

Beyond Collaborative Intelligence we can see a Meta-Mind Society Surfacing and we can Dream of a Ω -Mind?

FACTS, FADS AND PREDICTIONS ABOUT THE JOINT VENTURE OF HUMAN MIND AND AI ALGORITHMS

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"Humans have dreams, computers don't! Computer programmes can be replicated easily, human minds not at all!"

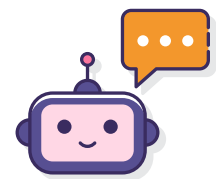
We are living in an extraordinary time; our world is in the midst of digitalisation that is already shifting towards a world dominated by virtualisation and artificial intelligence. Many agree that people will work and live in collaboration with "intelligent¹ machines." Although Chaos Theory is able to describe this imminent change as strange distortions (attractors) and disruptive contextual changes, what is most profound is that we are at the dawn of a deep transformation with historical dimensions creating the emergence of shifts in societal cognition.

This imminent change will literally turn things on its head as we know it. Everything seems to be put upside down. The deep transformation is still in process. We are still in the phase of transition and probably will be there for the next 25 years or so. Presently, we are busy with the challenges of globalisation and digitalisation, but within the next decade we will have to cope with the challenges of virtualisation and AI.

The virtualised world equipped with artificial intelligence will never be the same. We

have started a disruptive journey into the big unknown. For virtualisation we are aiming at "seamlessness²" of "our reality" with the "virtual reality". In terms of artificial intelligence, we still have to figure out what we mean by the construct of "intelligence."

Human beings are psycho-physiological entities operating with different processes on different levels: reason, imagination, emotions, feelings, and instincts. Beside the physiological processes, there are conscious (i.e., controlled, instinctive, automatic which employs routines) processes. Humans are communicating constantly whether they be verbal, visual, through body language or other behavioural signs. Words are based on concepts and are loaded with meanings and emotions. Most of human communication is subjective and colored by our worldview, the Zeitgeist and our cultural environment. In addition, our perceptions are heavily distorted by



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prejudices and subjective worldviews. By contrast, machines are not conscious, non-emotional and ruled by algorithms created by humans.

Human behaviours and realities are based on genetic programming, life experiences, role models and education. Humans are all children of the Zeitgeist; even science is affected by it³. The history of science and ideas is the best proof to support this argument.

Science is the most objective way to look at the world. But it is also biased by its very rudimentary assumptions and foundations. We tend to see the world and universe through the lens of the four-dimensional macro cosmos. Meanings are contextual and we are operating within different theoretical frameworks. Today we can see the edge of contemporary science, but most of us are not able to move beyond it. It seems to be reserved for future generations.

So far humanity has been relying on individuals and groups of individuals to find solutions for our problems. Today we are able to leverage the intelligence of large groups of people and are approaching the possibility of using the collective intelligence of our entire humanity for this purpose. However, with the development of artificial intelligence, we can see an additional level that searches and finds convenient solutions; it is the collaboration of humans with intelligent programmes and machines.

The collaboration of humans with smart machines and programmes creates new solutions way beyond our imagination, leading to meaningful life quality enhancing products,



services and experiences! The objective of this paper is to explore several levels of co-existence, cooperation and co-creation of humans and intelligent machines that we denominate collaborative intelligence.

Plainly speaking, digital platforms⁴ enable us to leverage collective human intelligence. The first attempt of collaboration and co-creation of humans and intelligent machines is popping up in the Internet of Things daily. Soon we will see the emergence of “Meta-Intelligence”: it will represent a merger of human intelligence with AI, leveraging collective intelligence with the computational power of intelligent machines, the Internet of Things, the cloud and virtual

reality. This will be the era of the Meta-Mind, which will lead us towards the “Fusion-Mind”, when advancements in technology will allow us to merge an enhanced human mind with “Advanced General Artificial Intelligence” (hereafter AGAI) based entities. We argue that this will be a process of “symbiosis” rather than replacement.

CONTEXTUAL CHANGES IN THE CYBER-AGE

Are we heading towards a state of Meta-Mind?

Several **extremely powerful forces** and major threats are converging simultaneously and pushing us into a new world yet to be experienced.

Let us examine these trends briefly:

Table 1

POWERFUL FORCES, TRENDS & OPPORTUNITIES	MAJOR CHALLENGES & THREATS ⁵
<p>The fast-growing Artificial Intelligence (AI) industry is on the way to reach “General Artificial Intelligence” (GAI). It still largely depends upon us if AI will become a friend or a foe. Will “enhanced humans” and highly developed AI based Cyber Entities be able create a partnership for a better world? The progress of AI will lead to the appearance of Cyber-Symbionts, people with enhanced mind power in symbiosis with AI based Cyber-Entities.</p>	<p>Loss of control; safety & security; cyber-threats, cyber-crime. There will be “good” and “evil” Cyber-Symbionts fighting for a different future.</p>
<p>Progress in Robotcs will impact society and work.</p>	<p>Robots in the form of seamless Cyber-Clones could become a big issue.</p>
<p>Collaborative Intelligence, meaning, people working jointly with AI based entities, opens new opportunity to leverage AI applications, and may open the possibility to create what we label “Meta-Mind”.</p>	<p>Abuse of collaborative intelligence for control of people and the creation of new powerful weapons. Lethal autonomous weapons will become a big threat.</p>
<p>Unexpected discoveries and breakthroughs</p>	<p>Black Swans. Unexpected destructive events e.g. a digital blackout, unforeseen negative consequences of the world wide plastic pollution, climatic mega disasters etc. may destabilise, damage and even destroy large parts of our civilisation.</p>
<p>The Artificial Intelligence is driving the development of Cyber-Reality and creates Cyber-Entities. Cyber-Reality is transforming “our world” into a “Hybrid multiple Reality” a mix of “Our-Reality”, “Digital-Reality,” “Augmented-Reality” and “Virtual-Reality” According to several thinkers, we may well see exponential growth in this field;⁶ Cyber Reality a increasingly becoming seamless to “Our Reality.”</p>	<p>Escape to Virtual Reality; game addiction; cyber-junkies. Increasing polarisation between the “haves” and “not-haves” is based on the growing gap in terms of wealth, power, access to technology, health services etc.</p>

Table 1 continued

<p>Hybrid forms of life, society, politics, education work and business based on discovery, spirit of adventure and entrepreneurship in the different realities, will appear and will demand new solutions for education and a way of life.</p>	<p>Automation of production, jobs, mobility etc.</p>
<p>Connectivity of people, artifacts and Cyber Entities (hereafter CE) across the different realities, based on a “new intelligent internet”, may become the first autonomous CE. The social changes linked with the global connectivity are creating connected communities and together with Cyber-Reality may well finally lead to the creation of a new civilisation.</p>	<p>Anyone, Anytime, Anywhere, Anyway, Anyhow (AAAAA). Will this lead to the end of privacy?</p>
<p>The Mega-Convergence is accelerating, transformative interaction among different scientific disciplines, old and new technologies, business and different communities to create new, often-disruptive solutions. We can expect to see a new form of convergence of science (research, knowledge and expertise), with technology (know how), and with society (talents). All these transformations will lead to the creation of new, often disruptive, solutions.</p>	<p>Disruptive technological changes, Asymmetric threats and conflicts like terrorism, cyber-attacks, cyber-crime are threatening the peaceful coexistence and stability of the world order.</p> <p>Demographics: Overpopulation with an aging society is one of the biggest challenges humanity is facing. It threatens the near future of the planet in economic, environmental and social terms. It leads also to global migration and extreme urbanisation.</p>
<p>In addition to quantum computing many new technologies like blockchain, Neurotech, nanotech, biotech, robotics, on the edge computing, 5G and other will allow solutions that we do not even imagine today.</p>	<p>Environment: Climate change; global pollution (waste, plastic, pesticides, pharma products etc.); degeneration and destruction of life-ecosystems. Global pollution due to the uncontrolled amount of waste released to the environment, e.g. plastics, pharmaceutical products, pesticides etc. Climate changes are creating major environmental disasters.</p>
<p>Fast growing complexity within the existing systems requires agility and resilience within the systems and organisations.</p>	<p>Accumulated complexity and with global connections may become a major issue. In the globally interconnected and interdependent world and economy the existing tools and instruments will soon not be able to cope with it.</p>

To get prepared for the big transformation ahead of us, we need to understand what is happening right now and we must explore where this is leading us to.

The advancement of artificial intelligence is unstoppable. AI is already

present in all areas of our life and work. AI applications in business are spreading like a wildfire, but most of them are just pilots⁷. The big explosion is still ahead of us. Due to the development of Cyber Reality (Digital Reality, Augmented Reality, and Virtual Reality)

and artificial intelligence we are also experiencing the transformation of reality towards “hybrid” realities.

To cope with this deep transformation, we need to have life-long learning experiences encompassing all forms and levels of education. The formal education and the corporate education need to converge to leverage human specific skills, competencies and talents, and to prepare people for collaboration with artificial intelligence based entities. Future education needs therefore to be based on four pillars: learning, research, development and deployment, with a strong focus on individual talent development⁸.

Thus, collaboration and partnership are the keys to success. In the future, we can imagine scenarios where information integration, visualisation and new modes of collaboration will improve business performance beyond our expectation⁹.

At the end of this transformation we will be living and working in a different world using hybrid models based on the different “Realities”¹⁰. When we are dreaming to go back to the solid grounds of the past, we are reinforcing the blindness towards the context around us. When we are mourning our losses, we are missing new opportunities.

AI and Hybrid Reality¹¹

Table 2 (next page) is a synoptic summary of the expected seamlessness of the emulating capacity of the human abilities through AI & CR. In a previous article published in this journal we have already presented a classification of the realities we are facing¹². Based on these we will create multiple “Hybrid-Realities.” The full power of the

The collaboration of humans with smart machines and programmes creates new solutions way beyond our imagination, **leading to meaningful life quality enhancing products, services and experiences!**

Table 2: Classification of realities we are facing

Kinds of reality	Descriptions and examples
REAL ENVIRONMENT	The reality accessible to other human beings and autonomous AI systems based on algorithms that can learn to recognize objects by analysing vast amount of data ¹³
OUR REALITY (OR)	
Our subjective reality	Our perceptions, insights, imagination and fiction
Invented Reality	A view of the world based on our subjective reality
Evidence-based reality	Based on our own and other people experiences
Shared reality	Culture, Worldview, Religion, Ideology
Objective reality	Science and technology

CYBER REALITY:

DIGITAL REALITY (DR)	
Digitised elements	Documents, music, images, videos, films, maps in the digital space (e.g. in the cloud)

AUGMENTED REALITY (AR)	
Enhancing on perception of reality	Google street view, city tours, museum tours. Use of smartphones and goggles to place users on the middle of a 360-degree digital environment or overlay digital artifacts on the physical world. 14 Several firms are already using AR and VR in the available quality for business ¹⁵

VIRTUAL REALITY (VR)	
Partial Immersion¹⁶	Particular elements from our reality in the digital space (e.g. shops, travel destination, meetings, proxies of our reality, Second Life, Sansar ect.) Helping devices like smartphones, googles, PC, digital experiences on the way to becoming multisensory. A 100% percent immersive experience not available
Deep Immersion	Creation of digital worlds in the virtual space similar to ours with progressing levels of seamlessness: 1. Particular experiences similar seamless to our reality with special devices. Mainly computer-generated VR 2. World seamless to ours with brain to machine and machine to brain communication

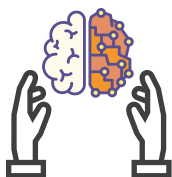
Table 3: Current estimations for seamless and reality senses

Seamless	Sight	Sound	Taste	Smell	Touch	Other
<5%			X	X	X	All
<20%	X					Pressure
20-50%		X				
50-100%						
100%						

Cyber-Reality will be actualised when the Virtual-Reality will be seamless to Our-Reality. Table 2 takes a closer look at the expected development of Cyber Reality and Artificial Intelligence.

Development of Cyber-Reality on the road towards ‘seamlessness’

Our experience of the world is multisensory. Thus, it is important to understand where we stand in respect to the different senses on “seamlessness.” This means that people would experience “Our Reality” in a similar way even if the content would be pure fiction. The possibility to experience products of imagination and fiction like our reality, would make it immensely larger and deeper. This bears the risk that VR may become a substitute for real life and then becomes an escape.



Virtual Reality (VR) seamless to Our Reality (OR) (i.e., engaging our senses) will take quite some time to reach where all the core senses are encompassed. Cyber-Reality may allow us to have new senses; some not known today. (see Table 3)

Enablers of seamless includes:

- Artificial Intelligence
- Quantum Computing
- Computer interface Mind to Brain (M2B) and Brain to Mind (B2M)
- Development of the Internet and global connectivity
- Communication infrastructure: global connectivity, mobile communication, 5G etc

Development of Artificial Intelligence

In the following we will revisit the expected developments in Artificial Intelligence.

AI is just a “proxy term” and it is highly imprecise. Often it is misleading. It is mainly based on the limited concept of “IQ”, not considering the other intelligence concepts, like the one proposed by Gardner’s Multiple Intelligences¹⁸.

In order to better understand the human/AI interaction, let us differentiate between skills, competencies and talents. So far, the AI based entities, can replace several human skills and partially human competence, but so far not human talent. A talent is composed of a key skill, focused on a selected knowledge or expertise domain. Both of them need to be developed and deployed jointly to build a core competency (i.e., intent + behaviour = competence). Intensive deployment of a core competency leads to the creation of a talent. Extraordinary talents have in addition a genetic competitive edge.

AI as the future driver for growth

Research by McKinsey has gone as far as to describe AI as contributing to a transformation of society “happening ten times faster and at 300 times the scale” of the Industrial Revolution²³. Several authors see AI as the new driver of growth, and it is well summarised in an excellent document produced by Accenture entitled: Artificial Intelligence is the future of growth²⁴.

Mark Purdy and Paul Daugherty see that AI has the potential to overcome the physical limitations of capital and labor and open up new sources of value and growth²⁵. In the report ‘How AI Boosts Industry

Profits and Innovation’ published by Accenture Research and Frontier Economics the authors claim that AI technologies have the potential to increase productivity by 40% or more by 2035. According to Purdy and Daugherty AI will increase economic growth by an average of 1.7% across 16 industries by 2035 with information and communication, manufacturing and financial services

leading all industries²⁶. In a Forbes article Louis Columbus claims that Artificial Intelligence will enable 38% profit gains by 2035²⁷. It will mostly increase profitability in education, accommodation and food services and construction industries.

AI is already enabling a wave of innovation across many sectors of the global economy. It helps businesses use resources more efficiently. New AI deployments are already widely spread in the business world and beyond. There are many excellent overviews about the deployment of AI in the different industries²⁸.

Table 4: Speculating some future developments in AI

AI Development Steps	AI Performance	Mimicking	
Narrow AI: single task Not human level AI Very good at routine jobs, both physical and cognitive Can replace many physical and cognitive human work activities	Fast data processing Narrow AI is good at performing a single task, such as playing chess or Go, making purchase suggestions, sales predictions and weather forecasts Speech and image recognition	Machines can mimic cognitive functions such as problem solving and learning Systems that analyse and find patterns in data (machine learning)	2019
Narrow AI: coordination of several single tasks Not human level AI	Self-driving car technology Intelligent robotic weapons	Machines can mimic complex human activities	2019
General Artificial Intelligence (GAI) Human-level AI or strong AI	Human-like robots AI-human hybrid intelligence Singularity ²⁰	Machines can mimic other kinds of human intelligence, e.g. linguistic, interpersonal, bodily kinesthetic, musical, naturalistic	204 ²²
Advanced General Artificial Intelligence (GAI) AI which can understand and reason as a human would	Robots seamless to humans	Machines can mimic the human mind including all cognitive processes, and emotions	???
Artificial Super Intelligence (ASI)	AI becomes much smarter than the best human brains in practically every field, including scientific creativity, general wisdom and social skills	Machines can mimic human consciousness with free will, purposeful action, entrepreneurship, as well passion pleasure and pain	???

Note: In table 4, we did not consider activities by Cyber-Entities that will be able to perform tasks and operations not known today; in particular those that humans cannot perform.

Table 5: Predicting “Singularity” in four steps:

Seamlessness of AI	When?	
To analytic human intelligence	Singularity 1	2029
To other kinds of human intelligence	Singularity 2	2050+
To human mind	Singularity 3	?
ASI seamless		
To human consciousness, with free will, purposeful action and entrepreneurship	Singularity 4	Second part of the 21 st century, if ever

Note: We will further elaborate this concept hereafter when we discuss AI emulating human behaviour

Talking about Singularity

The technological singularity is the moment when machines reach a level of intelligence that exceeds that of humans²⁹. Kurzweil, the father of this concept, claims that when “Singularity” has been reached machine intelligence will be infinitely more powerful than all human intelligence combined. “Singularity” is, according to Kurzweil, also the point at which machine intelligence and humans would merge³⁰.

2029 is the date Kurzweil has predicted when an AI will pass a valid Turing test and therefore achieve human levels of intelligence. He has set the date 2045 for the “Singularity”, which is when we will multiply our effective intelligence a billion-fold by merging with the intelligence we have created³¹.

ARE WE ENTERING A WORLD IN REAL TRANSITION?

Creativity and entrepreneurship are the driving forces of human civilisation. Artificial Intelligence and Cyber-Reality are powerful forces pushing both of them into a new dimension.

The transformation provoked by the powerful forces of change create major issues for the fabric of society, for the economy, for business, for science and technology and for education. Remember, transformation is not change – because it is change that stays and there is no way of going back. We need to move from past glories towards future challenges and opportunities. This requires changing from future exploration towards future design. To survive and to thrive, most organisations need to operate on two levels simultaneously: coping with the existing



context and requirements and venturing into the emerging requirements at the same time.

The transition towards a digitised world is at its heights, and the transition towards a fully developed Cyber-Reality is in its infancy. In a world of permanent transition, organisational and political leaders need to focus much more on the emerging opportunities and challenges. What we are facing, is one of the biggest transformations in human history comparable to the taming of fire, the development of a writing system, and printing.

We are looking at a permanent transition on all levels. The following are a few examples to illustrate this point:

- Work may become a privilege. A job for life will be the exception.
- We have shifts from one geopolitical constellation to another.
- We soon will be living and working in multiple realities: Our-Reality, Digital-Reality, Augmented-Reality, Virtual-Reality
- Lifetime education will become a reality hence we will need to permanently cope with disruptive events, transitions and transformations throughout the lifespan

At the end of this transformation we will be living and working in a different world using hybrid models based on the different “Realities”. For detailed discussion of the transformation in business please read our former article published in this journal and entitled: “Insights into the transformation of business in the Cyber-Age³²”.

Instead of focusing solely on “Artificial Intelligence”, we should start thinking about artificially enabled and performed purposeful actions. Remember that all of the so-called “smart” and “intelligent” machines, are actually based on algorithms. Consequently, they are just mimicking human behaviour to get similar or same outcomes as humans.

This transformation is escaping many people because their intuition is to follow the old, outdated patterns and settle in the comfort zone. There is no surprise that in this type of VUCA world, many feel lost and anxious as they have tremendous fear of what the future will look like and they wonder if they will grasp it and be able to find their way in it. We are in a great need of a compass that will guide us in this regard. The attitude of denial or an escape is not the solution to confront the deep transformation around us. One way to deal with an uncertain world is to develop an individualised compass. Dolan, for example, has been working for years on the need to develop an internal compass by focusing on values and understanding what is really important³³.

Today collaboration and partnership are the keys to success. In the future, we can imagine scenarios where information integration, visualisation and new modes of collaboration will improve business performance beyond our expectations and current imaginations!

HUMANS AND CYBER-ENTITIES

Computers cannot think. But increasingly, they can do things only humans were able to do before. It is now possible to automate tasks that require human perceptual skills, such as recognising handwriting or identifying faces, and those that require cognitive skills, such as planning, reasoning from partial or uncertain information, and learning. Technologies able to perform tasks such as these, traditionally assumed to require human intelligence, are known as “cognitive technologies”³⁴.

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Back to basics: what is human uniqueness?

If we want to compare humans with AI based “Cyber-Entities”, we need to bear in mind a holistic view on both sides. We need to look at what is unique and what is common to both sides. There is an immense amount of biological, biochemical and neurological processes necessary to create a living entity, and this is just a small part of being a human. “Life” as such, is still

a conundrum. And, there are plenty of “non-material” elements of a human being.

Cognition, consciousness and self-consciousness, self-awareness, conscience, the mind with many different processes like thinking, decision taking, several different intelligence processes etc.; the free will allowing purposeful planned actions, imagination, intuition, abilities like imagination, intuition, insights, creation, destruction, and entrepreneurship. We can add the personality, the Ego, core characteristics, dreams, the whole array of human senses, socialisation, relationships, empathy, emotions, feelings, gut feelings, etc. We need to add education, culture and civilisation, and the spiritual dimension. And so on.

The foundations of our mind can be also highly irrational, based on beliefs, assumptions, prejudices, generalisations, etc. The mind can be also linked to instincts, values, ethical or moral principles. It is also a mesh of irrational elements and processes. To make things even more complicated, the elements mentioned above can be interwoven and linked.

Will Cyber-Entities ever have consciousness? Can they become self-conscious? Will they be able to become like humans? Will we be able to “download” the human brain to a computer?

These questions might not be relevant today, because technology, which would enable this, is still far away. And moreover, perhaps these are the wrong questions. So far, the development of so called “smart”, responsible intelligent machines and Cyber-Entities is based on emulating human behaviour and certain human abilities. They perform certain human actions and behaviours in a similar way like humans, but the basis of their activities is very different. Or, as Michael I. Jordan calls them “human-imitative AI”³⁵. Maybe we should use the term “artificial behaviour”, rather than “artificial intelligence”? In fact, the real question bothering us today is: “How far can and will Cyber-Entities replace humans, because they can do it better and more efficient than humans?” Another troublesome question is, “What will the Cyber-Entities be able to do that humans cannot?” According to the One Hundred Year Study on AI³⁶, already today, AI is changing our daily life, and work. It also changes the way people interact with technology. AI systems are developed to accomplish particular tasks, and each application requires years of focused research and a careful unique construction.

Table 6 is an attempt to synthesise and present an overview of the expected AI emulating

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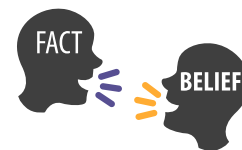


Table 6: Examining current and future development of Artificial Intelligence and Cyber-Reality

HUMANS Natural Intelligence	CYBER-ENTITIES Artificial Intelligence	CYBER-REALITY (CR)	TECHNOLOGY	SINGULARITY	AI BEHAVIOUR Emulated Seamlessness
Animal Intelligence Human analytical intelligence Learning abilities Collective Intelligence Collaborative Intelligence connecting people and AI	AI weak AI Narrow, single task Cognitive Computing Machine learning AI coordination of several single tasks	DR ₁ (DR = Digital Reality) AR ₁ (AR = Augmented Reality) VR ₁ (VR = advanced DE) OR: Our reality i.e. the “Real Reality”	Neurotech Biotech; Genetics Bioinformatics Exascale Computer 5G Network Collaborative Intelligence connecting people and AI	S ₁ (S = Singularity) AI seamless to human analytic intelligence and some learning processes	Analytical Intelligence Learning Problem Solving Partial perception (sensory information) Partial Movement
META-INTELLIGENCE Merger of Human Intelligence with AI leveraging the Advanced Collaborative Intelligence and combining collective intelligence of the crowd with the computational power of machines, Internet of things, cloud and VR		DR ₂ ... advanced DR AR ₂ ... advanced AR VR ₂ ... advanced VR	Advanced Collaborative Intelligence Advanced machine and deep learning		Enhanced creative problem solving Creativity Free will, purposeful action Intuition, entrepreneurship
All human intelligence processes e.g. Emotional intelligence Advanced Collective Intelligence	GAI strong AI General Artificial Intelligence High autonomy	DR ₃ ... advanced DR AR ₃ ... advanced AR VR ₃ ... advanced VR	Quantum Tech & Computing Interface: B2M; M2B Advanced Gaming Web 3.0; Spartial Web	S ₂ AI seamless to several other kinds of human intelligences	Increased perception Creative Problem Solving Simple cognitive processes Some emotions Free movement
Human Super Intelligence AGAI gives humans superpowers Transhumanism	AGAI Advanced General Artificial Intelligence Very high autonomy	DR _n AR _n VR _n seamless to OR	Brain enhancement Global Consciousness Hybrid activities humans & machines	S ₃ AI seamless to most human cognitive processes and abilities	Cognitive processes Symbolic abstract thinking Structure building; Emotions Social competencies All perception & movement
HYPER-META-INTELLIGENCE. Merger of Human Mind with AGAI and GCMP General Connected Mind Power					Talents; wisdom; values Human mind and higher consciousness Self awareness
Spiritual Intelligence (SQ)	???	VR _{seamless} to imagination	Sub-Quantum Computing	S ₅ AI seamless to SQ	Altered states of mind Spiritual Intelligence

We also need to acknowledge that people have more than just “intelligence”, collective intelligence and a mind. They also have a personality, self-awareness, inspiration, imagination, inspiration, intuition, also beliefs, desires and intentions, finally instincts, feelings and emotions.

capacity mimicking human intelligence and behaviour. For now, it seems that we are only at the first steps, we have still only “weak AI” and very simple CR. The necessary technological basis, like quantum computing and the computer interface: “brain to computer” and the other way around, are still in their infancy.

But no doubt we are making progress. Someday “hybrid intelligence” and Cyber Entities with a high level of autonomy will be reality. As of today, we can see only the first steps in the development of the worldwide consciousness³⁷. Nonetheless, as Martin Giles is pointing out, artificial intelligence is often overhyped – and that’s is dangerous³⁸. It is too early to speculate if the highly sophisticated Cyber-Entities will have their own consciousness, because we still don’t know what consciousness is all about. It seems that no existing AI can master even the simplest challenges without human-provided context³⁹. But we cannot exclude that in the far future when AI might become truly intelligent and able to operate without context. In any event, we should start developing abilities and activities to deal with future Cyber-Entities which we do not expect or even anticipate today.

The keywords here are “emulated seamlessness!” For example, robots, even “Robo-Clones” copying humans to perfection, with identical appearance and even reactions like humans will be just machines emulating humans, because of their different physical and non-physical construction. They can be easily identified, even at a distance, by control of the heart beat or brain waves.

Richard Gall points out that an artificial neural network can process very specific data at an incredible scale but is not able to process information in the rich and multidimensional manner a human brain can⁴⁰. The human brain allows humans to think critically and creatively in a way that does not need to be programmed. We also need to acknowledge that people have more

than just “intelligence”, collective intelligence and a mind. They also have a personality, self-awareness, inspiration, imagination, inspiration, intuition, also beliefs, desires and intentions, finally instincts, feelings and emotions⁴¹. People are capable to create social relationships and friendships. They are able to predict other people’s behaviour; they can even have compassion and empathy, (i.e., understand or feel what another person is experiencing).

People have talents and sometimes amazing mental abilities comparable to computers, such as image memory, calculation, etc. They can be entrepreneurial, create cultures and civilisations. And last but not least, people have a personality and spiritual experiences. Ted Chu⁴² identifies three traits which make humans unique:

- Symbolic abstract thinking, i.e. the ability to think about objects, principles and ideas that are physically not present
- Structure building, i.e. the ability to build physical, and social structures and mental models
- Higher consciousness. Raya Bidshari describes it in her article as self-reflective consciousness, boosting our ability for self-transformation. According to her it contributes to our abilities for self-monitoring, self-recognition and self-identification.

For Gerald Edelman higher consciousness, “involves the ability to be conscious of being conscious”⁴⁴. Other authors see higher consciousness as an ever-increasing awareness of the meaning of existence, of our spiritual essence, and of the spiritual or energetic nature in all things⁴⁵. Almost all religions have a concept of higher consciousness⁴⁶.

Humans thrive on empathy, emotions, imagination, creativity, and entrepreneurship rather non-existent so far in even the most advanced and powerful Cyber-Entities. We believe that even “hyper smart machines” will not be able to have feelings and emotions, like love, hate, happiness, sadness, etc. They will never experience



compassion, jealousy, or be sorry and regret something. They will not be inspired, enthusiastic or passionate; be optimistic or pessimistic. No doubt they will be able to mimic feelings and emotions, but not more. Neither will they have conscience and sense remorse. All this is very human and will remain human for long, if not forever. In this respect animals are closer to humans than the machines.

On the other hand, someday machines will be able to help increase people's happiness, overcome depression or deep pain. They will help us to make better decisions⁴⁹. They will be able to increase cognitive powers; help to sustain our creative fire or entrepreneurial spirit.

It is important to bear in mind that today's AI applications, including the fast spreading business applications, are still in an emerging stage, based on simple AI moving into multiple factor AI, like the autonomous cars. As Daniel Faggella the founder and CEO at Emerj clearly states, "AI is being hyped, and its potential in business is still for the most part experimental"⁴⁹ but we never the less need to be aware that an AI powered Fourth Industrial Revolution will affect, complement, destroy, transform and create millions of jobs worldwide.

FROM COLLABORATIVE INTELLIGENCE TOWARDS THE STATE OF META-MIND

"Intelligence" is a tricky and debated concept. For the purpose of this paper we are using a simplified definition. We consider "intelligence" as a process leading to a purposeful action creating specific results. This action can be provided by humans, animals, or machines.

Maybe in this context we should differentiate between "Organic Intelligence" (carbon-based living entities like humans and animals) and "Anorganic Intelligence" (silicon-based, like machines, robots, and cyber-entities).

Collaborative Intelligence (CQ⁵⁰) is a combination of Human Mind (HM) (individual & collective) and Artificial Intelligence (AI) in different forms and levels. It delivers the best results leveraging the most appropriate abilities of both sides.

$$CQ = HM + AI$$

Given the fast developments in AI, we may require focusing more on the human factor of the equation in order to keep the balance and make real progress. As Erin and Katinka Dijkstra state: "It is about human/AI co-creation in the digital world"⁵¹.

The MIT Centre for Collective Intelligence is exploring how people and computers can be connected so that – collectively – they act more intelligently than any person, group, or computer has ever done before.⁵² Thomas W. Malone, a Professor of Management at the MIT Sloan School of Management and the founding director of the MIT Centre for Collective Intelligence⁵³ prefers to use the term "collective intelligence." Moreover, according to Don Tapscott and Anthony D. Williams, "collective intelligence" is mass collaboration. In order for this concept to happen, four principles need to exist: openness, peering, sharing, and acting globally⁵⁴.

A successful deployment of collective intelligence is **Crowdsourcing**, a process through which a task, problem or project is solved and completed through a group of unofficial and geographically dispersed participants⁵⁵.

Collaboration, cooperation and partnership can exist between people, or people and other entities (animals, robots, AI based machines). The basis is similar. Between people they are based on common ground, open communication, finally mutual trust and respect. Collaborative Intelligence (CI) needs: a clear and meaningful purpose (P), direct communication (DC) finally trust, reliability, safety and security (TRSS):

$$\text{Collaborative Intelligence} = P \times DC \times TRSS$$

The three top priorities for a successful collaboration of people with AI based machines and systems include:

1. Trust based on Safety, Security and Reliability
2. Ease of use and meaningfulness, (i.e., access and direct communication)
3. Control of deployment and further development

Fast and meaningful development of collaborative intelligence is only possible with focus on the human mind enhancement in parallel to the development of the AI. It also requires the ability to recognise advantages and uniqueness

Table 7: Collaborative Co-Creation of Humans and AI

HUMANS	JOINT AREA <i>Symbiosis</i>	AI BASED SMART MACHINES & PROGRAMMES
COLLABORATION CO-CREATION		
Psycho-physiological processes Consciousness	Joint efforts	Algorithms AI CR
Mind Consciousness Intelligence Imagination Creativity Reason	Collective Intelligence Collaborative Intelligence Meshing of different types of "intelligence", human and non-human	Speed & Scope Automation Coping with big data AI in progress GAI CR in progress
Emotions Experiences Instincts Purposefulness & Free Will	Meta-Mind Fusion-Mind	Global connectivity Future Internet Increasing Degree of Autonomy
Education		Deep learning
Enhancement		Seamlessness
Hybrid World in Transition Hybrid Organisations & Cyber-Organisations		
Solutions and Creative Solutions Purposeful Actions, and Activities Outcomes and Results		

of organic and anorganic intelligence to create a beneficial partnership. (see Table 7 on the previous page)

Examining the “Development of Artificial Intelligence and Cyber-Reality” we can identify, perhaps, three development stages or levels of collaborative intelligence:

- **A basic stage of Collaborative Intelligence**, the simple connection of people and AI based entities. This stage of Collaborative Intelligence is already in place in many working environments today⁵⁶. In a subtle way we are giving up decisions step-by-step to AI based programmes and machines. The authors of “Solomon’s Code: Humanity in a World of Thinking Machines”, claim that the shift in balance of power between intelligent machines and humans is already here⁵⁷. But they see many advantages in this symbiotic-intelligence” which is justified by partnership, and enhances economic good, well-being, at work, and quality of life⁵⁸.
- **Meta-Mind**, a merger of Human Intelligence with AI leveraging the Collaborative Intelligence and combining collective intelligence of the crowd with the computational power of machines, Internet of Things, cloud and VR. The stage of Meta-Intelligence is on

the increase and is emerging⁵⁹. But we still have not developed some of the basics in human-machine interfaces⁶⁰. Meta-Mind (M-M) is encompassing human mind and AI in all available forms. We need it to be able to live and act in the upcoming “Multi-Reality” and “Hybrid-Realities”. Meta-Mind is a merger and symbiosis of Human Mind with AI leveraging the Collaborative Intelligence and combining collective intelligence of the crowd with the computational power of machines, Internet of things, cloud and VR.

Meta-Mind requires new forms of organisations, in particular business organisations, also new structures such as digital and virtual platforms and meta-platforms, as well as core processes. This will also lead to a partnership of people and “smart machines”, and a shift of values. “Smart machines” stand here for any “Cyber-Entity⁶¹ in all different realities.

M-M is also the result of the deployment of new technologies like neuroscience, bioinformatics, Cyber-Reality (i.e., digital, augmented and virtual reality). And finally, it requires a new understanding of “human mind” and “consciousness”⁶².

- **Fusion-Mind**, a merger of Human Mind with GAI-based entities and

Meta-Intelligence. The Fusion-Mind is one of several possibilities leveraging the strengths of both sides of the human mind and the AI resp.

Alternatively, there is the possible path of AI development without partnership with humans. Today most of AI applications we experience are still at the stage of “**weak AI**”. It allows AI to execute narrow, single tasks. Some coordination of several single tasks executed by AI is, however, emerging. A good example are the self-driving cars⁶³. The next stage would be General AI, which is considered to be already “**strong AI**”, aiming to emulate most if not all human intelligence processes⁶⁴.

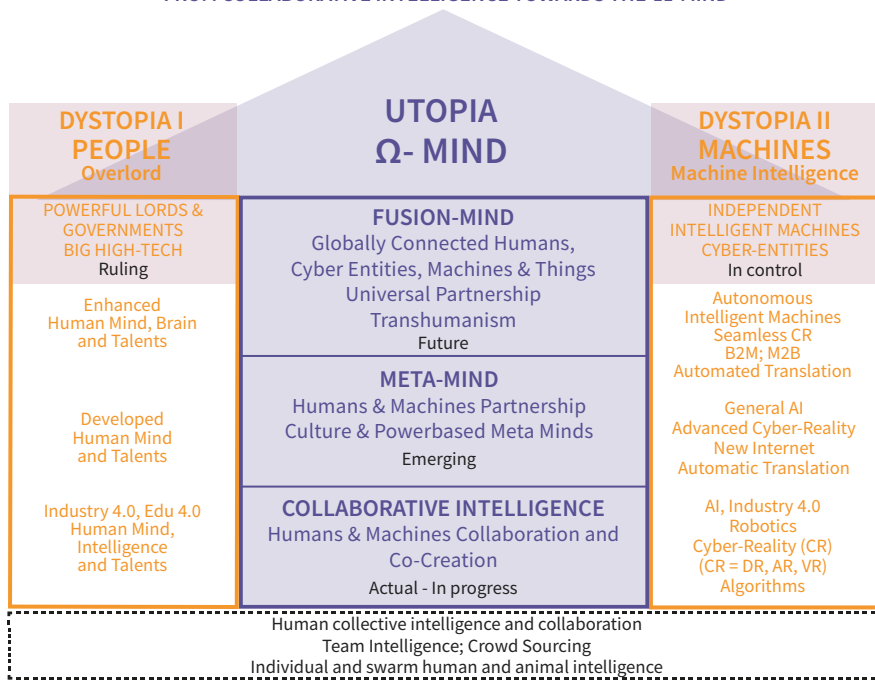
Whether AI will ever reach the stage of being equal or even surpassing the human mind is a dream of some researchers⁶⁵ and a nightmare for others⁶⁶. Anyway, we need first to find answers to some difficult questions, like “What is consciousness?” and “Can AI be conscious?”

Peter Rudin proposes three scenarios depicting how AI may become equal to human intelligence.

1. “As machines continuously learn from humans and previously generated knowledge, they will eventually create their own identity, far surpassing the intellectual capacity of humans. Triggered by some kind of knowledge explosion, they might seek independence from humans.”
2. “Humans decide to merge with intelligent machines, most likely via a direct brain-computer interface (BCI). Due to the high-speed access to knowledge and intelligence provided by intelligence-service providers, this combination will significantly increase the intellectual capacity of humans.”
3. “Creating a new Singularity-Ecosystem enhancing human-machine partnership, fostering the strength of each



FROM COLLABORATIVE INTELLIGENCE TOWARDS THE Ω -MIND



without the tight interconnection described in scenario 2⁶⁷”.

This does not exclude a fourth one, where the AI enabled machines create their own intelligence completely different from the human one. This could lead to a different description of the world, as well as science and technology.

CONCLUSIONS AND IMPLICATIONS FOR THE FUTURE

Future “Collaborative Intelligence” is the outcome of the merger of Human Mind with Advanced General Intelligence (AGAI) leading to Meta-Mind. It is a symbiosis, not a replacement⁶⁸! It can, in the far future, even lead to a “fusion” of human minds with the AGAI

Whenever we are dreaming to go back to the solid grounds of the past, we are reinforcing the blindness towards the context around us. When we are mourning our losses, we are missing new opportunities. Cyber-Age is a time for creation and destruction. Unchained creativity and entrepreneurship are the driving

forces of change and transformation. As of today, we can see the collaborative Intelligence unfolding and the state of Meta-Mind emerging. The Fusion-Mind is a still far-fetched possibility and the rest are utopias and dystopias.

- **Synopsis of the principal message:** To get prepared for the big transformation ahead of us, we need to understand what is happening right now and we need to speculate on where this is leading
- We must permanently explore and deploy the possibilities of mind enhancement and talent development and the creation of lifelong learning systems
- We need to build and sustain continuous development of collaboration between people, machines and other non-human entities based on the available enhancement of mind, technologies and solutions
- We need to invest continuously equally in parallel into human mind enhancement and talent development

and into AI development with corresponding applications

- As guideline we should aim for the use of the better suitable “ability between human activity, AI deployment or joint work”
- We also need to carefully watch the progression of the AI to see any development of unexpected abilities and deployment

Containing the Risks of AI

- Safety and security. Ownership and access. Right for deployment
- Reliability. Malfunctions. Software errors: there is no perfect error free machine, code or algorithm. Wrong algorithms based on biases and prejudices
- Control of deployment and future development of AI. Autonomous and independent CE’s and robots “out of control”
- Cyber-crime: hijacking programmes; malicious programmes; extortion, etc.
- Cyber war and cyber terrorism
- Malpractice: malicious use
- AI overdoses and over reliance creating “cyber-junkies” and causing stupidity on a large scale: “endemic stupidity”. People giving up autonomy and freedom
- Total government control of individuals and the population

Dreams are changing the world. Let’s dream together about a better world!

The journey towards Ω -Mind begins when humans smart AI-based machines considered to work together. This is the beginning of the age of collaborative intelligence. It is where we seem to be at the present (i.e. the year 2020).

The next two steps involve the reaching of the state of Meta-Mind and the ensuing state of Fusion-Mind; both states are still ahead of us. Nonetheless, what is already visible are the different directions the enhanced development will

take place. We can move towards the first dystopia with an overlord ruling the planet, or at least a big part of it. We could also be moving towards the second dystopia where the machine intelligence is controlling the planet, or towards the utopia with an Ω -Mind where people with enhanced minds and talents are collaborating and co-creating jointly with machine intelligence, and are shaping and designing the world for the betterment of humanity. What we will probably see is parts of the world being ruled by powerful Lords and high-tech companies and individuals, and others by machine intelligence. Today we still have the possibility to have an impact on the main direction of future development. To counterbalance the already visible preference for the development of dystopias, we need to focus on the direction towards the Ω -Mind, which means investing into the enhancement of the human mind and talents, as well as into the collaboration with the machine intelligence.



The collaboration of humans with AI, leveraging the unique abilities of both sides, will produce the best and most powerful solution, leading to the creation of AI-Symbionts.

Future View

We cannot conclude this paper without taking the risk of venturing into the future. It is a calculated risk, but we wish to conclude this paper with a “future view” that will provide the readers, some reference points to dream or to act upon.

Remember that AI is invisible just like electric power, but it is virtually anywhere. Collaboration between humans and AI based entities is a part of daily life, education, science, technology work and even politics. AI is an essential ingredient of nearly all activities in all “Realities.” People will be working much less than in the past. They will be rewarded based on the value they create, some for which is the outcome of partnership and collaboration with machines. Taxes will be based on the value created. If people’s incomes will not cover the minimum necessary for a decent life, the missing part will be supplied by a “minimum life quality fund.” The pension fund will be based on a basket of shares.

If our predictions are valid, we also argue that the fears of AI overtaking control over the world, did not materialise. The collaboration of humans with AI, leveraging the unique abilities of both sides, will produce the best and most powerful solution, leading to the creation of AI-Symbionts. People with particular talents will be selected for mind and body enhancement and get a special education to become AI-Symbionts. These are humans living and


acting in partnership with highly sophisticated and powerful AI entities. The AI-Symbionts are living incognito all over the planet. Although some live and work in special highly secured resorts, in particular the scientist and technologists doing research. A particular focus will be on the human mind and the question arising as to the nature and source of consciousness. Mind you, in the real world there will always be “good” and “evil” Symbionts, depending on the purpose they are aiming at.

The formula is that only the AI-Symbionts know how many of them do exist. The AI-Symbionts can communicate directly, if they wish so, with all other AI-Symbionts, but also with all AI enabled entities and devices. Their communication will be based on a secure new technology using the “entanglement” properties of the elementary particles. This proposition is based on a completely different approach to science and technology which will generate new scientific methods. For the public in general, the AI-Symbionts will appear only as 3-D projections, or as Robo-Clones. They differentiate them by the basic symbol and different colors. So far, the AI-Symbionts are far more powerful than any pure AI system. Since the entire world is highly interconnected safely and securely, this will be the primary concern of the Symbionts. The latter, are also working on solutions to the global key issues of our planet, like the consequences of climate change, pollution and destruction of the eco-systems, regeneration of the oceans, social polarisation, fundamentalist ideologies etc.

The Ω -Symbionts, known stand for peace, piece of mind, universal human values and a sustainable life quality for all people, and overall for the meaningful and beneficial use of AI. They are known as the Ω -Symbionts. The “evil” AI-Symbionts using the lightning symbol to fight against them because they stand on the side of the power. It is the eternal fight of good and evil forces leveraged on a new level. For some people AI has become a surrogate, an ersatz for religion. For them the AI-Symbionts are the angels and demons.

The fears based on the advancement of AI were not completely unfounded. The abuses by the power players on one side and the unexpected and uncontrollable features of the autonomous cyber-entities, could not always be prevented by the Ω -Symbionts, leading to extremely dangerous situations. Again

and again the world was tangling between wrongly directed digital autonomy and power greedy humans, governments and organisations. The world development council is still very busy with workup and prevention, to keep the world a safe place and to prevent major disasters.

The Ω -Symbionts are dreaming of a world with a Fusion-Mind where all people and intelligent machines are connected together. Some dare even to think about a world “beyond” based on one single mind, combined of all human minds and artificial intelligence-based machines and systems creating the Ω -Mind. 

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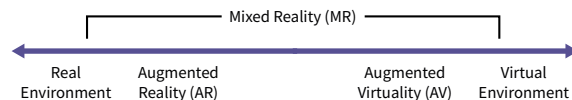
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 - Proprioception (the ability to tell where your body parts are, relative to other body parts)
 - Equilibrioception (the ability to keep your balance and sense body movement in terms of acceleration and directional changes)
 - Stretch Receptors (These are found in such places as the lungs, bladder, stomach, blood vessels, and the gastrointestinal tract.)
 - Chemoreceptors (These trigger an area of the medulla in the brain that is involved in

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