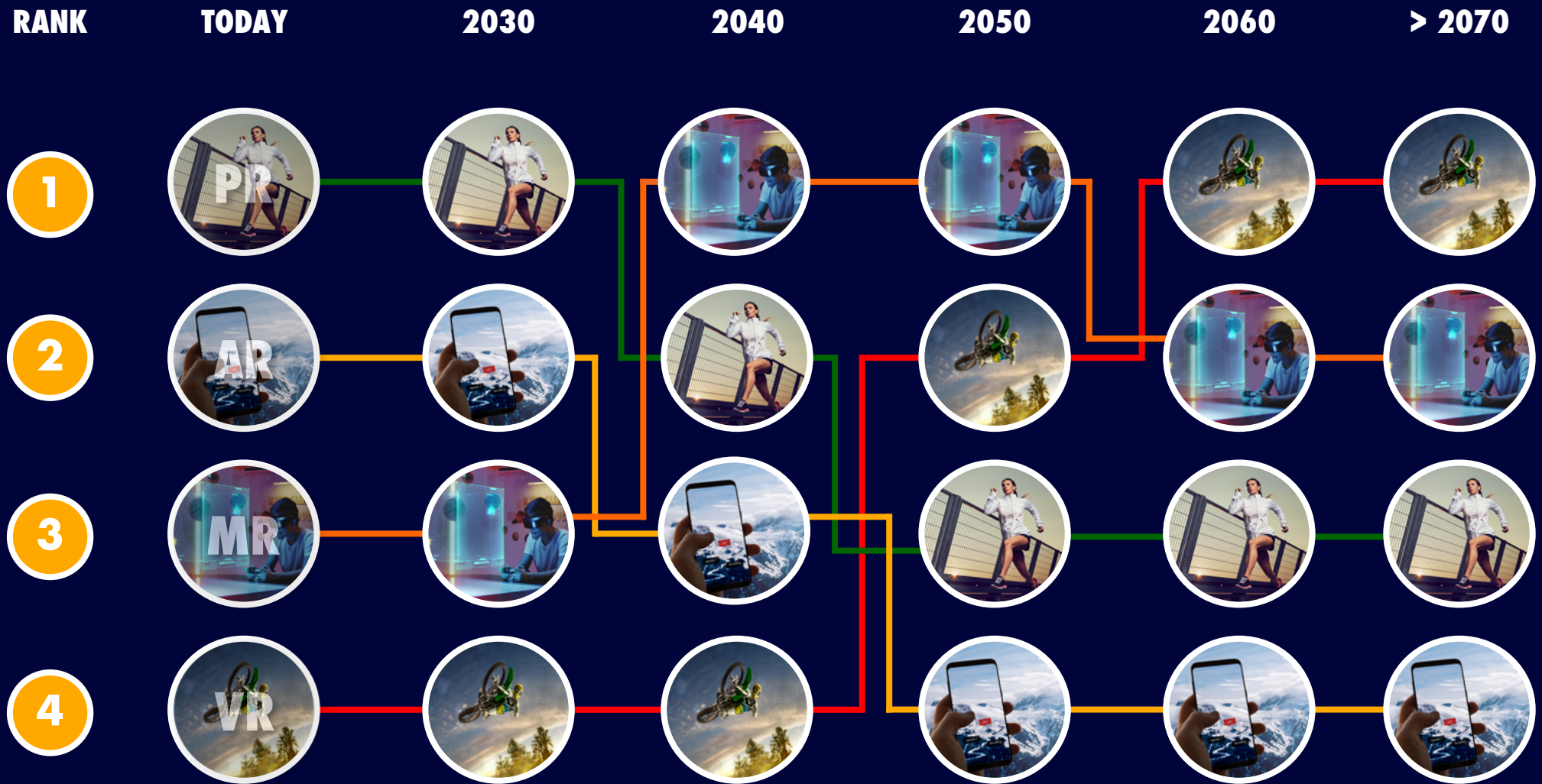
However, while the arenas and the experiences they evoke will evolve so are the tools and technologies we’ll use to design and produce them, for example, via the emergence of Creative

Machines, that are in many ways just as extraordinary and fascinating as the arenas themselves, and we’ll discuss these in their own chapter.

FUTURE EXPERIENCES

When we discuss future experiences there are two primary perspectives that I’ll discuss in detail - the perspective of the athlete, and the perspectives of the spectators.

Needless to say technology is going to have a big impact on both of these areas, but as different technologies arrive and mature the other impact that they’re going to have is on the user experience within each type of arena, after all everyone has their own tempo and every moment has its own intensity, and of course both of these vary depending on the activity we’re participating in and our mood and motivations at the time, but what if you could have just as an intense experience in the virtual arenas as you could in physical ones? And this is an area I’ll also go into in more detail in this chapter.



CHANGES IN ARENA USAGE OVER TIME

Over time the arenas people prefer to engage with and experience will change, but the cultural adoption of new arena types will always lag behind what technology can deliver. As the technology becomes increasingly easy for users to access and adopt, and invisible, whether it's in the form of the elimination of VR headsets with new Retinal Display technologies, or new types of devices and wearables, we will find that in time the use of Cyber-Physical arenas will become more commonplace until they become the norm.

THE EVOLUTION OF ARENA USE OVER TIME.

WHEN WE consider the rate of global change on the one hand we have the rate of technology innovation and development that can increasingly be compared to the speed of a rocket ship, and on the other we have the rate of new technology adoption, which, thanks to certain cultural biases and other factors, by comparison is positively lethargic. It's this schism why today we don't see some of the more bleeding edge technologies, such as Virtual Reality, going mainstream yet.

Over time though as customers get more comfortable with these new technologies, and as those technologies become more accessible, affordable, and invisible, slowly we see their adoption reaching a point where they become the new normal. And so it is with the plethora of new so called experience technologies such as Augmented, Mixed, and Virtual Reality that in time will all be used to help us create new styles of arenas and play spaces.

Furthermore, as these foundational technologies become more accepted, and as their use and ecosystems grow,

we often then see a second wave of development taking place where entrepreneurs now innovate on top of them much in the same way that an artist creates on top of a blank canvas - all of which then only serves to increase their value and utility to customers and cement their position in the marketplace.

Needless to say as the physical and digital worlds combine, not just figuratively but also literally, where, for example, the sense of touch or an emotion in the digital world translates into a feeling or emotion in the real world, the activities and sports we participate in within these new arenas will also change and evolve, and with them bring about a whole new multi-verse of opportunities, and that's what we're going to dive into next.

PHYSICAL ARENAS



THE PHYSICAL WORLD IS MY PLAYGROUND.

WHEN WE consider the future of today's physical arenas, however you want to define them, whether it's your living room at home or your neighbourhood stadium, technology is making everything smarter, from the emergence of smart cities and smart stadiums, through to the emergence of smart homes and smart spaces.

Outside of this area though technology is obviously also increasingly making itself known in our physical spaces thanks to the devices we carry with us and on us that athletes and spectators alike are increasingly using to keep tabs on everything from their physical activity and stats, through to their rankings on online leader boards and virtual meets.

However, while giving consumers access to these types of technologies and platforms for their own use is relatively straight forward and low cost the opposite is true when it comes to making today's traditional built environments smart. That's why there's a huge lag between what today's technologies are capable of doing and delivering and

how long it takes companies to deploy and integrate them into our physical environments so they can create new arenas and new experiences.

As a result of this today most of the technology investment that would move the dial on helping us create new experiences in this space goes where it's going to have the greatest impact and return, and in today's world that means stadium and league sports franchise operators and owners as they look for new ways to attract and engage new audiences, and ultimately boost income streams.

The net result of this means that for now at least most of the technology innovations that would have the greatest impact in this space are only being used in a narrow way to either augment the athlete and spectator experience, and boost fan engagement and participation.

In spite of this relatively slow progress though it's this latter point, participation, that from a futures perspective is one of the most exciting new developments - especially as the digital and physical

2020 - 2040

worlds continue to collide, and we start to consider the future of mixed arenas and experiences which I look into in more depth in the following section. Furthermore, while integrating and augmenting our physical world with technology is still complex and expensive in time both these barriers will fall significantly.

As we start looking deeper into what holds for the future of physical arenas during this timeline frankly there are a lot of exciting things coming down the line.

On the one hand as the cost of manufacturing high quality displays continues to plummet cities, for example, will be able to turn every wall into a living display that let you virtually race against other athletes in real time as well as yourself without the need to jump into augmented reality. And on the other

2020 - 2040

hand local communities will be able to use new augmented and mixed reality tools to create new interactive spaces and gamify their world.

But, as the cost of turning everyday dumb objects smart, which includes everything from buildings to trees, becomes as simple as graffitiing a surface using a spray on material loaded with nano-antenna and nano-sensors, rather than just regular spray paint, all of a sudden we'll see our world getting increasingly smart at an accelerating rate. And as the sensors in these sprays, for example, get increasingly sensitive and the variety of sensor types continues to expand not only will smart city planners finally have their day in the sun, but the entire city could quickly become both our physical and virtual playground, orchestrated and managed in new ways.

Imagine, for instance, a smart city, run by a city wide operating system that not only improves the city's overall efficiency and functioning, but that also tries to create a more social city experience. By plugging into all these sensing systems, as well as more traditional camera and CCTV systems, not only would it know where everyone is but city authorities could plug into people's devices to encourage them to get active and participate in sports in new ways. Rather than just being static

spaces as we see the emergence of these hyper connected smart cities the city itself could plan and orchestrate events based on the behaviours of the citizens within it.

CITIES AS A GENERAL PURPOSE TECHNOLOGY.

TRYING TO embed intelligence into and upgrade the physical world is one of the most difficult challenges urban planners and governments face which is just one of the many reasons why developing truly smart cities today is still such an issue even as we see the emergence of the first sensor laden nano-sprays that, as described the previous section, let you connect and turn any object or surface into a smart one just by spray painting it.

During this timeline though individuals will likely be slightly fatigued by the continuous proliferation of technology and the near now constant invasion of their online and offline privacy - something that will inevitably make off grid experiences, for example, taking their bikes into the mountains to fly down drops with abandon, increasingly appealing.

However, as they head back into the built environment where sensors and intelligent sensing systems await, it could be argued that compared to today most cityscapes will look fairly similar, albeit that cities equipped with increasingly

intelligent surveillance technologies, from the CCTV cameras in the streets to the persistent surveillance drones in the skies, will be able to track everything from your every move to your every twitch, and analyse and assess everything from your character and personality through to your behaviours, emotions, and health.

While many people will see this as what it is, a huge invasion of their privacy, there could be advantages to this type of so called surveillance. For example, as people's identities and health records are increasingly put onto the blockchain, and as governments increasingly adopt centralised databases and systems, these systems can identify you, quickly figure out your goals and your mental and physical wellness, and then send you interventions and rewards to get you to boost your exercise levels.

Think of it like this, even at a basic level - you're walking home, but your skin flushes are showing signs of slight heart arrhythmia, and the city system knows that'll lead to health complications down the road that could affect your life and livelihood. Deciding to make

2040 - 2060

an intervention the system offers you a crypto bonus and one percent off your tax bill if you run home not walk. And as you run home the city changes the billboards and advertising screens along your route to egg you on, then notifies your friends along your route, which it mapped out, so they can encourage you on as well.

Scale this type of system up and join together all of the dots and you now have an intriguing way to gamify an entire city and create and encourage new social behaviours, and an entirely new form of social construct.

But this timeline has a lot more to offer than that. That's just the basic version - especially when you consider the new augmented, mixed, and virtual reality experiences, that I'll discuss in the following sections, that we can mix in with this physical environment. However,

2040 - 2060

in this section we're sticking strictly to the built environment and we can bring everything together later.

When it comes to exercise, and the games and sports we'll be able to play and partake in future cityscapes a large part of the equation is going to be down to what your goals are, and what city regulators will permit.

After all, for example, drones in all their forms, from giant aircraft sized drones through to nano-scale drones, will be hundreds of times more powerful and capable than they are today but if you want to race them, race on them, race in them, then that's all going to be down to the city regulators to give your game the green light. Which then opens up a whole can of worms as we think about the sports that can be played within these cityscapes in terms of official events, such as an organised league match at a park or stadium, and unofficial off the cuff activities and events such as a run in the park or quickly organised soccer game.

These activities, games, and sports are what you do and what you play within these cityscapes which then brings us full circle to this - the built environment is your arena, and as technology within cities becomes increasingly pervasive, from the sensors and sensing systems that

are strapped into them, through to the city wide operating systems that analyse everything and run them, in time the cities themselves become a General Purpose Technology - the technology, just like Artificial Intelligence, Blockchain, and Genetic Engineering, that we use as our foundation and then innovate on top of.

DECONSTRUCTED. RECONSTRUCTED. GROWN.

During this timeline the cities that we knew back in the early part of the millennia look like a relic of the past compared to the new buildings and facilities that are springing up.

Thanks to developments in synthetic biology we now have the technology to grow buildings, much in the same way that we grow trees today, as well as engineer buildings using synthetic living materials that not just suck the toxins out of the air and break them down, but that also self-heal, morph their shape, and even replicate themselves - two buildings for the price of one anyone? Imagine, for example, growing your own arena from a special synthetic seed.

However, why bother with fancy seeds when you can simply tell a creative machine your requirements and get it to design the perfect physical arena for you, and then get that arena manufactured in real time using a replicator robot, based on old additive manufacturing technology, that sucks carbon dioxide out of the air and turns it into a graphene based material that's 99 percent lighter than steel and ten times

stronger. But if pulling a futuristic building material out of thin air isn't for you then why not combine the two technologies I've discussed and combine synthetic bacteria with your smog brick to create what's known as a bio-mineralisation material that's got the properties of both - ultra-lightweight, ultra-strong, but at the same time self-healing and self-replicating.

I know, I know, this all sounds like science fiction but we laid the foundation for these technologies back in the late 2010's. Lest I need to remind you again - go and click that red button at the start of this chapter and explore some more! plus, don't forget this is a super summary.

During this timeline technology has advanced so much that all these and more are possible, and we haven't even ventured into realm of programmable materials and molecular assemblers - or even smart dust that could come together to form smart and sophisticated new arenas, equipment, and objects on command. Or the advent of quantum sensors that are millions of times more powerful than today's sensors and

BEYOND 2060

sensing systems... Maybe we'll come to all those in time.

UNIVERSAL ARENAS



GIVE ME MORE SPACE.

WHILE THE vast majority of us are more often than not confined to the pile of dirt that we call land the fact of the matter is that as humans we have access to three other fascinating arenas, namely the continental shelves and deep oceans, the skies, and, of course, space. But, I hear you say, what good are these arenas if we can't access them?

Well, one of the beauties of technology is that not only does it put a scary amount of power in our hands, but it also helps drop the cost of, well, everything by multiples. For example, think about how much it now costs you to video chat with your Australian cousin, or how much it costs you to take thousands of selfies... precisely my point.

When it comes to space however we are reaching a point where we are democratising access to space in a way we've never been able to before. Over the past decade alone we have dropped the cost of accessing space so much so, by over a hundred fold thanks to the introduction of re-usable rockets and launch systems, that in this current

decade we'll not only see the emergence of space tourism as a new industry, but also the development of the world's first space hotels. And do I really have to spell out what that could mean? How about a game of zero gravity kick ball, or, as we establish bases on Mars and the Moon, how about base jumping off of Olympus Mons, a Martian mountain that's over two and a half times the height of Everest...?

As you can see, when it comes to plain old fashioned off the hook fun we're only just getting started - obviously all in the name of good sport.

Turning our attention to the deep oceans, well access to these deep oceanic trenches is falling too, albeit at a slower rate than access to space, but nevertheless costs have fallen by tens of fold, so much so that even today if you're rich enough you can hire a Trident 36000/2 submarine and be playing catch with a friend while sitting in the abyssal mud of the deepest point on Earth just sixteen hours later. And as for turning the continental shelves into playgrounds, advances in nano-

2020 - 2070

manufacturing are already opening the door to creating passive regulators with huge internal surface areas that let us extract oxygen from seawater in the same way fish do through their gills without the need to use bulky scuba gear.

And as for the skies, well, access is already relatively cheap - by today's standards anyway. But as drones and other flying vehicles get more powerful and easier to customise and design, thanks to the emergence of Creative Machines that will design and iterate new drone form factors in real time in the blink of an eye, and new 3D and 4D printing techniques that will let us manufacture them on demand before they self-assemble, the cost of access to this arena is going to fall too - and that's before we discuss the emergence of hover boards or jet packs. If you like that sort of thing that is... and who doesn't?

GLASS ARENAS



BYTES STUCK BEHIND THE GLASS.

IN TIME it is inevitable that the digital and physical worlds will merge until they reach a point where it's difficult to distinguish which is which, and in time the arenas that this cyber-physical union will create will go way beyond our wildest dreams and help us create and experience arenas that are as amazing as they are immersive.

For now though all of this future promise starts here, in an entirely different type of arena in the world of gaming and E-Sports where the arenas are still locked behind glass.

As we continue to see gaming's rise to prominence on the global stage, whether it's thanks to the emergence of cloud game streaming services or E-Sports, or both, and the introduction of new technologies, such as haptics, neural interfaces, and VR, to name but three of many, it's inevitable that these arenas and experiences will one day be able to leap out from behind the glass and that we'll be able to experience and interact with them in new ways.

In the next couple of decades the arenas

that gaming and E-Sports fans experience today will start their own transformations in earnest.

First we'll see the continued ingress into the space of haptics and wireless virtual reality rigs which will be the way that many gamers get a taste of their first "real" cyber-physical experiences.

In time, as virtual gaming inevitably takes off, we'll then begin to see the introduction of what I'll call "Constructs" - purpose built physical arenas that are augmented with the latest technologies, from electro-magnetic floors that let gamers run marathons while staying in the same spot, through to AI and machine vision systems that help the organisers replace traditional motion capture rigs and let them seamlessly manage the spaces and gamers as they do battle with one another in virtual worlds.

Then, finally, in the latter half of this timeline we'll see the cyber-physical experience ratchet up and become even more intense as increasingly powerful neural interface systems, that not only let

2020 - 2040

gamers explore and interact with their virtual worlds using just their minds, but that also let future Creative Machines, like the ones I've discussed, read their thoughts and construct new procedural game content on the fly, take a more prominent role - at which point we then move onto the next timeline and go even deeper into the wormhole.

E-SPORTS ARENAS



SPORTS MEET E-SPORTS.

OF COURSE, it would be absolutely remiss of me, as we talk about the Future of Sport, to not discuss or shine a light on the future of E-Sports - especially as the physical and virtual worlds continue to collide and merge even more so in the future than they do today.

However, while E-Sports is obviously it's own category in the real world within the construct of this codex it's simply another type of sports arena where individuals and teams compete against one another in the digital realm rather than the physical realm.

That said though increasingly over time these digital superstars will not only be competing against one another but also increasingly capable Artificial Intelligent entities which will increasingly find new ways to take them to town and hang them out to dry. And we shouldn't lose sight of the irony that not only have we created new forms of digital arenas, but that we've also created new forms of digital adversaries as well.

However, we're not going to stop there,

while today these awesome E-Sports arenas, or gaming environments as we should perhaps call them, are created by humans in time they'll be created by Creative Machines, machines that are capable of both imagining and generating infinite procedural games and worlds without end and without limits that will test our human superstars like never before, because where we're headed this isn't just E-Sports, this is exponential E-Sports.

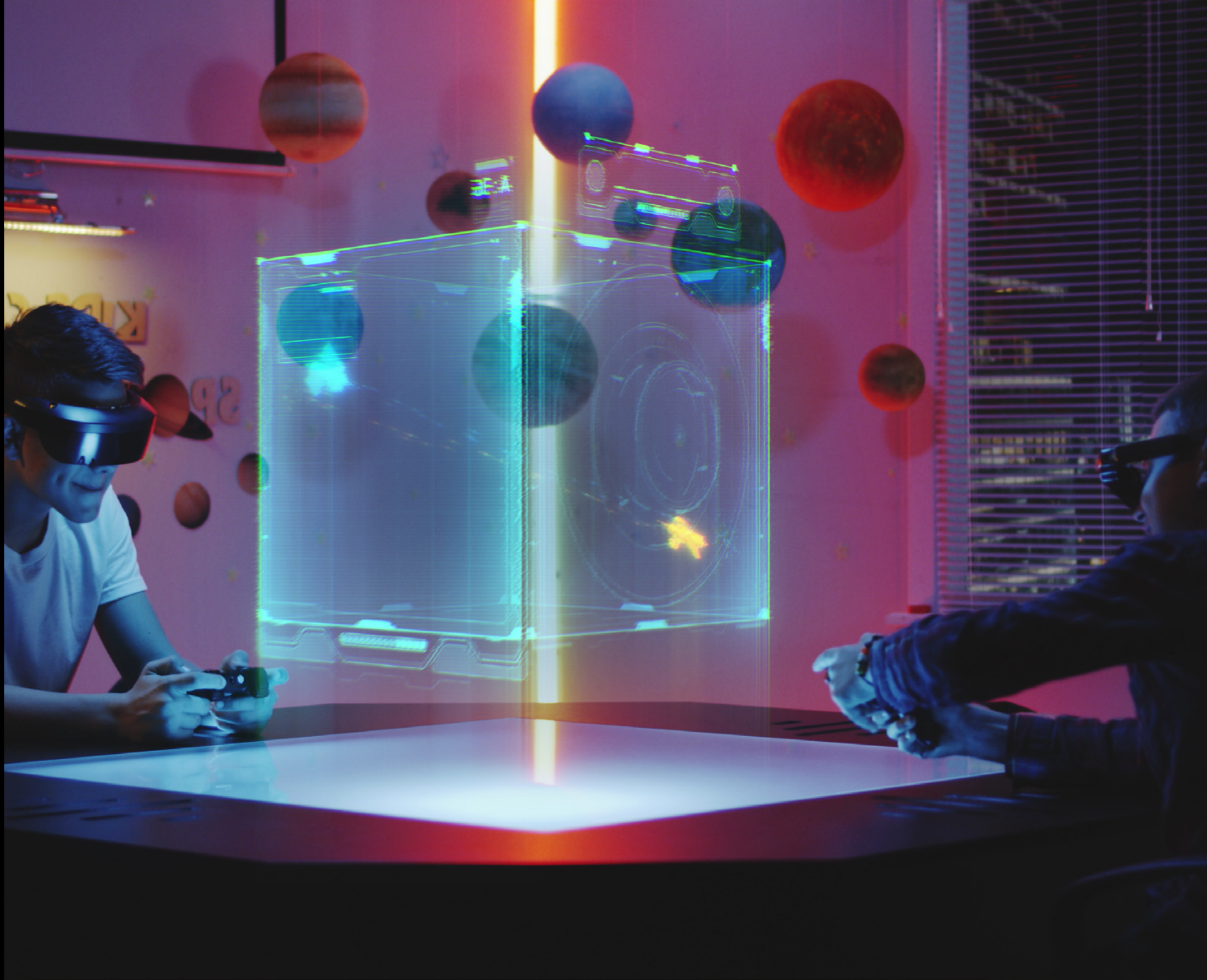
As we start combining all of the different arenas and technologies together though the gaming environments that are currently secured behind screens will increasingly escape their glassy prisons and gamers will be able to experience everything as they would in the real world - physically.

Haptics and neural interfaces, for starters, will kick the experience up several gears, and as we see new types of mixed arenas emerge, complete with full body tracking and electromagnetic flooring that let players move seamlessly around environments without ever having to leave their station, and as we see

2020 - 2070

more bio-mimetic sensors and sensing systems embedded into everything from headsets to apparel increasingly it will be hard for gamers to differentiate between what's real and what's not.

MIXED REALITY ARENAS



MIX IT UP AND GHOST ME.

WHEN WE look into the future of Augmented Reality and Mixed Reality arenas and their role in this world I have to say they kind of feel like a halfway house - especially when you compare them against the types of physical, cyber-physical, and virtual arenas we'll be able to experience in the future.

While Augmented Reality, for example, undoubtedly has its merits the biggest draw back of the technology today is that it's predominantly screen based so while that's all well and good for playing single-player games and turning your kitchen table into a Angry Birds arena, when it comes to playing single-player or multi-player sports, let alone sports that require you to have one or more free hands and a free range of movement it's very difficult to see just how AR in its current form will scale and become invisible enough of a technology to provide users with the sporting experiences they crave.

After all, could you imagine playing even a simple game of virtual catch or tennis in your living room with a friend while

waving your smartphone or tablet about? No, neither can I, and as interesting and as promising as AR is these two examples almost perfectly explain why the current technology is flawed.

However, fear not, all is not lost. Once we flip out AR on a smartphone for AR in a pair of smart contact lenses, or those rather cringe worthy albeit interesting glasses, well that screen locked experience disappears and suddenly AR is set free and the arenas gets a whole lot more interesting and interactive. And as an example, now imagine playing in the park hurling virtual fireballs at each other and suddenly you'll appreciate the completely different type of experience between the two examples. And now that AR is free our imaginations can get busy again.

As our minds wander now thinking about the new arenas we can create, and then eventually sports which I will come to in a later chapter, the world is literally our playground, and when we bring Mixed Reality into the game not only do we have a way to interact with these arenas using AR, but we also have a way to

2020 - 2040

morph and bend them and everything in them to our wills. At which point the only question that's left is what arena do you want to create?

Moving one step on though, just as the digital world is increasingly able to merge with and invade the physical world, the physical world can also invade our digital worlds and this is where the incredibly interesting concept of Ghosting now comes in that allows you to virtually compete and play off against anyone anywhere in anything.

Imagine, for example, being able to sprint against a virtual Usain Bolt from 2008 as he smashes it at the Beijing Olympic Games, swim against Michael Phelps, or being able to pit yourself against an entire sports team in real time during live events in a cyber-physical battle royale. And if you want to do more than just take part and feel the

2020 - 2040

experiences, well just strap on that haptic second skin.

While creating and initiating this kind of cyber-physical play off requires a mix of equipment, for example HD cameras at one or both ends if you want a two way competition, Video to Digital AI generators, codecs, and powerful networks that can stream those digitised experiences from one user to another to and from your smart contact lenses the fact of the matter is that those technologies are already here.

All this leaves then you with one major problem during this timeline - you're going to either have to stop bragging about how much faster or better you would be if that was you in the game, or get your game face on and prove it in the virtual arena.

Furthermore, as we consider how these new forms of arenas could impact and merge with the E-Sports market, well, who's not to say you aren't as good as you say and that a scout won't sign you up? In which case don't forget to cut the futurist a cheque. Thanks.

DITCH THE GEAR. PLUG IN.

WHEN YOU think of mixed reality arenas today your first thoughts are likely of smartphone screens and goofy headsets and glasses, but in the future, well, those are gone. Plus we also have new sci-fi toys to play with.

For far too long during the past couple of decades we've been used to our favourite mixed reality arenas being locked behind two dimensional glass or only being available to us when we put on goofy gear. But now during this timeline they're free, free thanks to the development of exponential technologies that include holograms, neural interfaces, volumetric displays, and new screenless display systems that beam these mixed reality worlds right into your eyeballs without the need for you to wear any of that awful gear.

Of all the technologies that are maturing during this timeline volumetric displays, as well as 11K and 16K displays that have natural naked eye 3D effects will be among the first - although all of them will inevitably face their own uphill battles when it comes to adoption. But that said

of all of the early technologies to mature during this timeline volumetric displays might be one of the more interesting ones as they allow people to interact with new objects and new worlds in new ways albeit within the confines of a limited space - just think of them as the mixed reality arenas of the 2020's and 2030's except without the need to don all that funky gear or without having to angle your smartphone or tablet at specific angles in order to capture the arena's full effect. In short, this is today's mixed reality arenas set free - and then put into a box on the table.

That said though they're going to have to compete against augmented smart reality contact lenses which by now are a real thing that you can buy from, well, anywhere.

Arguably it's the mid to late 2040's where things get much more interesting, especially as we begin to see the first real holographic systems emerge. While these systems will still likely be moderately expensive and bulky in the early part of this timeline the first prototype 3D free form, free to air living

2040 - 2060

hologram systems we first saw emerge in the late 2010's will now be starting to be commercialised, and as we continue through the timeline they will become increasingly affordable and miniaturised which means that, just as we saw in the early Star Wars movies holographic games, like Holographic Chess, will now be a reality, and finally we will have mixed reality arenas as they were always meant to be.

However, as great as holograms are though they'll still be dependent on physical hardware that you have to either transport or set up so it's going to be hard to beat the advantages offered to game and sports enthusiasts by screenless displays - systems that, literally, beam images directly into your eyes and that are the ultimate in not just mixed reality arenas but also virtual reality arenas as well.

2040 - 2060

By this timeline these systems will be miniature enough to fit into small objects, including wearables, and their AI enabled sensors and tracking systems will know how to create the best visual immersive experience for you irrespective of the position of your eyes of head.

Extending the timeline out further though, and now starting to look at a technology that will give regulators kittens, neural interfaces will also be increasingly mature during this timeline. However, unlike the neural interfaces of the 2010's and 2020's these neural interfaces will not just be able to read people's minds and broadcast the content, but they'll be two way systems that can both read peoples minds and upload content to people's minds non-invasively. At this point we have reached the Singularity and we are now able to interface with machines using neural links.

DISTORTED REALITY. NEW PLAYSPACES.

DURING THIS this timeline mixed reality takes on an entirely different meaning, and arguably, the entire concept of mixed reality as we knew near the start of the millennium has now been consigned to the history books.

In this timeline individuals, particularly from the younger generations, are now culturally starting to get used to the idea of being able to use both invasive and non-invasive neural interfaces that allow them to share and stream their thoughts to human and digital entities alike in the ether, download and upload information, share experiences, and collaborate with other members who also have access to these new Hive Mind constructs.

In short, your mind and other people's minds, as well as the mind of Artificial Super Intelligences (ASI), that first began to emerge during the last timeline, are now the arena and the playspace.

Furthermore though, and again, going further into the wormhole, memory editing will now be much more mature which means that, if you really wanted to open Pandora's Box, companies will be

able to edit your memories as a service, as well as upload new memory constructs into your brain, so whether you're jacked into a hive mind or not, now your entire life is something new. Call it a game if you will, but could we call your entire life a game, and what happens when your real life becomes the arena?

However, if memory editing and tampering, and neuro-jacking with others or into hive mind constructs, isn't your cup of tea as we say in the UK then you can still live out a range of experiences via some of the other mixed reality systems which will be available during this timeline, including real live Holodeck systems, embedded with holographic femtolaser systems, and parallax screens, that we first saw emerging in the late 2010's.

BEYOND 2060

VIRTUAL REALITY ARENAS



BREAKING DOWN REALITY.

THE ONE thing that true virtual reality enthusiasts crave is immersion, full immersion, and the thrill of being mentally and physically teleported to any time and place they can imagine. And where we're going in the long run they're not only going to get their wish, they're going to get much more than they bargained for.

Let's face it most of today's VR experiences are lame, sorry, I mean tame, by future standards. The equipment is bulky, the resolutions are low, there are gaps in the experiences, and unless you've got a sweet rig then you're stuck in one place and then latency creeps in and ruins your timing. And as for content, well, several studios shut down recently. So you have to admit that while the concept of VR might be intriguing the experience isn't as compelling as it should be. Yet.

But by now you should be getting the picture. This isn't what the future looks like, not by a long shot, so let's dive into that big virtual ocean that is the future and explore the art of the possible.

While getting to the point where users believe that the simulation is the real world as they do in the Matrix will take time, and in the interim most of the effort in this field is going to be focused on miniaturising the tech involved, such as the bulky VR headgear and the bulky haptic clothing, and experimenting with creating new products that enhance the user experience and increasingly tie all of our five senses, not just the sense of sight, sound, and touch, into these worlds. But as developers set forth to conquer all of these challenges elsewhere others will increasingly focus on an entirely different problem - that of motion.

After all, being fully immersed in a virtual environment is one thing, but if you can't walk or run around it as you would in the real world then, well, you're still getting only part of the experience even if you can smell the cordite in the air and feel the sweat on your brow and taste the copper in your mouth. And this is where the floors we stand on, whether it be in an arena or at home are an issue - they're just too static. As a result several companies are now developing electro-

2020 - 2040

magnetic floors that, in essence, move under you and move with you, following the world and your movements wherever it is your feet want to take you.

It goes without saying that all the developments across all these different areas will play a vital role in helping us create increasingly realistic and intense virtual environments that feel increasingly real and immersive to us. And as all these technologies mature, as the clunky headsets first become wireless, then miniaturise, then become brain controlled, and then towards the end of this timeline disappear altogether as we see the emergence of screenless display systems that beam VR content directly into your eyes, and as the bulky haptic suits become lycra thin then nano thin and essentially become nothing more than a second skin, we'll be well on our way to creating the ultimate magic act and making the illusion real.

2020 - 2040

Over time as all these developments become increasingly mature and commercialised we'll also see giant leaps in the way content is created and delivered.

Today's relatively manual content creation techniques and workflows will become increasingly automated, and then we'll see the Creative Machines I've discussed assume more of the load, generating 4K, then 8K, then 11K, then 16K synthetic content faster than we could have using traditional techniques, and then as these Creative Machines start moving into the cloud, improve and mature, increasingly we'll reach the point where they can read a user's behavioural and biometric cues and data to generate procedural content on the fly that's tailored to their individual point in time preferences.

Bringing all of this together it's increasingly easy to see therefore how we progress from today's rather tame virtual experiences to a world where the headsets are gone, where haptic suits become as invisible as our own skin, and where we can experience and interact with high definition worlds using nothing but our thoughts and in very much the same way we interact with the real world. And then of course, as we push the timeline further out, we go deeper

into the wormhole.

As I close this timeline out there is a wrinkle though, and it's an interesting one. So far I've discussed improving the quality of the virtual world and our experience with it, but what if we could mix things up and turn our real world, our actual real world, into a virtual experience, a virtual experience where, as you walk down the street, for example, an AI renders a completely new virtual world over the top of the real one, turns office blocks into trees or dinosaurs, or turns cars into giant candies?

While this kind of technology still leverages the same VR technologies I've just talked about hopefully you can see the differences in the approach, and when it comes to building new types of arenas, well, frankly, how many options do you want!?

CLICK ON. CLICK OFF.

DURING THIS timeline the clunky headsets that we were lumbered with for far too long have now begun to disappear into the dim and distant past and new devices such as smart contact lenses, as well as screenless display systems, mean that we are now able to enter and exit the virtual world with nothing more than a blink.

Furthermore, in this timeline all of the other bulky virtual reality gear, such as haptic clothing and suits, bio-mimetic sensory systems that let you experience everything from personalised sounds and smells, through to taste and touch, have now been miniaturised and embedded into everything from clothing and discrete devices, and even into smart tattoo like patches. All of which means that not just can you enter and exit the visual virtual reality world with a mere blink, but you can exit the entire virtual world construct with that same blink.

All of this though just makes accessing your virtual reality arenas easier, as well as making the experiences more immersive and more intense, so taking a look into what these arenas could look

like, well, this is still the digital world - the world without limits. Just think up the world you want to experience, the sport you'd like to play or participate in, and creative machines will build it, and light speed quantum networks will take you there.

Despite all of these advances though there's still one thing that these domestic virtual reality systems can't emulate very well and that's movement. While the electromagnetic floors I discussed during the last timeline are now mature enough to let you frictionlessly move around these worlds without ever having to leave the same spot in your living room experiencing or feeling more extreme effects, such as fast acceleration or the sensation of falling through space, can still only be mimicked using cleverly synchronised sensory systems. And that just won't cut it.

So how do you feel the experience of falling, for example, without actually having to plunge down your own stairs? Well, it's time to move on.

2040 - 2060

VIRTUAL NO MORE.

IN THE previous timeline we had gotten about as close as we could to experiencing fully immersive virtual worlds as we could without actually being physically there. But there was a flaw in the system. A flaw in our construct. And that flaw was our inability to experience everything that these worlds had to offer, such as the feeling of free falling from a plane.

For all the effort and technology we throw at the problem of trying to create a full immersion system that can truly convince users into believing that the construct is more real than reality itself there's one technology we haven't flexed to its full potential yet - until this timeline.

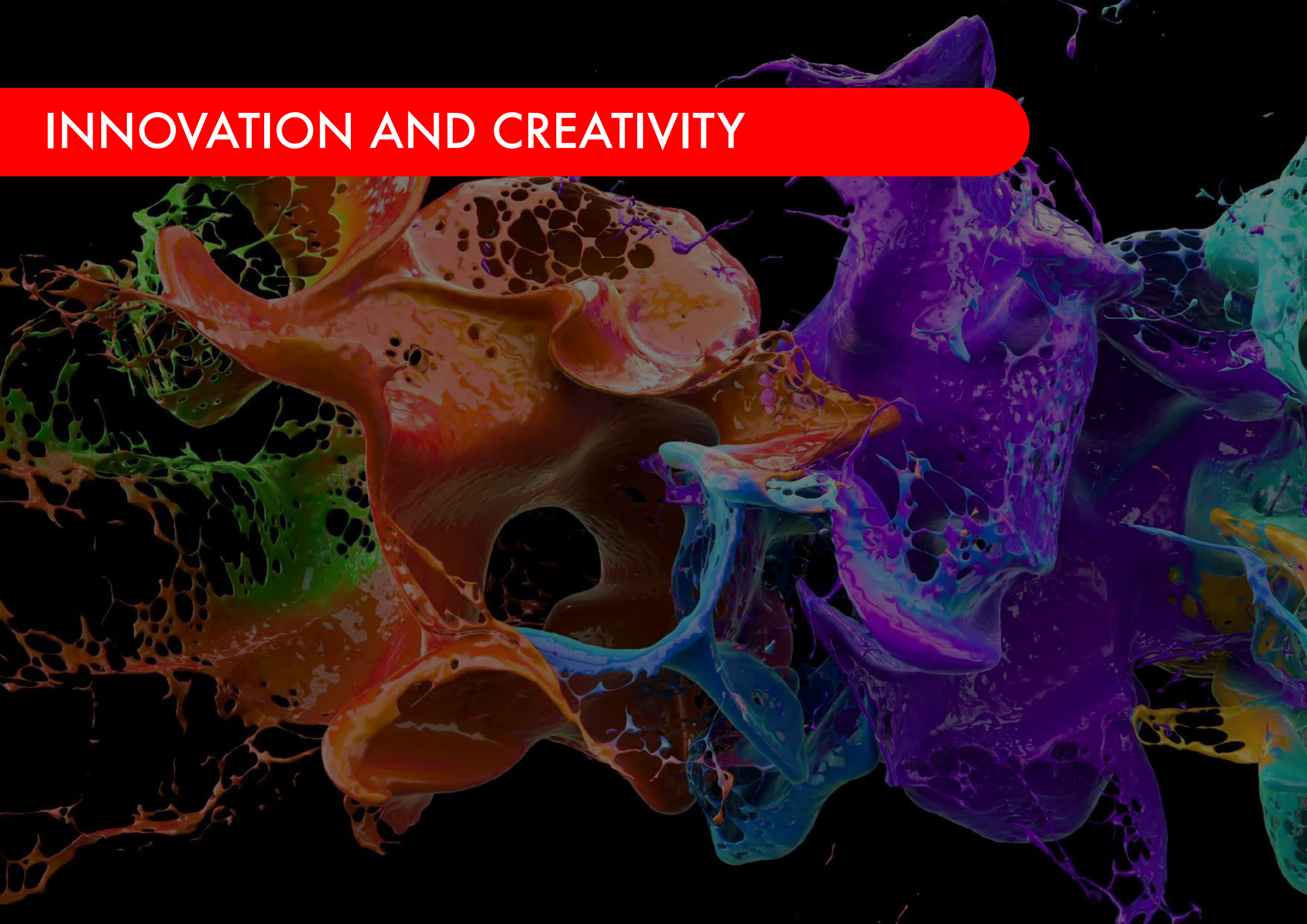
Have you ever woken up from a dream where you felt like you were falling? The human brain is one of the most powerful technologies in the universe, albeit a biological technology, and during this timeline users will now have access to non-invasive neural interfaces that not only let them connect to other people and AI entities telepathically in the network via hive mind constructs, but they'll also be increasingly able

to upload and download experiences into these constructs, and the constructs themselves, via these interfaces, will increasingly be able to use the individual's brain to trick them into feeling full immersion - from feeling the sensation of a Andorkian Pandaguar's bite through to feeling the sensation of falling and the sensation of accelerating through 10G and beyond as their spacecraft loops around Alpha Centauri. And now finally here we are, we've done a full loop - welcome to the unlimited arena of your own mind. The ultimate arena, but now augmented in ways you could never have imagined a scant forty years ago.

Blink and you're in the construct. Enjoy.

Notes:

INNOVATION AND CREATIVITY



An abstract, vibrant splash of liquid in shades of blue, green, and yellow against a black background, creating a dynamic and organic shape on the left side of the page.

CHAPTER SUMMARY.

CREATIVITY USED to be an exclusively human trait, but now Creative Machines are mastering it, and in time they will be able to design, innovate, and produce new products at superhuman speed.

INNOVATION IS A PROCESS

Innovation is a process that can be copied and turned into an algorithm, and the more complex the concepts you want to create the more complex those algorithms need to be. Start with the problem to solve, mindstorm ideas, create your prototypes, test, finalise, and then produce them. Once Creative Machines master these fundamentals companies will be able to accelerate their rates of innovation by millions fold, produce products on demand, and massively shorten the time to market.

CREATIVITY IS SUBJECTIVE

When we consider the design of a product, and it's aesthetic appeal, our opinions are often subjective. But with access to big data sets, for example, social media likes and reviews, Creative

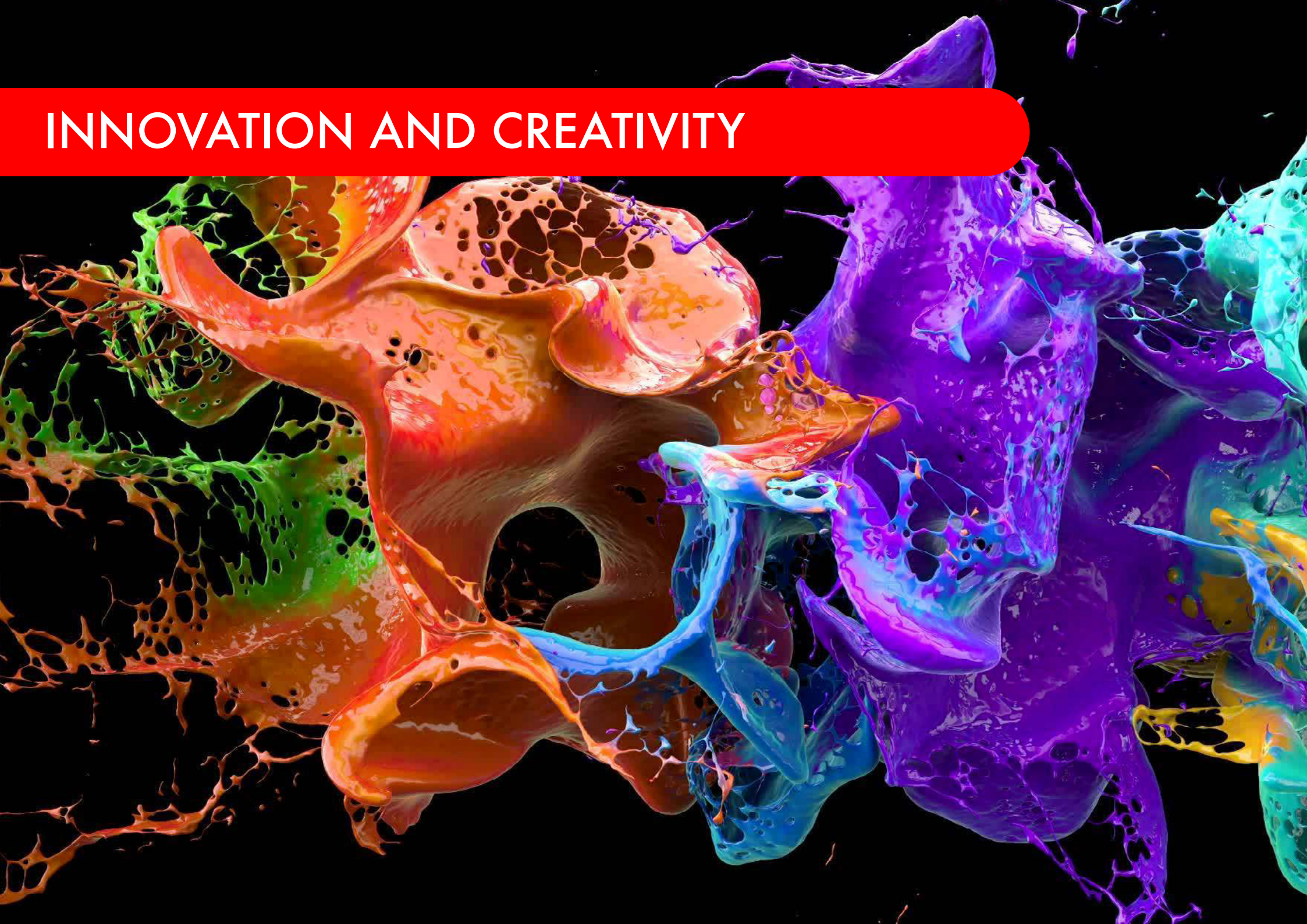
Machines have a ready made pool of five star rated designs and design ideas that can inspire them and help them not just create products that meet a brief, but create products that are beautiful and well designed.

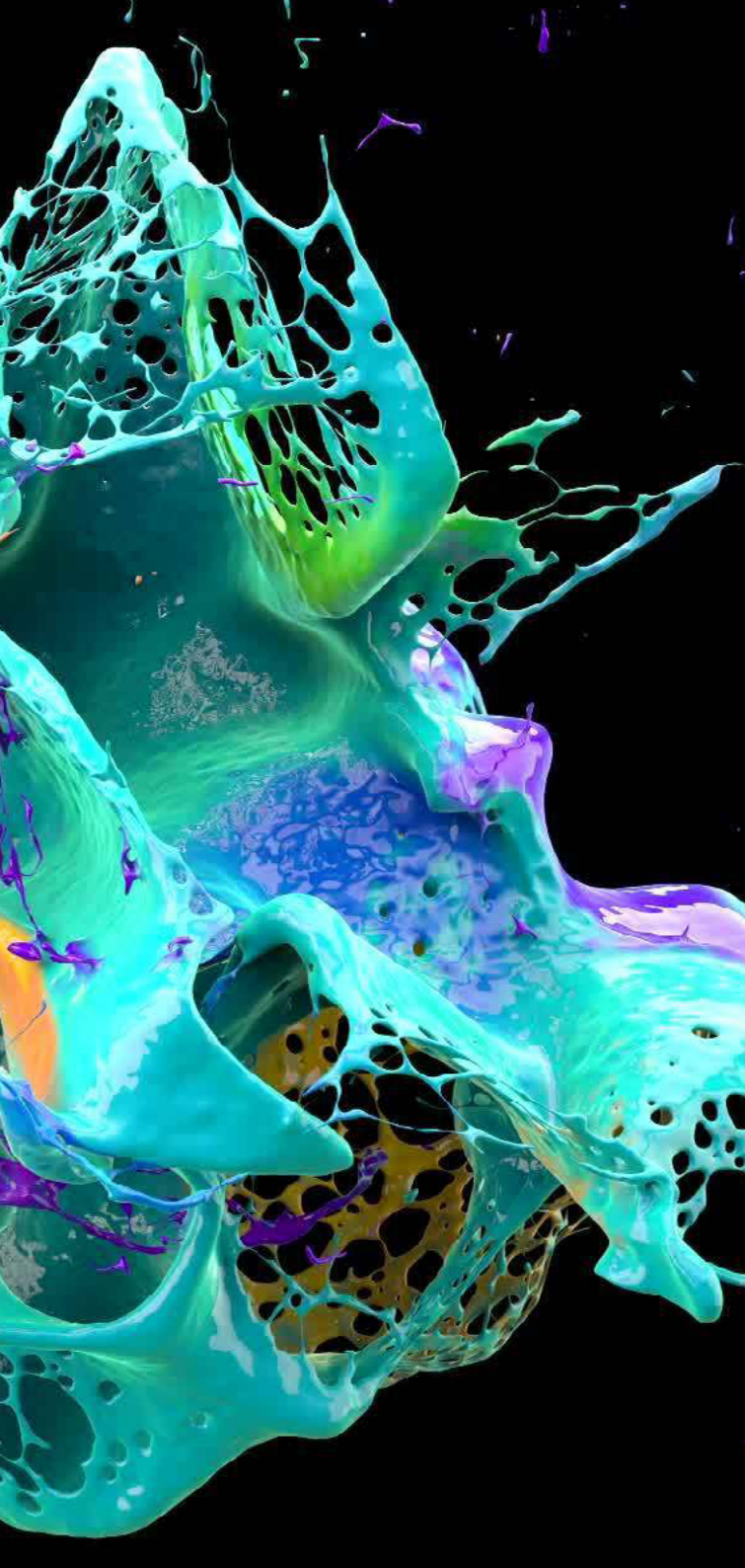
INNOVATE ANYTHING

Creative Machines are already at the point where they can innovate new digital content, including synthetic worlds and environments. They are also at the point where they can innovate new digital and physical products, from AI software and computer chips to sports apparel.

As time progresses their ability to move from basic iterative innovation to more advanced primary and disruptive innovation modes will increase exponentially. Ultimately this then means our ability to innovate increasingly complex and sophisticated products, from new AR, MR and VR arenas, to new electronics and sports products, will also accelerate, and ultimately we will reach the point where products are innovated and produced in real time on demand.

INNOVATION AND CREATIVITY





IN THE previous chapters I've discussed the future of humans and arenas, but so far, frankly, I've been relying on my own human creativity and experience to try and chart out the future and the art of the possible. And as I consider all the different ways we can combine all these amazing and powerful exponential technologies together to create an increasingly awesome and vibrant future there's one constant - my brain hurts. It hurts alot.

But that's okay, because in the future not only will creativity be a human trait as it is today, it'll also be a machine trait - and it's one that they're already learning and using to our advantage.

As we fast forward into the future it would be all too easy to think that it's going to be purely we humans who'll have to come up with the good ideas, the spectacular new arenas, the amazing human augmentations and mods, and the awe inspiring new products and sports, but it won't be.

Therefore, in this chapter I'm going to take a closer look at the rise of so called Creative Machines - the AI fuelled machines that are both creator and tool, designer and innovator. I'm going to look at where they are today, where they're headed in the future, and, more

importantly, how when they're combined with other exponential technologies, including 3D and 4D printing, molecular assemblers, gene editing and all manner of other insane technologies they'll help transform the world of sport, from the clothes you wear to the arenas you play in and the sports you play in them, forever. Welcome to the future, and let's dive right in...

THE ERA OF CREATIVE MACHINES





WE CAN now see a day when Creative Machines, either autonomously or in unison with humans, will be able to design, innovate, and mass produce new digital content, and new digital and physical products, in real time and on demand at global scale. And while this reality is already here and being leveraged by companies, to some extent, given the inter-connectedness of our society it's no small leap to say that these machines will, sooner than later, revolutionise every corner of global culture, industry, and society, and forever change how we create and innovate products from A to Z - from AI software and Augmented Reality gaming arenas to Zebra burgers made from lab produced meats, and way beyond.

A NEW NARRATIVE

Machines can never be creative. And machines can never innovate or be innovators. That's been the false narrative spun by analysts and experts alike over the past few decades. It's also a narrative that, at best, has been counter balanced by analysts and experts elsewhere who have spun the narrative that posits when, not if, machines are capable of creativity and innovation then that time will be a long time coming with the average estimate

being that these so called Creative Machines arrive in the year 2035.

However, as any of you who have ever watched my keynotes or read my blog know, firstly never say never, and secondly, remember that everything is accelerating exponentially. Needless to say, not only is it possible for machines to be creative and innovative, but they're already here, and ironically they're here because of our own insanely brilliant human creativity and inventiveness.

There is an important point to highlight here though. While today's Creative Machines can all innovate and produce a wide variety of different types of content and products how they innovate them isn't too dissimilar from how we humans do it, except for the fact that at this point in time their process is much more logical and data driven rather than emotional or empathetic.

As a species humans have long been of the opinion that what sets us asides from all other living things on this blue planet of ours is our seemingly unique ability to create and innovate new products and tools - including technologies. But what all the aforementioned analysts and experts seem to have forgotten is that creativity, without entering into a theological debate about the act of

creation or the soul, is subjective, and innovation is merely a process - a process that can be broken down and replicated in algorithmic form and embedded into a machine.

INNOVATION AS A PROCESS

Today Creative Machines are only capable of iterative innovation and not Primary or Disruptive innovation, yet, so just to drive home the point that most innovation is a process, besides from all of the innovation methodologies that lay it out as a process, if I asked you to reduce the weight of a cup by half, which is a simple example of iterative innovation, in your head you're already going through a series of, albeit complex, mental steps and weighing them all against the desired objective. And here's the magic, here's how we now create our own Creative Machines.

If I can understand what those individual process steps are and their consequences and outcomes then, with some data science magic, I can convert them into an algorithm - a Creative Machine. Furthermore, the more complex the algorithms and models are the more capable these Creative machines become and the better able they are to design and innovate increasingly sophisticated

products, whether it be new movies or interplanetary rovers, or new drugs or even new AI's and robots.

A CROWD OF MACHINES

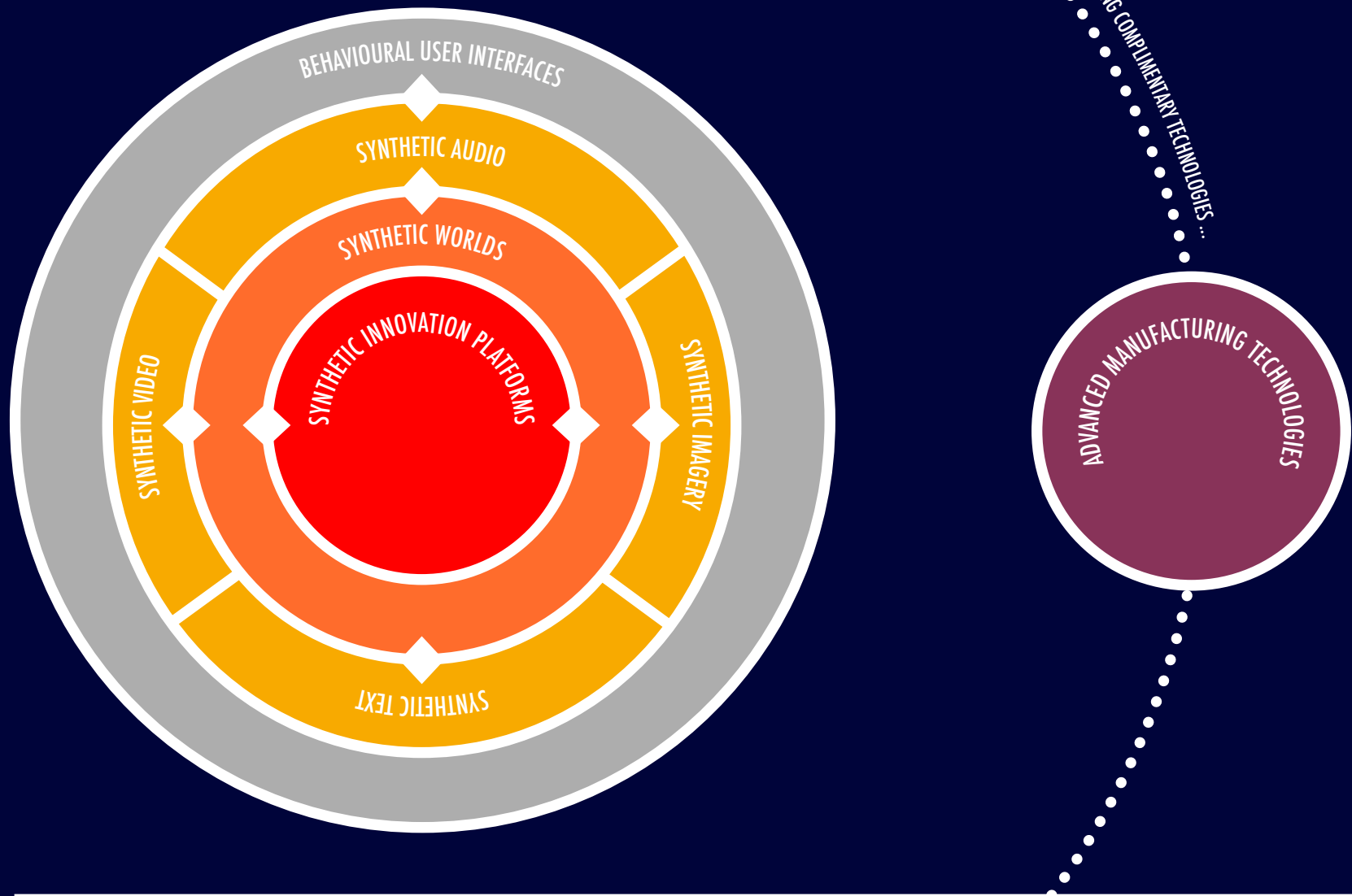
There's more to developing Creative Machines than you might imagine though because it's not simply enough for these machines to be good at or to be competent in one discipline or one skill. They have to be competent in many different disciplines and skills, and the best way to explain this is by using an example.

A Creative Machine that's been tasked with generating a piece of new Synthetic Video content will need to have a grasp of atmosphere, context, flow, human emotions, natural language, perspective, scripts, tempo, tone, and much more, as I'll discuss in later chapters.

Meanwhile a Creative Machine that's been tasked with creating a new physical product, for example, will perhaps need to have a grasp of bio-mechanics, context, design thinking, durability, function, materials science, manufacturing processes, physics, reliability, supportability, usability, and, again, much more.

Notes:

In short, just like we humans, in order to master their respective “trades” these creative machines have to be well rounded, be well versed in multiple disciplines, and then be able to intelligently combine all of these disciplines together within the context of the task in order to achieve their desired objective. And that’s what researchers around the world have been developing, and that’s what we’re going to explore in more detail in this Codex.



EVERY TECHNOLOGY ACCELERATES THE OTHER

These technologies, whether they are used to generate synthetic audio, imagery, text, video, or Synthetic Worlds, will disrupt the entire global content industry - from the production of art, books, games, and movies, to Virtual Influencers and VR. They also compliment one another and accelerate each others development, including the development of Synthetic Worlds which Synthetic Innovation platforms will use to virtually innovate, model, and test new product concepts at speed.

MULTIPLE FORCE MULTIPLIERS.

WHEN THINKING about how to harness the potential of these Creative Machines, that can arguably create and innovate anything, for maximum advantage and impact, whether you're interested in machines that can innovate new content in all its forms, from audio, imagery, text, and video, to Synthetic Worlds, or machines that can innovate new digital and physical products you should also think about what happens when you combine those powerful exponential tools with other powerful exponential technologies because this is where you really unlock their true potential.

For example, combine these Creative Machines with 3D and 4D printers and you now have a way to innovate and produce products in real time and on demand at a rate and speed that was previously unimaginable.

Furthermore, not only does this mean you can dramatically reduce your time to market by multiples, but it could also have a dramatic impact on your business model, go to market, and open up a wealth of new opportunities you'd never

dreamt of before - all this is only possible though because there have been multiple developments in multiple technology disciplines in the field that are now becoming mature enough for companies and researchers to integrate together to create increasingly capable and usable creative machines.

TECHNOLOGY COMBINATIONS

When you look at the diagram to the left you will see six distinct technology categories that each, within their own right, will transform the world and revolutionise how we create content and products. All that said though, and as impactful as they all are, when they're combined together that impact is multiplied thousands fold, if not more.

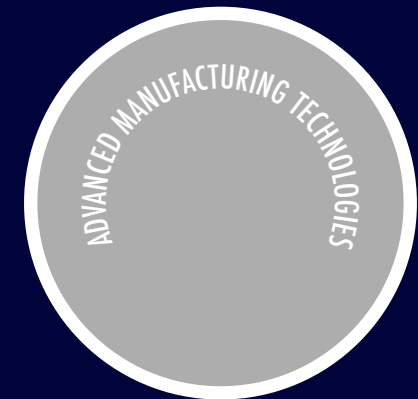
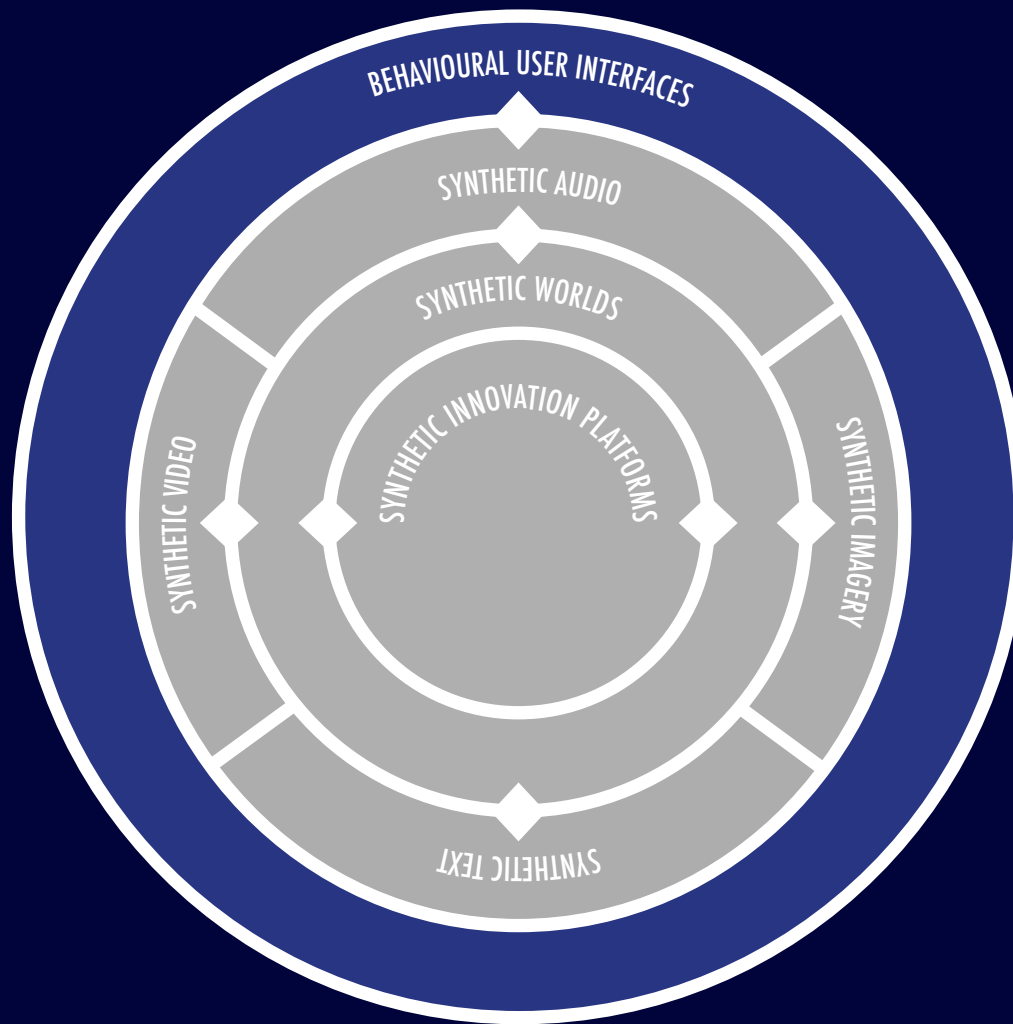
For example, Synthetic Text generators can write authentic news articles, novels, research papers, and scripts, for starters, with the obvious implications on industry and society.

When integrated into Synthetic Video generators though all of a sudden these

generators, these machines, can write the script for a movie and then the Synthetic Video generator can use that input to auto-generate the corresponding movie.

Combine the same Synthetic Text generators with Synthetic Image generators and you now have a way to convert text into imagery. Combine them with Synthetic Audio generators and now you have a way to create music with lyrics and human vocals. And so we can keep going through the wheel, so try thinking about the potential of these combinations for yourself.

Furthermore, and diving further into the wormhole, by combining all these generators together we then use them to create increasingly sophisticated and realistic synthetic virtual worlds that on the one hand could become new Virtual Reality game environments, as well as even movie sets, as we recently saw with the production of Disney's Lion King, but that also become the ideal digital environments that let Synthetic Innovation platforms design, model, test, and then train and evolve their new product concepts at extreme, or "digital" speed.



ORBITING COMPLIMENTARY TECHNOLOGIES ...

UNLOCKING CREATIVITY AND INNOVATION FOR ALL

As Creative Machines become increasingly advanced behavioural user interfaces will let everyone with a smartphone and an internet connection tap into their power using just their voice, as well as a variety of other means. In short, these behavioural user interfaces will be the secret ingredient that democratise access to creativity and innovation for the billions of people on the planet who today have great ideas but have little or no way of making them a reality.

DEMOCRATISING CREATIVITY AND INNOVATION.

AS THE development of these Creative Machines, in all their variants, continues to accelerate the next step will be to simplify their user interfaces and make them increasingly accessible and easy for people to use, at which point the technology will be democratised.

EVERYONE IS A CREATOR

The impact of the democratisation of these technologies on human society, as well as industry, will be nothing short of revolutionary. The result of which will be that we will be able to create and innovate content and products not at traditional human speed, but at exponential digital speed.

In just a three year period, for example, we've already seen convincing DeepFake content, which is just one form of synthetic content, move from being a high tech lab experiment that requires a team's worth of PhD's to create to being integrated into smartphone apps that allow anyone with a camera and a face replace Hollywood A-Listers likenesses

for their own.

Now take this development a step further and all of a sudden the billions of people with nothing more than a smartphone and a lousy internet connection will be able to just ask an app to design a new product for them and make modifications to it using nothing more than their voice.

Furthermore, when this technology is combined with 3D printing, for example, those products can then be manufactured anywhere on demand - time and time and time again.

Ultimately, we are now starting to bear witness to the exponential acceleration of global innovation, but it's not just constrained to content or physical products, in time it will apply to everything - from AI software and computer chips all the way through to new pharmaceutical drugs and other increasingly sophisticated products.

We are nearing a tipping point and make no mistake that the rate of global change, that we already think is fast today, is about to be kicked into

overdrive.

AUTONOMOUS CREATORS AND COMPANIES

However, as fast as human creativity and innovation is at digital speed it will be nothing when compared to the rate of creativity and innovation when autonomous Creative Machines and autonomous companies, driven by machine entrepreneurs not human entrepreneurs, emerge and combine - something that is already starting.

At this point not only will the machines be able to identify problems to solve, or opportunities, and create the content or products to match, but they will then, thanks to the nature of our increasingly digital and interconnected society, be able to build and scale companies, and market and sell these goods to a global audience and at global scale at exponential speed.

MACHINES THAT INNOVATE PRODUCTS





INNOVATION IS one of humanity's most exalted skills and crowning achievements - one that, as we are almost continuously told, separates us from many of the other animals and arguably makes us the "most unique species in the known universe."

Naturally then you can imagine the fallout that the arrival of so called Creative Machines, machines that share this trait and that can autonomously design any kind of product, from a building or a computer chip, to a piece of AI software or an item of clothing, will have on human culture and society. And that's before we discuss their impact on the global business environment, the impact they'll have when they eventually exceed our own amazing talents, and then are able to innovate and produce products at digital speed, millions of times faster than humans could.

Furthermore, and as if this breakthrough alone wasn't enough, as I'll discuss in more detail later in this chapter, when these machines are combined with new advanced manufacturing technologies like those laid out in the Griffin Exponential Technology Starburst, not only will they be able to scan social media and other big data sources for problems to solve and new market opportunities and then innovate

new product concepts but they'll be able to manufacture and evolve them too - irrespective of whether those products are hardware or software based.

The result of all this will be that eventually they'll be able to identify opportunities, innovate and manufacture new products at such speed that they'll be able to take the Concept to Market times down to just days, and potentially, as I alluded to earlier in this Codex, disrupt global industries within just hours and days not decades or years as it takes today.

WE CREATED THE IMPOSSIBLE. AGAIN.

Ironically the arrival of these types of creative machines has only been made possible because of our own human ingenuity and inventiveness, and given the scale of the task of creating them it's little wonder that so many people never thought these types of machines would ever exist. But, here we are, and here they are.

Humans are amazing at many things - especially our ability to break large tasks down into simpler, replicable steps that can then be scaled up and developed further, and that's precisely what's happened in this instance.

Notes:

After all, as I explained in the previous chapter innovation is a process, and processes, no matter how complex they are, once understood can be replicated, and if you skipped that chapter then let's run through it again with a simple exercise because it's a very important point. Let's begin: Take a cup and make it half the weight. This is an example of what's known as Iterative Innovation where we take a product and improve it, and it's just one of several types of innovation.

In your mind you're already going through a process and weighing the results against the desired outcome. So, for example, no doubt you're wondering if you can cut the glass in half, change it's size, or the materials that it's made out of, and so on, until eventually you settle on a solution.

By understanding this process and by mapping out all of the individual steps involved we can now digitise them using machine learning to create an AI capable of mimicking it and this AI becomes our first basic Creative Machine. Then, in order to improve it, we iterate it and continue improving it until we have a machine that can solve the problem and innovate a product.

And as for creating machines that can

create well designed products that meet the briefs, rather than creating products that noone wants to use or buy, well, that's an innovation problem, and we're solving that too so let's move onto the next section.

BUT IT'S NOT AS SIMPLE AS THAT.

Creating a good creative machine that's capable of innovating well designed products that meet the brief, whatever that brief is, isn't just as simple as digitising a few steps though - just think about all the different permutations and thoughts your mind had to run through just to create a lighter glass, let alone a more complex product.

Not only did you have to understand the context of the brief and the outcome we were looking for but you also had to take into account the purpose of the product and the final products usability. However, while you were running all the permutations in your head you also had to consider all of the different properties of the materials you could have used - concrete, for example, wouldn't have met the brief from a weight perspective, meanwhile paper would have met the brief, but the product would have been all but unusable. And so on.

Notes:

Innovation is anything but simple, even for a human, and it's even more difficult for a machine whose knowledge and experience is starting from scratch.

So, while developing a creative machine might sound straight forward in order to mimic even the simplest skills of the human mind researchers in the field have had to develop complex multi-disciplined AI's capable of understanding everything from context and natural language, through to materials and the laws of nature, and much more besides. Then, naturally, as they have to code in more information and "intelligence" into these machines the complexity of the models increases exponentially and that's a real challenge.

That said though we are now at the point in time where AI's capable of Iterative Innovation have arrived, and they are only going to improve and get more capable from here.

FROM ITERATIVE TO DISRUPTIVE

Being able to develop machines capable of basic, iterative innovation is obviously just the first stage of what will be a very long and protracted journey, but as the platforms develop they will in time be capable of much more including,

eventually, Disruptive and Primary Innovation.

Disruptive innovation is where they are skilled enough to design new product concepts that are significantly better than anything we've ever seen before that can disrupt existing products and markets, for example, a disruptive new game, healthcare treatment, material, or vehicle, and many millions of other things besides.

Next up comes Primary Innovation - the point in time at which they become capable of ingesting data about problems to solve and designing new product concepts we've never seen before - a skill that could also help usher in new industries. An example of primary innovation could be anything from the development of interstellar space travel through to cracking the secrets of fusion and human immortality, creating a new healthcare treatment, and again many million other things besides.

As researchers, and then the creative machines themselves, as we're already seeing today, work together in tandem to develop more capable machines in time we will see them become so good at what they do and so plugged into the digital fabric of our society that they'll be able to spot problems and opportunities

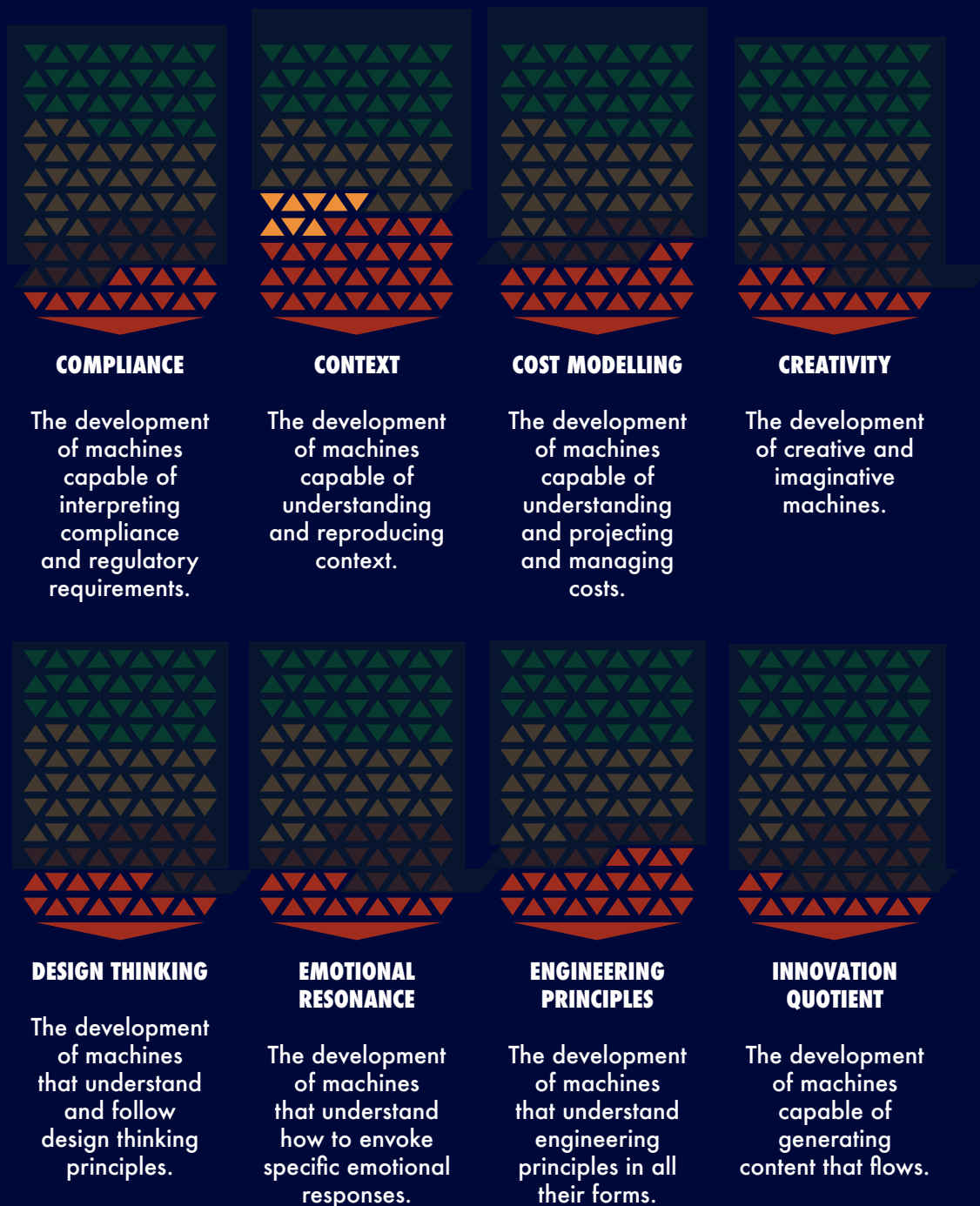


Figure 3. Current state of Creative Machine development by individual AI discipline.

Source: Multiple Sources

as they appear and design new products that solve them in real time.

For example, imagine everyone complaining about a product on a social media platform, whether it's a hardware based product or a digital one, and a Creative Machine being able to understand the context of their complaints and design a better product - something that leveraging the massive computing power and resources of AI and the cloud it could do in real time.

STILL WORK TO BE DONE

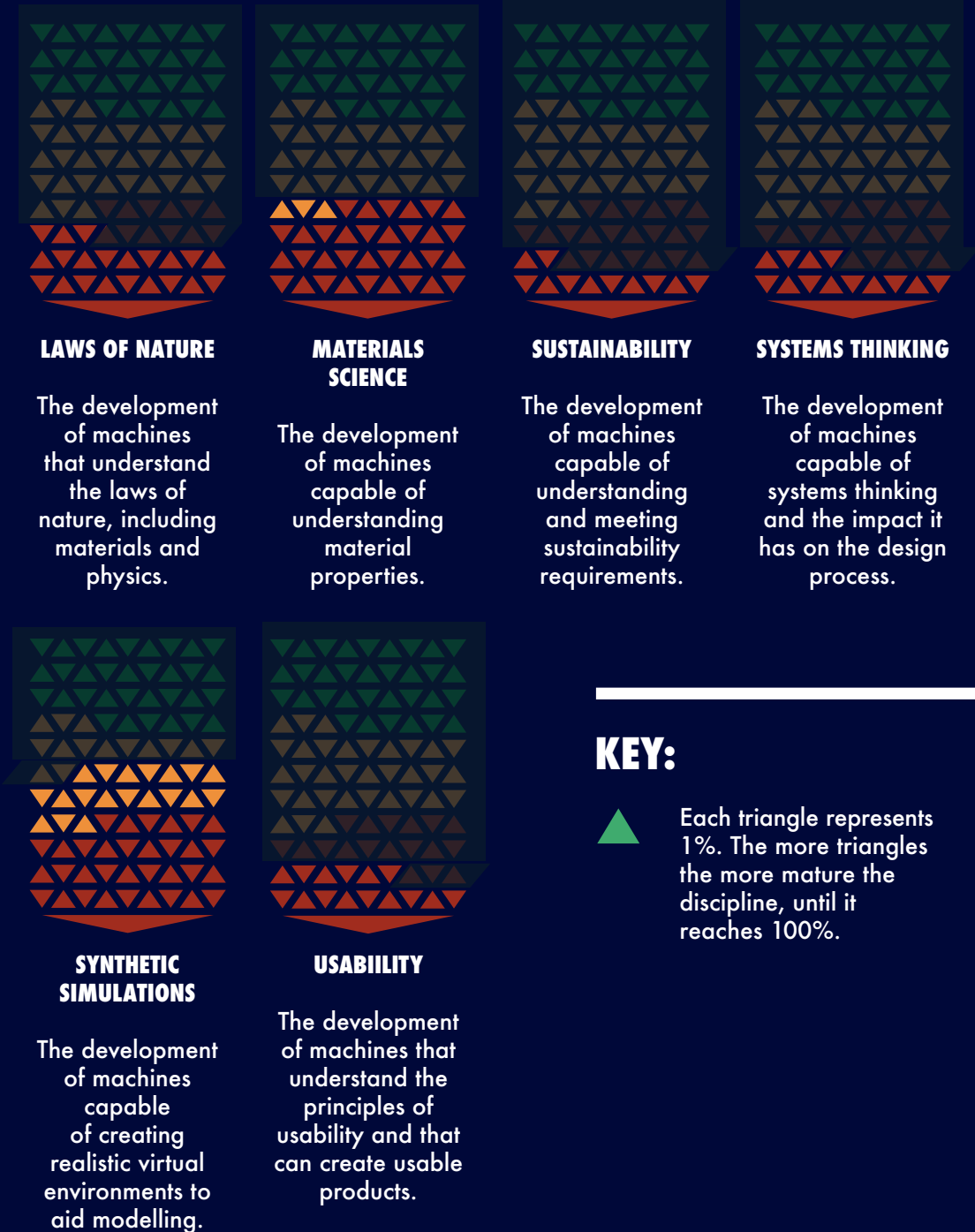
While many of us might think that building effective Creative Machines might be a herculean task in itself the truth is that it's actually harder than that, and it goes without saying that the more complex the products that these machines are tasked with designing the more complex the algorithms underpinning these Creative Machines need to be.

To the right and left of this column you'll see just a small number of AI disciplines, out of many, that all need to mature and then be combined and integrated with one another before we get close to creating what will be known as a General Creative Machine, in other words, a Creative Machine that can best

any human in almost any innovation task.

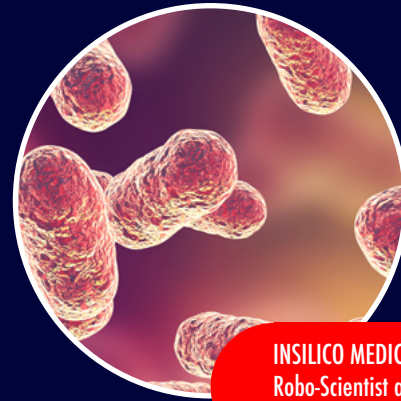
Take my glass example in the above chapters, in order to design an effective glass the machine first has to understand the context of our request, it also has to have an understanding of the purpose of the glass - which is no small feat for a machine that doesn't need to drink and doesn't have any way to physically hold or interact with a glass with in the first place. Ironically, this latter problem is where virtual modelling, in the form of Simulation Engines, which are being generated by another form of Creative Machines that I'll discuss in a later chapter in this Codex, become especially helpful during the innovation process.

Then, add into this that while it's always possible for the machine to meet the black and white brief, namely to reduce the weight of the glass, the final product it designs has to be not just functional but also has to meet other criteria as well, such as affordability, desirability, usability, and more. And, as mentioned, as the products become more complex it's therefore easy to see how the level of difficulty in creating creative machines that can meet the briefs demanded of them become exponentially more difficult.





AIRBUS are using creative machines to design and innovate new ultra-lightweight components for their A330NEO and A380 aircraft.



INSILICO MEDICINE are used an early example a Robo-Scientist and it designed 30,000 new drugs in 21 days, some of which were winners.



NASA are using creative machines to help them design new ultra-lightweight interplanetary landers and martian habitats.



UNDER ARMOUR are using creative machines to design new trainers and sports apparel which are then 3D printed in shops.

PRODUCTS DESIGNED BY CREATIVE MACHINES

As the capabilities of Creative Machines improve more and more companies are starting to experiment with them to create new product concepts, so here are some examples. And I could have also included Amazon and General Motors who are using creative machines to help them design fashion lines and cars - the floodgates are opening.

Notes:

BROADER AND BETTER

As our ability to create machines that are good at innovating specific products improves naturally over time the breadth and the complexity of the products they'll be able to innovate will also naturally improve.

Today, for example, they're already innovating everything from aircraft parts and apparel as well as cars and furniture. But, even though it's still early days we're already seeing the emergence of so called Robo-Scientists, creative machines that are designing new healthcare treatments and drugs, as well as new materials, so if you think that creative machine innovation will simply be confined to specific product categories then you'll be very wrong and at some point they'll likely cross every field.

SUMMARY

We are starting to see the emergence of a new world order and economy, one that is built and led by machines, and as humans we need to gather a point of view and understand the strategies our enterprises need to design and embrace in order to reap the significant benefits of this new reality while minimising the threats and the down sides.

MACHINES THAT INNOVATE CONTENT





IT GOES without saying that not all content is created equal. That said though every piece of content, whether it is an individual piece of content or an entire virtual arena, environment or world, has its place and its own special intrinsic value, from a pamphlet whose commercial value is relatively low and fleeting, or a blockbuster movie or AAA game whose value is substantially greater and much longer lasting.

AS RESEARCHERS get better at creating Creative Machines that generate Synthetic Content the next battleground will be creating the techniques and tools to direct, edit, manipulate, and control the outputs.

Over the past few decades there has been a paradigm shift in how the world creates and consumes content as people embrace new content formats, techniques, technologies, and tools, and move from creating and consuming mostly physical content to creating and consuming digital content instead.

It's this shift from physical to digital, combined with the emergence of increasingly democratised and powerful exponential technologies that are helping developers build the first generations of

Creative Machines that are capable of generating a wide variety of so called Synthetic Content - either automatically or on command - which will change the way content is created forever.

Furthermore, besides from being able to automatically generate synthetic content on their own in time these creative machines will themselves become democratised which in turn will then help democratise content creation for everyone on the planet who has a smartphone and an internet connection. And one of the major implications of this, of course, will be that today's seeming torrent of content will end up looking like a mere trickle - especially when you consider that these creative machines will be able to generate and pump out content non-stop 24-7.

Today, we stand on the brink of a new era where these machines, that will be both the tools and the creators, will help transform every sector and corner of society in new and previously unimaginable ways - from the generation of DeepFakes that threaten to undermine democracy to putting the power to create blockbuster movies in everyone's hands - and where the rate of content creation only continues to accelerate exponentially.

Notes:

Furthermore, it should not be lost on you that as the growth in digital content continues its meteoric rise many analysts estimate that, on the one hand it will help drive over \$2.7 Trillion in GDP, and that the emergence of creative machines, like the ones I'll discuss in the following chapters, will impact the careers of over 375 million people.

DEFINING SYNTHETIC CONTENT

As the way we create content continues to evolve, moving from human generated content to machine generated content, and moving from the generation of physical to digital content, one of the pedantic challenges that we face is accurately defining what we mean by the term synthetic content, so let me clear that up now - bearing in mind of course that today there still isn't a formal definition of the term.

In some people's minds digital content is already synthetic content, irrespective of who or what creates it, but for the purposes of this codex when I refer to synthetic content what I am specifically referring to is the digital content that is synthesised by machines.

THE NEW ERA OF SYNTHETIC CONTENT

As creative machines get more adept at generating synthetic content from scratch, whether it's in the form of synthetic adverts, articles, books, documentaries, imagery, movies, soundtracks, or video, they will bring about a new content revolution unlike anything we've ever witnessed before where the variety, velocity, and volume of the content being produced will be unfathomable by modern standards.

That said though, in order for future creative machines to conquer the proverbial content mountain and become the primary way that all digital content is generated - whether it's generated automatically or with some level of human involvement - not only will all of the individual content types that these machines need to draw on need to be mature, for example, synthetic audio, imagery, text, and video, but furthermore they will need to be able to combine them together accurately, and then also - as if the above isn't enough - draw on a whole variety of skills that are completely alien to them, including contextual, emotional, and semantic understanding, flow and rhythm, storytelling, and much more. And it's the combining together of all of these individual content elements, within the bounds of a storyline, that will be researchers greatest challenge.

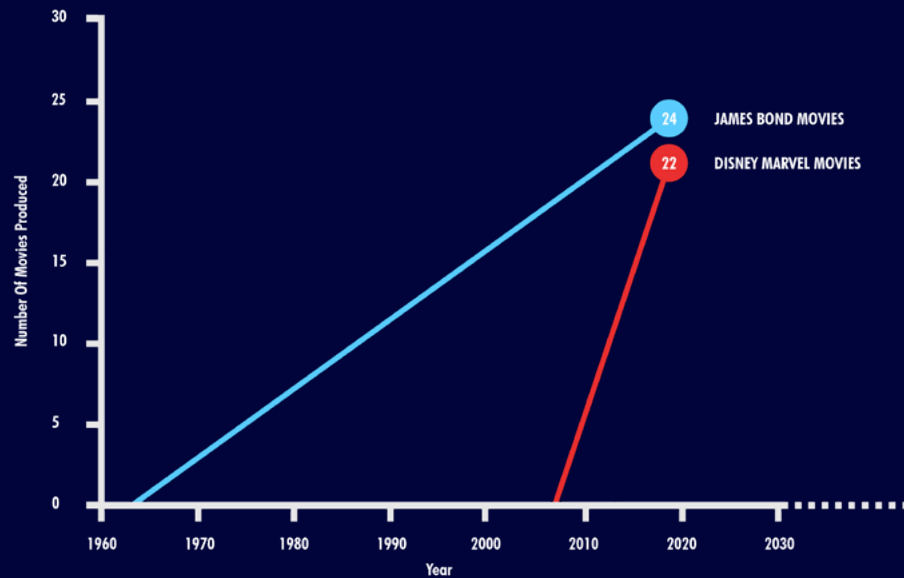


Figure 1. The rate of movie production.

Source: Visual Capitalist

While it can be said that there are creative and technological differences between the two studios when it comes to the production of movies the impact that new technologies, techniques, and tools, have on the speed of movie production cannot be denied.

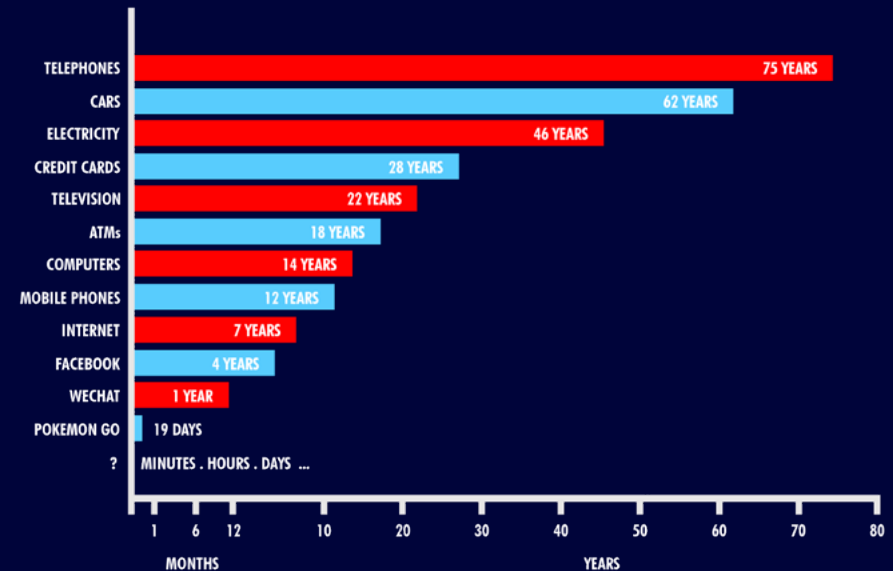


Figure 2. The rate of content and technology adoption.

Source: WSJ

However the data is presented it is undeniable that, thanks to the collision of different trends, including a more connected and digital society, that the pace of product and service adoption, in all its forms, has accelerated dramatically.

DIGITAL TECHNOLOGIES AND AN INCREASINGLY CONNECTED SOCIETY ACCELERATES DISRUPTION.



GOOGLE used synthetic audio generators to create Duplex, an AI assistant whose voice blew past uncanny valley.



NVIDIA used synthetic simulation generators to create the world's first computer game intro made by an AI.



OPENAI used synthetic text generators to create the world's first procedural text based games, which one day will include graphics.



SPRINGER used a synthetic text generator to create the world's first research book written completely by an AI.

SYNTHETIC CONTENT GENERATED BY CREATIVE MACHINES

As the capabilities of Creative Machines improve more and more companies and individuals will use them to push the boundaries of synthetic content creation and use them to generate everything from simple adverts and art, all the way through to using them to generate books, games, movies, and even digital humans.

Notes:

However, once researchers manage to create the first creative machines adept enough at combining all of these individual elements together to create realistic, high quality content - whether that content is 2D or 3D, static or dynamic - then, and only then, will the balance of creativity and creation finally and fully tip into the machines favour.

AND THEN COMES PROCEDURAL CONTENT

When researchers finally manage to crack the code of developing creative machines that can produce content that rivals the content put together by today's human professionals, especially video content, then fortunately they'll still have work to keep them occupied. And this is where now they start ratcheting up their pursuit of creating what's known as Procedural Content, and it's arguably one of the most exciting content categories.

For those of you who haven't heard of procedural content before it's the ability of machines to take in a variety of different data sources, which I'll come to in a moment, and then automatically and in real time adapt the content they're generating accordingly.

So let's run through an example, and, just in case you are wondering everything I'm going to run through in this example is based in real technologies that we're seeing emerge today.

It's Friday night and you're sitting by yourself on your favourite sofa - the one that you've sat in so many times before that it's now permanently moulded to the shape of your body. You finally flick on a movie from your favourite provider, and while you're sitting on your sofa the Creative Machine platform that's running in that providers cloud environment is ingesting data about all of your behaviours, emotions, mood, and preferences, from multiple sources - everything from your Facebook profile and so called "Big Data" footprint, all the way through to the UHD video feed from the camera on your Smart TV that's capturing all of your biometric information and micro-facial movements.

All the time the movie's playing the platform's analysing huge volumes of information in real time and after a while it notices you're looking bored - your attention's waning, you're facial expression's changed, and your heart rate's slowed. As a result of this analysis it makes the decision to dynamically re-write the movie and generate new more exciting content in order to get

Notes:

your attention back, and now rather than showing you the stock version of the movie that everyone else is watching elsewhere it's creating a perfectly tailored movie, just for you.

That is what we mean when we discuss procedural content - the ability of a creative machine to dynamically generate new content and storylines on the fly with no human involvement.

THE ENDGAME

The ultimate endgame of all this work and research, of course, will be to develop creative machines capable of generating human grade, and better than human grade synthetic content in real time without the need for any human involvement or intervention - a Master Creator, the impact of which will be revolutionary, in every sense of the word.

SUMMARY

Today, we are creating a whole new range of Creative Machines that are capable of generating increasingly high quality and sophisticated synthetic content in a wide variety of forms and formats. This is the first battle ground for developers to conquer. And when they

do they will then swiftly move on to the next task of creating the technologies, techniques and tools, needed to control, edit, and modify all of the various outputs.

However, like any good story the story doesn't end there, because once we have mastered creating these sophisticated machines it is inevitable that many of those same researchers will then turn their attention to integrating the technologies and creating the machines that can edit and modify content in real time, on the fly, in response to consumers behaviours - at which point the era of Procedural Content will have arrived.

Notes:

FUTURE SPORTS



A person wearing a white cap and an orange shirt is running on a paved path that runs along the ocean. The path is made of light-colored bricks. The ocean is visible in the background with waves breaking. The sky is blue with some light clouds.

CHAPTER SUMMARY.

ANYTHING AND everything can be turned into a sport. Or a game. Or a competition. And that's the beauty of sport. But today if you can imagine a new sport or game in many ways you are limited in your ability to turn it into a reality.

As our technology and tools, however, become increasingly powerful and democratised in time if we can imagine it, or if your Creative Machine associates can imagine it, then we'll be able to create it and turn it real.

SPEAK IT AND IT WILL BE CREATED

As the Creative Machines, discussed in an earlier chapter, improve, we'll ultimately reach the point when we can simply talk to them using natural language and they will then be able to design and produce a new Augmented or Mixed Reality arena, for example. We'll also be able to talk to them and describe a new product, or product modification, and have them design a new product for us which can then be 3D printed off and used right away.

THINK IT AND IT WILL BE CREATED

As we move the timeline out, and as we can already see emerging, in time we won't even need to talk to these Creative Machines, we'll simply be able to think of a new game or sport, or a new arena or play space, and the machines, via non invasive Brain Machine Interfaces, will then generate and produce them for us, again, on demand and in real time.

THE REGULATORS HAVE KITTENS

Elsewhere though other exponential technologies, such as genetic engineering and synthetic biology, are also being developed at an increasingly rapid rate. As a result our ability to create designer organisms with special abilities is also accelerating, and if the regulators allowed us to we can easily see a point in time where these organisms, with or without cyborg-like augmentations, can be a part of the sports. A new breed or team mates or opponents - literally.

FUTURE SPORTS





OF COURSE, having delved deeply into the future of humans and arenas, as well as a wide variety of other topics, every human and every arena, whether that arena is your kitchen table or outer space, needs a sport. And as the technologies we're developing today increasingly make even science fiction look tame, and as the limits of our own imaginations are no longer the limit, as we see the emergence of Creative Machines, as discussed in previous chapters, the only challenge we have left is to imagine future sports.

Which then brings us to one ultimate question: What sports will we create and play when all the limits are off?

FUTURE REALITIES



BREAKING REALITY

YOU CAN think of this timeline as being a transitional timeline where we move from today's more commonly physical constructs and start witnessing the increased technologisation of not just sports but life itself with all the implications that that brings with it.

Today the physical and digital worlds are still largely distinct and separate, with technologies such as Augmented Reality and Mixed Reality especially slowly breaking down the barriers between the two but during this timeline these barriers will increasingly become eliminated and, in time, the digital world will feel as real, mentally and physically, as the real world does today.

ANTI-GRAVITY GAMES

We've all heard of the Gravity Games, well during this timeline we might be able to see the emergence of the first Anti-Gravity Games, and let's face it, while pulling off such a feat in this timeline would be difficult it's not impossible. After all, we've already seen the emergence of the first 3D printed

liquid magnets and the emergence of magnets so powerful that they blow the doors off of the labs they were created in, and we've also seen the emergence of the first passive cryostatically cooled hoverboards, and when you fast forward all of these innovations into this timeline with some clever engineering it wouldn't be beyond the realms of possibility to bake all this tech into a suit and give sportsmen and women the experience of Zero Gravity here on Earth.

HOLOGRAPHIC SPORTS

In the late 2010's we saw the emergence of the first real 3D, living holograms that during this timeline will continue to mature and miniaturise, and while the technology will still be relatively expensive and still be somewhat from full commercialisation during this timeline it's likely that we'll start seeing the first real applications of the technology come through. So while you won't be playing holographic chess quite yet you may be able to play large table format sports and games.

2020 - 2040

INFINITY SPORTS

When you consider the advances in especially Creative Machines, Mixed and Virtual Reality technologies, as well as haptics, neural interfaces, and other immersive sensory technologies it's clear that our ability in this timeline to start shattering the barriers that separate the real and virtual worlds is going to accelerate.

As a consequence it will become increasingly inexpensive and easy to immerse yourselves in virtual worlds and virtual sports, whether those sports are E-Sports or mixed reality sports that let you physically play rugby with other players from around the world via 5G and in time 6G, or augmented reality based sports that, relying on cloud based rendering technologies, let creative machines create an infinite array of AR

2020 - 2040

sports and games on the fly and in direct response to your environment and your behaviours and moods.

TELEKINETIC DRONE RACING

During the 2020's and 2030's non-invasive Brain Machine Interfaces advanced significantly, but in this timeline not only does this mean that these interfaces are now commercialised, but it also means that we're also starting to see the emergence of the first human Hive Mind platforms that let you connect your thoughts to others - and that's before we give a cursory hat tip to telepathic Brain to Brain interfaces.

When combined with Virtual Reality smart contact lenses or screenless displays, again, as discussed in earlier chapters, that means that now we're opening up the door to telepathic sports with drone racing, where you control drones with your thoughts alone as they race through insane courses, become more mainstream.

INTO THE FRIGID DEPTHS

DURING THIS timeline everything that we first observed emerging during the late 2010's and 2020's have now been miniaturised and combined together to create a wide variety of new products and concepts. And as I've mentioned several times our imagination is no longer the limit. So, with that in mind let's take a look at some of the sports that could emerge during this timeline.

ENHANCED DECATHLON

In this timeline the word enhanced can be taken to mean anything, as I've discussed in this codex, from cognitive augmentation and genetic manipulation, through to technological augmentation which can take a multitude of forms, from bionic implants to neuro-prosthetics.

However, for now we're going to leave all that technical chicanery alone and instead zero in on the emergence of exosuits that, by this timeline, will have been miniaturised to the point where they are so thin they could resemble a second skin, and at which point our ability to

obliterate traditional world records across every sport, from the high jump and triple jump, through to sprinting, weight lifting, and much more besides, will just be a given.

TRENCH DIVING

The advent of new ultra flexible, lightweight, and strong materials combined with breakthroughs in underwater supercavitation technology means that, just as the skies are no longer the limit, neither are the seas.

Today the fastest sea going racing vessels, the F1's, have top speeds of 250km/h but during this timeline we'll be able to achieve those same speeds underwater at depths of up to 30,000 feet thanks to the maturation of technology that first made its appearance in the military sector that let torpedoes travel at over 200km/h thanks to their advanced supercavitation capabilities that eliminated the negative effects of water drag on underwater vehicles by using streams of bubbles that emerged from the front of the vessel and encased

2040 - 2060

them in underwater pockets of air.

ZERO GRAVITY KICKBALL

As we continue to open up and democratise access to space, with the first commercial space hotels being opened up to tourists during the late 2030's, this also gives us the opportunity to begin developing some of the first space based sports, and frankly take gravity out of the equation and even the most traditional sports suddenly get a new twist.

I ♥ UNICORNS

BEYOND THE year 2060 it could be argued that sport, all sports, have changed beyond all recognition - especially in light of the fact that even the most traditional sports such as Football will become increasingly techno-centric which will then inevitably help influence the future direction and development of the sport.

As technology's influence on sport becomes increasingly acute it is increasingly going to be down to the governing bodies and the regulators to set the bar and determine what is, and what is not, permissible.

That said though we all know how much regulators like to have fun and let everyone experiment with new things so, thanks to the regulators of 2060 here are a few of the new sports we can expect to be playing.

LEGENDARY BASE JUMPING

As our access to space gets easier and cheaper over time, with the democratisation of space first starting to

emerge in earnest in the early 2020's by this timeline it's not beyond the realms of possibility that rather than taking a trip into the Swiss Alps, or to the sky scraper canyons of New York, you could be boarding a spaceflight to the Moon or Mars, with the latter costing around \$200,000 per trip by this timeline, to base jump off Olympus Mons, the highest mountain in the known solar system standing at just under 70,000 feet high or over twice the height of Everest.

LIGHT SABRE BATTLES

First conceived in the 1960's light sabres have long been the realm of science fiction, but they became science fact in the late 2010's with the development of new Plasma Jet technologies that were made possible when scientists combined electrons with photons to create a new state of matter. And we aren't talking about weak replicas of the once science fiction technology, we're talking actual, real light sabres capable of slicing through metal with a single stroke - the next generation of fencing has arrived.

UNICORN RACING

The so called sport of Kings and Queens today horse racing is one of the world's most popular sports enjoyed by hundreds of millions of enthusiasts around the world but by the year 2060 advances that we first saw emerge in the late 2010's will have developed to the point where our ability to create transgenic species, that's species that share behavioural and physical characteristics and genomes, will have matured.

The result of which means that not only will we have a way to create many of the imaginary species of Pokémon that everyone loves today, most of which are transgenic in appearance, but we'll also be able to finally realise everybody's dream of creating unicorns. Simply take a dash of Narwhal or Ibex DNA, animals which some say are the original unicorns because of their horns, and combine them carefully with horse DNA using a gene editing tool, such as CAST or CRISPR, and there you have it. A real live unicorn, and what better way to celebrate the birth of this new previously mythical animal but to race them...

Furthermore, take bio-luminescent and photo-chromic genes from cuttlefish, fire flies, and plants, and, just as we did back in 2010 you could then create a multi-coloured unicorn that not only glows in the dark but that also changes its colour. And then, of course, we can turbo charge them by tweaking their genomes so they produce more adrenaline and a greater ratio of slow to fast twitch muscle fibers - along with many other things too.

BEYOND 2060

CONCLUSION



PEOPLE SAY change is a constant, but in today's technology fuelled world this simple phrase is a deceiving, and often comforting, misnomer because change isn't constant, it's exponential, and the only boundaries to what we can achieve as individuals and as a global society are the ones that we invent for ourselves.

As researchers and scientists increasingly prove that nothing is impossible, that yesterdays science fiction is simply the future generations status quo, and as we all continue to bear witness to an increasingly rapid rate of change that's affecting and transforming every corner of global culture, industry, and society the future belongs to all of us equally, and we should never lose sight of that.

As you race into your own future I wish you well, and never forget you have all the friends and support you need around you as we all voyage through time and space together on this fragile living spacecraft we call Earth.

[Explore More](#)

MATTHEW GRIFFIN
Founder

Notes:

A full-page background image of an astronaut in a white spacesuit floating in space. The astronaut is positioned in the center-right of the frame, floating towards the viewer. Below the astronaut, the Earth's horizon is visible, showing a blue sky with white clouds. Above the astronaut, the deep blue of space is filled with a dense field of stars and a faint, glowing nebula. The overall scene is dramatic and inspiring, emphasizing exploration and discovery.

THIS IS NOT THE END. **EXPLORE** MORE.

Copyright © Matthew Griffin, 311i Ltd. All Rights Reserved.

Produced in the United Kingdom.

This document is current as of the initial date of publication and may be changed at any time. Not all offerings are available in every country in which 311i operates.

The information in this document is provided "As Is" without any warranty, express or implied, including without any warranties of merchantability, fitness for a particular purpose and without any warranty or condition of non-infringement. 311i products are warranted according to the terms and conditions of the agreements under which they are provided.

This report is intended for general guidance only. It is not intended to be a substitute for detailed research or the exercise of professional judgment. 311i shall not be responsible for any loss whatsoever sustained by any organisation or person who relies on this publication.

The data used in this report may be derived from third-party sources and the 311i does not independently verify, validate or audit such data. The results from the use of such data are provided on an "as is" basis and the 311i makes no representations or warranties, express or implied.

UK311-200221-DOC01-FOSPORTS