Digital Vision:
Ethics

Global opinion paper

AtoS

Contents

The Atos Digital Vision series aims to provide an engaging and informed view of the opportunities brought about by digital technology. This global opinion paper explores how embedding ethical reflection into the design of digital technologies can lead to genuine benefits for customers and citizens by helping to address their legitimate concerns about their wider impact, today and into the future.

Building ethical foundations for digital innovation

Elie Girard
Chief Executive Officer, Atos

Human history is in large part the story of how we have developed and responded to new technologies, from the wheel and the plough to paper, the printing press, the steam engine, the automobile and all the recent innovations of computing and the digital age.

Today, we stand at the brink of a new epoch. The great inventions of the past have helped us move faster, produce goods more efficiently, communicate more easily, perform complex calculations more quickly and better organize our societies, but always from a human-centric perspective.

Now, with the rise of innovations such as artificial intelligence (AI), automation, data analytics and digital business models, digital technologies are offering tremendous power to transform society and shape the lives of each and every one of us. However, if new technologies are introduced irresponsibly, devoid of any ethical context, the consequences could be dramatic for the human species.

This is why organizations need to adopt a far-reaching digital vision which addresses the digital dilemmas of today and which puts human beings and their values at its heart.

The development of technologies such as AI poses a profound ethical and social challenge. As human beings, we generally aspire to base our judgements and decisions on personal and societal values and ethical principles. For the most part, such ideals are not a fundamental part of innovations such as AI systems, which although capable of expanding the frontiers of our understanding, could generate undesirable outcomes if they are not designed in a way that is consistent with the ethical standards that govern human behavior.
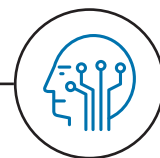
At Atos, we are committed to a human-centric vision of digital technology as a force for good. We strive for the best compliance with all ethics principles through the pursuit of Corporate Digital Responsibility. In accordance with the "Raison d'être" or "Sense of purpose" that our shareholders approved in 2019, it is part of our mission to enable our customers, employees and members of society in general to live, work and develop sustainably and confidently in the information technology space.

I firmly believe that when ethical considerations are fully integrated into the development and applications of AI and other innovations, today's technologies will be able to fulfil their immense potential, complementing human intelligence and helping humanity respond to the great challenges of our time.

Please read on to find out more about our Digital Vision for Ethics.

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What's at stake?

Digital technology has already fundamentally transformed the world we live in. As the pace of innovation continues to increase, significant changes will be felt through decision-making, attitudes and behaviors in all walks of life — from business, finance and employment to welfare support, healthcare and transport. We look at where we are on that journey — and how technology can transform society for the better.

Customer & citizen relationships
The success rate of bot interactions in the healthcare sector (those completed without relocation to a human operator) will move to over **75%** in 2022[1]

Data privacy
A projected **146 billion** records will be stolen between 2018 and 2023[4]

Future of work
Automation will displace 75 million jobs but generate **133 million** new ones worldwide by 2022[2]

Productivity
By 2025 AI will power **95%** of customer interactions[5]

Productivity
The impact of AI technologies on business will boost labor productivity by up to **40%**[3]

Inefficiency
Through 2022, **85%** of AI projects will deliver erroneous outcomes due to bias in data, algorithms, or the teams responsible for managing them[6]

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[1] https://www.juniperresearch.com/press/press-releases/chatbots-a-game-changer-for-banking-healthcare
[2] https://www.weforum.org/agenda/2019/08/the-robots-are-coming-but-take-a-breath/
[3] https://www.accenture.com/gb-en/insight-artificial-intelligence-future-growth
[4] https://www.irmsecurity.com/resources/10-staggering-cybersecurity-statistics-for-2019/
[5] https://www.financedigest.com/ai-will-power-95-of-customer-interactions-by-2025.html
[6] https://www.ey.com/en_gl/wef/why-we-need-to-solve-the-issue-of-gender-bias-before-ai-makes-it

Research & health
The approximate reduction in cost of sequencing a full human genome over a decade (2006-2016) was **10,000**-fold[7]

Research & health
AI can address **20%** of the unmet demand for clinicians in healthcare[8]

Future of transport
At least **15** original equipment manufacturers have pledged to release autonomous vehicles between 2019-2025[9]

Future of money
The estimated total value held globally in cryptocurrencies is **$100 billion** (June 2019)[10]

Wealth creation
AI could deliver additional global economic output of **$13 trillion** by 2030[11]

Ethical standards
42 countries have adopted the new OECD Principles on Artificial Intelligence[12]

[7] https://www.genome.gov/about-genomics/fact-sheets/Sequencing-Human-Genome-cost
[8] https://www.accenture.com/t20171215T032059Z__w__/us-en/_acnmedia/PDF-49/Accenture-Health-Artificial-Intelligence.pdf
[9] https://home.kpmg/content/dam/kpmg/uk/pdf/2019/08/mobility-2030-transforming-the-mobility-landscape.pdf
[10] https://www.investopedia.com/tech/how-much-worlds-money-bitcoin/
[11] https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-modeling-the-impact-of-ai-on-the-world-economy
[12] https://www.oecd.org/science/forty-two-countries-adopt-new-oecd-principles-on-artificial-intelligence.htm

John Hall, Head of Strategy & Portfolio, Atos Fellow and Editor in Chief of the Scientific Community, Atos

Ethical principles for business in a digital world

Ethics encompasses the moral principles that govern a person's behavior and the way that activities are conducted. It helps set the dividing line between what we consider to be right and wrong.

Broadly speaking, there are three schools of ethical thought – virtue ethics ("am I a good person?"), consequentialism ("do my actions have good consequences") and duty-based ethics ("am I following an ethical code?"). These questions have helped shape ethical principles and codes of conduct for individuals and organizations in all walks of life. They help establish frameworks around areas such as the fairness and integrity of business transactions or the way that medical practitioners operate. Although most large enterprises work to a defined code of business ethics, these are not typically directly translatable to the application of digital technologies such as Artificial Intelligence. However, by drawing parallels with ethical frameworks in the healthcare profession, as they relate to the care of patients, we can gain some helpful insights as to how they might be applied.

Registered Nurses in the US are required to adhere to seven principles: Justice, Beneficence, Nonmaleficence, Accountability, Fidelity, Autonomy, and Veracity.

We can paraphrase the intent of these principles as:

Justice: Care must be fair, just and equitable
Beneficence: Care must do the good and right thing for the patient
Nonmaleficence: Care must do no harm
Accountability: Nurses must accept responsibility for their own actions
Fidelity: Nurses must keep their promises
Autonomy: Patients' rights, opinions and beliefs must be respected
Veracity: The truth must not be withheld from patients.

These all seem perfectly sensible and appropriate in terms of human-to-human interaction. But what about when we translate our thinking to the digital world? How can we make robots and AI algorithms share our anthropocentric values?

In 2019, the European Commission published its 'Ethics guidelines for trustworthy AI', proposing a set of seven key requirements that AI systems should meet in order to be deemed trustworthy. Looking at these recommendations we see some very clear parallels with the nursing principles described above. The EC guidelines can be paraphrased as follows (together with their nursing parallels shown in **blue**):

Diversity, non-discrimination and fairness: Unfair bias must be avoided, AI systems should be accessible to all. **(Justice)**

Societal and environmental well-being: AI systems should benefit all human beings (including future generations) and should be sustainable and environmentally friendly. **(Beneficence)**

Technical robustness and safety: AI systems need to be resilient and secure to ensure that unintentional harm is minimized and prevented. **(Nonmaleficence)**

Accountability: Mechanisms should be put in place to ensure responsibility and accountability for AI systems and their outcomes. **(Accountability)**

Privacy and data governance: Full respect for privacy, protection, quality, legality and integrity of data must be guaranteed. **(Fidelity)**

Human agency and oversight: AI systems should empower human beings, and proper human oversight mechanisms must be ensured. **(Autonomy)**

Transparency: Data, systems and AI business models should be transparent, traceable and explainable. **(Veracity)**

With this in mind, perhaps the world of digital ethics is not so different in principle from the world of ethical human care. However, enforcing these principles in an environment that is constantly evolving and where digital actions are not always visible and traceable is likely to be easier said than done.

Business directions
Until relatively recently, the operating boundaries and control of digital technologies were, for the most part, well-defined and understood. However, particularly with developments in areas such as Machine Learning, Human Machine Interfaces, Data Analytics and even Digital Business Models, the scope and impact of what is possible has expanded massively. We are now faced not only with the question of "could we?" do something, but "should we?" do it, striking at the heart of the ethical theory questions of "am I doing good?" and "am I doing right?" Even in human terms, these can be quite subjective questions. But translate them into a digital world in which the boundaries of man and machine, and physical and virtual, are becoming increasingly blurred, and the scope for subjectivity is enlarged. Making the need for guidelines such as those from the EC even more pressing.

Businesses of all sizes and across all industries and sectors need to understand the ethical implications of adopting digital technologies. These go far beyond merely adhering to the EU's regulation on data protection (GDPR), to a clear understanding of what it means to conduct business in a way that is acceptable to customers, peers and society at large. Organizations that are able to demonstrate their adherence to an appropriate digital ethics framework will be those that build market trust and as a consequence enjoy sustainable operations.

Digital ethics is not so different in principle from the world of ethical human care. However, enforcing these principles in an environment that is constantly evolving and where digital actions are not always visible and traceable is likely to be easier said than done.

Guillaume von der Weid, Philosopher
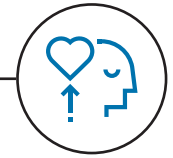
Ethics and the limits of AI

AI systems have the potential for great decision-making power but have no consciousness or moral conscience. The challenge now is to make sure that AI reflects and respects the ethical dimension of human society.

Something has gone badly wrong. A self-driving car controlled by AI is hurtling towards a barrier at high speed. If it crashes, the lone passenger will be killed instantly. If the AI system swerves the car to the right, the vehicle will run into a group of five pedestrians and kill them all. What decision should it make? Should the car be programmed to protect its passengers or should it be prepared to sacrifice them for the greater good?

What would be the right answer if there were two people in the car and just one pedestrian? If there was one passenger in the car and one person in the road? Or if the pedestrian was crossing illegally on a red light? Or if the sole occupant of the car was a pregnant woman and the potential victims in the street all elderly and infirm? These so-called "trolley problems," familiar to a generation of philosophy students as thought experiments involving runaway trains, have assumed a new relevance in the age of AI.

Now that machines have the capacity to make decisions, dilemmas such as these have moved to the frontline of an urgent debate about moral decision-making, accountability and responsibility in the age of AI.

Most people accept that ethical criteria will have to be programmed into AI systems so that they make the right choices. But in many instances the utilitarian calculus is not sufficient for this. Surveys by carmakers have comprehensively concluded that hardly anyone would buy a self-driving car which, in the scenarios above, would choose to kill them rather than a pedestrian.

The logic of utilitarianism looks hard to defeat on its own terms, but the principle of self-preservation seems to outweigh them all. Having said that, people would not buy a car exercising moral choices, even if they agreed with the moral principles embedded in its programming. The ultimate meaning of our life can't be encoded into a machine. For now, it seems that we want to be able to justify our choices in terms of principles, and conversely, to be able to hold a person accountable for their actions. Even if they can pilot themselves, we still want someone in front of the controls of our planes.

Putting humans first

It is the confrontation between, on the one hand, the utilitarian calculations that determine maximum well-being and on the other the ethical duties that we need to resolve, if human life is to have any value at all.

A celebrated example of the limits of simple utilitarianism concerns hospital surgery. Imagine a doctor with five severely ill patients who need respectively a new liver, heart, kidney, pancreas and lung if they are to survive. Should the doctor consider using the organs of a young and healthy patient who is asleep in the waiting room in order to save the lives of those five people, killing the healthy patient in the process? The calculation looks the same as in our initial example, but in the hospital case no-one would agree with killing one person in order to save five people's lives. There is little room for doubt here that the ethical principle – the doctor's duty to life – overrides the calculation of maximizing well-being.

Whatever science fiction may tell us, the real risk of AI is not that machines become conscious and turn against us. The real risk is that AI reduces human beings to mere numbers and units, with no respect for human values, principles and aspirations.

It is our responsibility now to set the right boundaries for AI. We must ensure that this most promising of technologies obeys ethical criteria and puts human beings at its heart. Our future depends on making sure that the AI systems of tomorrow respect the principles and values that make us human.

> **Machines do not, in terms of classical autonomy, comprehend the moral or legal rules they follow. They move according to their programming, following rules that are designed by humans to be moral.**
>
> The IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems[1]

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[1] https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/other/ead1e_classical_ethics.pdf

Célestino Guemes Seoane, Solutions R&D, Atos

Embedding ethical values into intelligent systems

"Technology is neither good nor bad; nor is it neutral."

Melvin Kranzberg, technology historian (1917-1995)

Some of the most evident technology-driven ethical issues result from the changes brought about by Artificial Intelligence (AI). These are highlighted in the news almost daily and include racial discrimination in facial recognition systems, gender bias in business applications, the widely-perceived "exploitation" of privacy by digital platforms, and inequality caused by automation.

As active players in this society-shaping evolution, technologists are starting to adopt a more involved, proactive stance that seeks to minimize negative impacts of technology and foster positive societal progress. While we need to avoid imposing our own values on others, as a minimum we should be aware of the ethical impacts of our own technological decisions. And as with many other high-impact concepts such as security, privacy or accessibility, our involvement cannot be an afterthought. If you try to retrofit this kind of thinking you will never get an optimal solution.

The conceptual framework that Ethics by Design represents can provide a solid foundation to address the way we build socially responsible intelligent systems. Our approach aims to form a set of standards as an ethical blueprint that our partners and customers will also be able to make use of. Importantly, Atos' Ethics by Design has the potential for incremental improvements to address future challenges that new advances in technology are set to bring in the future.

The conceptual framework that Ethics by Design represents can provide a solid foundation to address the way we build socially responsible intelligent systems.

Atos' blueprint for Ethics by Design

Atos' response to the ethical challenge has been to formulate Ethics by Design, our multidisciplinary approach to the development of intelligent systems which places ethics as a first principle at every stage in the solution lifecycle.

Tools

Methods

Governance

Culture

Regulation

Autonomy

Fairness

Explainability

No harm

Ethics by Design

Case study

AI, health and ethics

The application of AI in the health sector provides a useful illustration of the ethical considerations that could typically be built into application design.

Imagine a team of data scientists who are developing a deep learning system for predicting cardiac problems, based on multiple data sources such as health records and electrocardiograms. They develop a model that works well in some of the scenarios they tested, but which does not work at all well when applied to women. This means that further development on the model is unlikely to progress as the risks are too great.

Atos' Ethics by Design comprises tools to detect bias in data to avoid these kinds of anomalies from the outset. For example, it may be that there is significantly more data available about men of a certain age with heart conditions, and that this has been the principal source of data for the model. At the same time, tools need to be developed to explain why the AI algorithms are detecting certain patterns as this will help developers and doctors to gain a clearer understanding of the results.

By having a series of checklists and guidelines in place as part of a process methodology, the development team will be guided to anticipate problems early on in the design and the development cycle of AI systems. These methods should validate the outcomes of the model and pilot the data, and there will be use-case analysis from an ethical perspective before the first data is analyzed.

The best solutions are developed by talented teams of data scientists coming from diverse backgrounds. While training in ethical issues in AI is critical, incorporating culture as an element in design should cover latent biases. In the example of the cardiac solution, it could be that an all-male data scientist team might have preconceived ideas about heart disease based on male symptoms. Further, there are many examples of digital solutions that do not incorporate accessibility factors for people with disabilities.

Increasingly policy makers are considering the role of regulation in relation to AI. The data scientist team developing an AI health application will need to be aware of regulations, both for AI in general and also specific to health.

Alexandra Knupe, Global Head Corporate Social Responsibility, Atos

Integrating digital ethics in Corporate Social Responsibility

By deploying the immense power of digital innovation within a robust ethical framework, information technology companies such as Atos can shape progress towards a digital society that is more inclusive, fair and sustainable.

In recent years, and in response to rising concerns from investors, other stakeholders and society in general, most large enterprises have been steadily incorporating the principles of Corporate Social Responsibility (CSR) into their operating practices, value systems and reporting procedures.

CSR has long been a leading priority for Atos. In recent years we decided to explicitly extend this to a commitment towards Corporate Digital Responsibility to develop a culture of ethics and compliance that encourages the deployment of artificial intelligence and other digital innovations for the benefit of all society. In early 2019, we became the first company in France to publish a "Raison d'être" or "Sense of purpose" which commits us to enabling our customers, employees, collaborators and society in general to "live, work and develop sustainably and confidently in the information technology space."

Our culture of Corporate Digital Responsibility provides us with the robust ethical foundations we need to execute our short-, medium- and long-term business strategies. Our sense of purpose, which is fully integrated into our bylaws, our daily operations and our annual and multi-annual targets, serves as the star by which we are guiding Atos into a future replete with opportunities, where we are able to deal effectively with emerging ethical dilemmas.

Sharing our experience of successfully mapping out an ethical journey, we are now putting our insights and know-how to work in the service of our customers. Different organizations will have different values and principles, and their destinations may be far apart, but all their journeys will need to be informed by a deep understanding of the ethical risks ahead.

Sharing our know-how

In our landmark report, Journey 2022, Atos Thought Leaders identified the central challenge facing our customers as that of the art of possible versus the art of the permissible — the 'could we/should we' dilemma — when it comes to the implementation and exploitation of emerging digital technologies.

Guided by this awareness of the scale of the ethical challenge, we are working with our customers to deploy digital innovations in an environmentally and socially responsible way across many sectors, through reducing wastage in electricity and water networks or to cutting the incidence of reoffending in the justice systems.

In many of our digital solutions for our clients, we incorporate what we call a "Design for Good" approach which aims to maximize accessibility and inclusiveness through our policy of Ethics by Design.

For example, we have established customer experience labs which specifically seek to ensure that demographics at risk of exclusion, such as the hard-of-hearing or the elderly, can still benefit from our customers' innovations.

Using technology to help counter discrimination, we created an app for one of our clients which tests people's latent prejudices in certain difficult situations, helping to raise awareness across the organization of the dangers and risks of unconscious bias.

At Atos we have worked hard to become recognized leaders in corporate responsibility, and we continue to do so. Our goal is to help our customers to create their own visions of CSR and to develop the ethical digital solutions that will guide humanity to a more inclusive and sustainable future.

> **Our culture of Corporate Digital Responsibility provides us with the robust ethical foundations we need to execute our short-, medium- and long-term business strategy.**

> **In many of our digital solutions for our customers, we incorporate what we call a "Design for Good" approach which aims to maximize accessibility and inclusiveness through our policy of Ethics by Design.**

Jessica Hofmann, Founder and Managing Director, Blockchain Factory, Atos

Digital ethics – building trust in sharing data

The rise of blockchain and other distributed ledger technologies are illustrative of a growing need for solutions that provide trust at an ecosystem level. In a world where globalization continues at a pace and business ecosystems become increasingly complex, trusted business exchanges are essential for success.

Technologies such as blockchain enable trust ecosystems by connecting independent parties and facilitating the trusted exchange of value between those parties. The value exchange is shaped by features such as visibility, transparency, immutability, auditability and real-time insight, providing business partners with a new level of trusted exchange, ownership and confidence that can bring significant operational benefits. At the same time, the impact of these features is a source of ethical dilemmas: is it always desirable to have these new levels of visibility, auditability and insight in the value exchanges we conduct?

An example is provided in the healthcare industry. A majority of health industry stakeholders share the opinion that being unable to safely exchange patient data between independent parties (care providers) constrains progress in the entire healthcare field. The desire for data exchange solutions such as blockchain-based Electronical Medical Records (EMR) is extremely significant. Although these solutions are already available, their adoption is a delicate struggle that progresses slowly. Concerns remain over inappropriate use and impact of these solutions as they enable the exchange of (sensitive) patient data across entire ecosystems. Some key questions are: how does the patient remain in control of their own data? and how do we ensure the right levels of visibility of and access to data? In the worst-case scenario, patient data could be used against the patient by a healthcare insurer who gained unintended access to it. It is extreme situations like this that need to be unambiguously prevented, before widespread adoption of EMR solutions will find their way.

As such, the ethical impact of technical solutions should be considered in the early stages of solution development. Atos shares the vision that technical solutions are to serve business conduct and to add value for the stakeholders involved, including from an ethical perspective. As such, solution impact and ethical considerations are an integral part of our service and delivery standards.

Atos shares the vision that technical solutions are to serve business conduct and to add value for the stakeholders involved, including from an ethical perspective.

David Daly, Global Deal Assurance Manager and member of the Atos Scientific Community, Worldline

The ethics of Digital Business Models

Businesses and organizations wanting to embrace the opportunities presented by new technologies are advised to analyze how they expect their business models to evolve in order to leverage digitization, data-driven insights, and multi-sided platforms in line with ethical considerations.
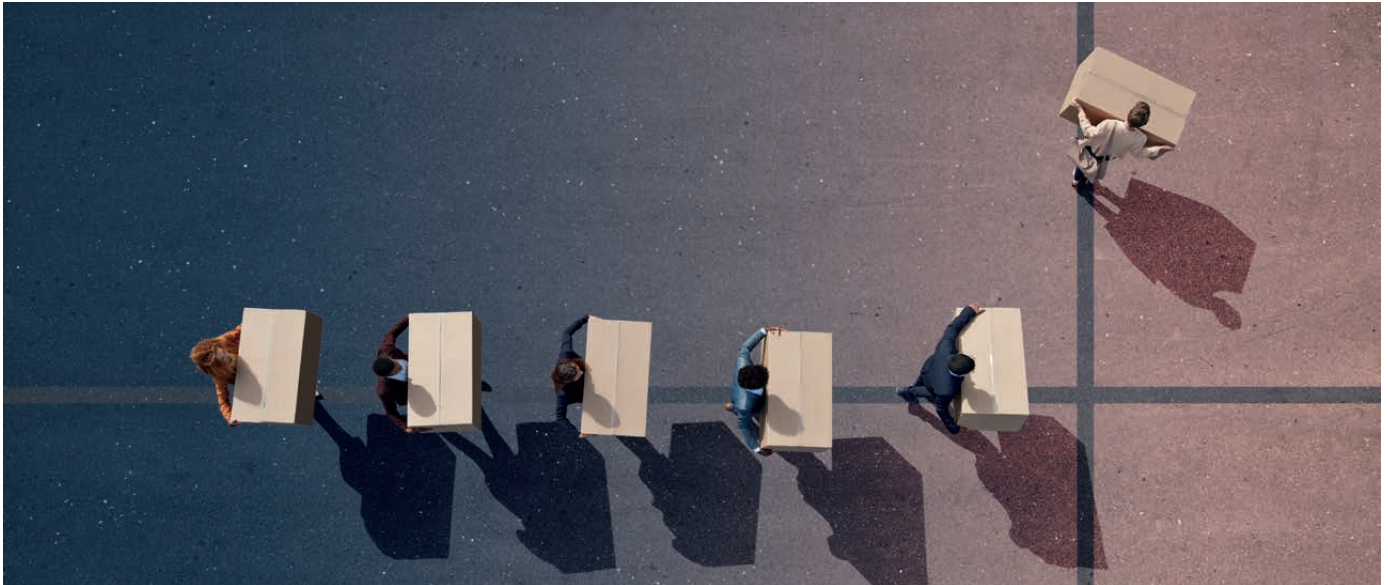
Digitalization, the full or partial replacement of physical goods and/or services with digital equivalents, opens up new business models because it reduces the marginal costs of production and distribution by orders of magnitude. The digitalization of goods and services both increases the speed and convenience of consumption or usage and enables vast amounts of data about customer behavior to be collected.

Even where physical goods and services remain, digital technology has enabled multi-sided platform business models at a scale not witnessed before. A multi-sided platform has two different types of user. For example, the Uber ride-sharing platform caters for those who need transporting from A to B on the one side, and for people wishing to provide rides on the other side. This business model uses digital technology to connect two sides of a multi-sided market.

Organizations need to take a close look at their current business models to ensure they are ready for data-driven changes, with robust and ethical safeguards in place.

Real ethical considerations

Managing intellectual property rights

Once a product or service is digitized, the barriers to copying it become much lower. Compare the cost of copying an mp3 file across a network against that of burning and distributing a physical CD. The ease with which digital copies can be made means that additional attention must be given to how the intellectual property is managed in a way that is fair to all parties involved: creators, distributors and consumers. Following a US court ruling that free music sharing company Napster was facilitating the illegal transfer of copyrighted music, current business models for music streaming services aim to address these considerations through, for example, member subscriptions and advertising revenue shared with artists.

Obtaining informed consent

If a company seeks to derive value from data-driven insights, careful consideration must be given as to whether the people and organizations who are providing the data on which these insights are based have given their informed consent for it to be used in this way. This is made more challenging by the fact that many may have difficulty in judging whether they are happy for their data to be used for a particular purpose (even if they read the end user license agreement). Additionally, when an organization first starts collecting data, it may not itself know precisely if or how it will be able to extract value from it. Yet this intended purpose will almost always be an important factor influencing the data provider's decision on whether to permit its usage: they may be happy to share data about their lifestyle to help find a cure for cancer, but not to calculate their insurance premiums.

Avoiding exploitation of users

In the case of a real-estate platform that connects (for a fee) those seeking to buy a house with those who are looking to sell, the operator of a multi-sided platform can make large profits with relatively low costs (and hardly any fixed assets) because the process of connecting people from both sides of the market is largely automated by technology. If there is a perceived imbalance between the effort and reward for users of the platform and the platform operator, the platform operator may be seen to be exploiting its users and the business can be negatively impacted. Furthermore, multi-sided platform providers could achieve a monopoly-like status where the value of their platform increases with its number of users and safeguards may be needed to avoid exploiting platform users.

José Esteban Lauzan, Head of Innovation at Iberia and founding member of the Scientific Community and Distinguished Expert, Atos
Amélie Groud, Senior Data Scientist and member of the Scientific Community, Atos

AI Explainability: making the complex comprehensible

AI Explainability is the name given to the approaches, techniques and efforts that aim to make Artificial Intelligence (AI) algorithms explainable to humans.

In the case of some AI algorithms, especially machine learning (ML) ones, the result of an AI solution cannot be understood by a human expert in a particular subject matter and the designer of the solution cannot explain why the AI arrived at that specific result. Lack of explainability raises concerns around safety, ethics, fairness, reliability and ultimately trust in the proposed solution.

AI Explainability is complicated. ML algorithms aim to detect patterns and hence insight from input data, but this process cannot be comprehended by simply listing rules or instructions in human-readable format. The machine learning process also cannot be understood by comparing it to a human learning process. An ML model can integrate thousands of dimensions in its learning process whereas a human being can barely work with more than a handful simultaneously. ML algorithms usually require a large amount of input data whereas humans only need a few examples to start making accurate decisions.

Responsibility for automated decision-making
To make things more complicated, it turns out that we apply different standards to humans and familiar algorithms (such as rule-based ones) than we apply to more innovative algorithms such as ML ones.

Algorithms are not (currently) responsible for their decisions, which means that determining liability in automated decision-making is still an open legal question.

Can technology help with rational decisions?
Humans are known to display bias in judgement and decision-making. Studies have shown that in hiring processes, for example, if photos and certain demographic information are removed from application forms, people often arrive at different selection decisions. Provided they are well designed with ethical considerations built in from the outset, digital applications could in principle vet applications with greater impartiality.

Nevertheless, humans consider themselves explainable because most of us can articulate why we took a particular decision. And there is an incentive to be able to explain – because humans can be held legally responsible for the consequences of their decisions.

By contrast, algorithms are not (yet) responsible for their decisions, which means that determining liability in automated decision-making is still an open legal question. Because of this gap in liability and because many AI algorithms are new to humans and business applications, there is a natural lack of trust in them and a strong desire for AI Explainability.
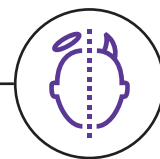
Making a tangible difference to citizens and society
Achieving AI Explainability requires understanding and insights aligned to both the socio-economic and scientific-technical dimensions.

Societies will probably progressively trust AI algorithms as their use becomes more widespread and as legal frameworks refine the allocation of liabilities. Of course, cultural differences greatly affect how countries and regulatory regions approach AI. In countries such as China, regulation is lax and the political system seemingly places little importance on the freedom of individuals; for example, China is implementing a social credit system, based on algorithms, which aims to provide a standardized assessment of the trustworthiness of its citizens. This context makes Ethical AI and Explainable AI, as we see it in Europe, less applicable. In the US, while the rights of individuals are more important, regulation is also lax (especially for business purposes), so the workability and benefits of AI solutions represent greater value than their explainability. In other regulatory areas like the EU, emphasis is placed both on individual rights and regulation (such as the General Data Protection Regulation), with the result that explainability is often more important than workability — especially in heavily regulated sectors, such as energy and finance.

From a scientific and technical perspective, methods and techniques are being researched and developed with the objective of increasing the interpretability of algorithms. Some of these methods are model-agnostic and can provide meaningful insights from any trained ML models (e.g. Shapley values — a method for interpreting such models which originates in cooperative game theory and assigns payouts to players according to their contribution to the total payout). Other techniques are specific to a given family of algorithms.

Depending on the use-case, client, sector, market, regulation, political environment, culture, etc., using a specific AI-ML model may or may not make sense, be legal, or ethical. We should identify the nuances and highlight the need for case-by-case analysis and decision-making. In the case of healthcare, finance or energy, most scenarios are heavily regulated (which means more explainability is needed). In other scenarios we might favor benefits over explainability — for example, using an AI-ML model that monitors the manufacturing of non-critical parts and flags up when problems are likely to appear in the process.

What all these scenarios have in common is a need for focused consideration of the level of transparency that is required and how it can be achieved.

Vincent Couteau, Corporate Legal Counsel, Atos

Regulators take up the AI gauntlet

Policymakers are rising to the challenge of designing rules and regulations that promote human-centric AI which is transparent and trustworthy.

As global understanding of the massive scale and impact of digital transformation increases, policymakers have realized the need for ethical standards and guidelines to curb any potential adverse impacts from new technologies in relation to privacy and loss of control of personal data.

Rising to this challenge, in April 2019 the European Commission presented its Ethics Guidelines for Trustworthy Artificial Intelligence following a stakeholder consultation launched at the end of 2018. These guidelines, which are considered elsewhere in this publication, focus on the need for AI applications to have ethical purpose and technical robustness.

In May 2019 the OECD group of high-income nations approved the first ever inter-governmental standard on AI. Drawing on that recommendation, the leaders of the G20 adopted human-centric AI principles at a summit in Osaka, Japan in June: 2019. The OECD has identified five complementary principles for the responsible stewardship of trustworthy AI aiming to ensure it benefits people and the planet, and AI systems respect the law and human rights. AI must also be transparent and secure and that organizations using AI should be held accountable for their proper functioning.

The need for human-centric values

The OECD Principles and the EU's Ethics Guidelines for Trustworthy Artificial Intelligence have been supplemented by initiatives from governments, universities and industry. There has been such a rapid proliferation of ethical standards and government models that they now number in the hundreds.

Noteworthy national efforts include the American AI Initiative in the US, the Advisory Council on the Ethical Use of Artificial Intelligence and Data in Singapore, and the Beijing AI Principles in China. Ethics for AI has also been made a national priority in Canada.

Although each country has differing priorities, the need for a human-centric, values-based approach to AI is common across all these initiatives. The challenge now is how to make these principles concrete.

As a major participant in the digital economy, Atos is closely involved in this debate with stakeholders of all kinds. Based on our vision of Corporate Digital Responsibility, we are committed to helping develop transparent, accountable and trustworthy AI systems that put humanity at their heart.

> **To foster public trust and confidence in AI technologies and fully realize their potential, we are committed to a human-centered approach to AI.**
>
> G20 Ministerial Statement on Trade and Digital Economy, June 2019

Kulveer Ranger, Senior Vice President Strategy & Communications, Atos UK&I

AI+Ethics: towards a Digital Society

The release of Atos' Digital Vision for Artificial Intelligence (AI) in 2018 represented an important step in our commitment to helping shape the debate on the power and social impact of this exciting technology.

It also encouraged us all to look at AI from a different and equally important angle: one that asks not only what AI can do, but also what it should do. This is the mission of Atos' ongoing work in this space.

It is an undisputable fact that digital technology carries with it enormous power to transform every aspect of people's lives. Over the past 20 years or so, we transitioned swiftly into hyper-connected ways of living which are now so ubiquitous as to become almost invisible. Artificial Intelligence may be self-apparent in digital personal assistants — Echo, Alexa and Siri fit smoothly into an archetype of AI that stretches back to HAL 9000[1] and beyond — but its reach stretches much further, from the algorithms behind search engines and travel planners to prescriptive maintenance that helps keep critical national infrastructure safe and operational.

While the domain of what AI can achieve continues to expand at pace, the related question of what it should achieve still lags behind. HAL 9000 remains a useful symbol for our deeply-set fears — an all-powerful, all-knowing and frighteningly emotionless entity that, when met with unforeseen circumstances, turns its logical brain against the humanity it was designed to serve.

Although this form of AI does not exist in reality, a frank public debate must still take place on both the promise and the challenges surrounding AI — not the one that hijacks interstellar spaceships, rather the one that is already quietly making us healthier, safer and more efficient. Only then will we be able to truly establish trust in technology to deliver positive transformation for people and businesses.

The AI+Ethics conversation we've led in the UK in partnership with the think tank Onward aims to do just that. Bringing together leaders and experts in the field of AI across business, politics and academia, it seeks to further discussion and to help inform the direction of future government decisions on potential regulation for the tech industry with a view to ensuring that AI benefits all citizens equally.

A frank public debate must still take place on both the promise and the challenges surrounding AI.

[1] The sentient onboard computer in Stanley Kubrick's 1968 movie 2001: A Space Odyssey
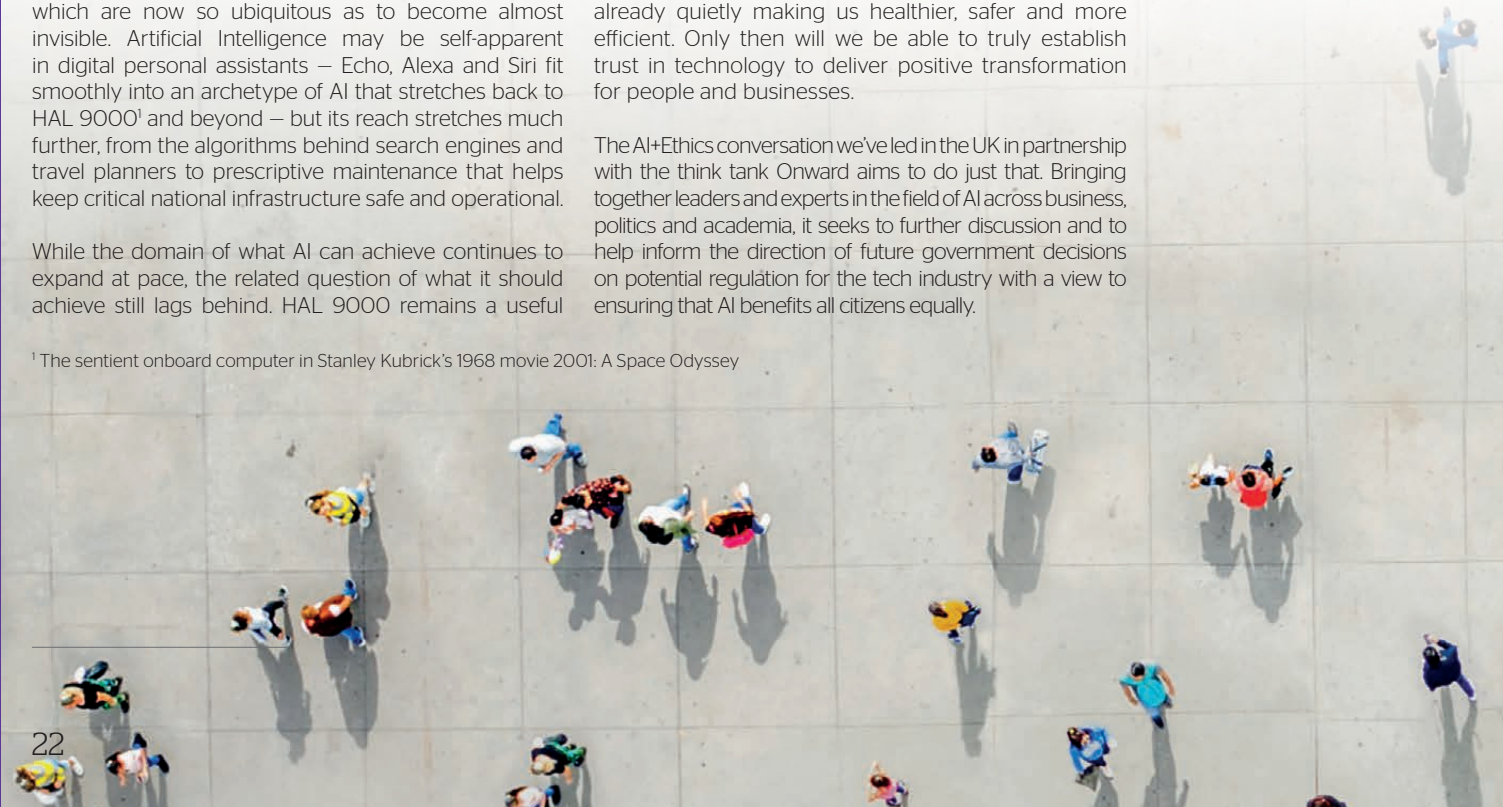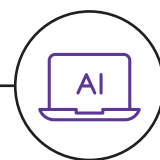
In the short time since we launched this programme in 2019, we have already organised four high-profile roundtables — two of them in the UK Parliament with several MPs in attendance — and have recently published a paper[2] outlining core principles to guide future technological and policy developments. For a peek at the direction the debate is going in, look no further than the titles of our recent roundtables: 'AI: How does it make lives better?', 'Trusting AI', 'Sharing the benefits of the technological revolution' and 'AI: Could we? Should we?'

In 2020 and beyond, we will be taking the debate further, harnessing the collective thought power of our AI+Ethics Network. This comprises the experts, practitioners and opinion formers who have taken part in our conversations in recent months together with new voices at the cutting edge of the debate. Everything we examine will continue to build on the principle that to explain AI through the lens of ethics means not only to create awareness and promote its

benefits to politicians and wider society, but also to explore what governance might be required to resolve potential risks and issues. If this body of work can ultimately help government and industry be better informed and therefore improve the choices they make, together we can contribute towards turning this powerful new technology into a catalyst for positive social change.

There is hardly any doubt that AI will continue to evolve at a blazing pace – even as I write, digital media is breaking the news that AI now outperforms human experts in medical diagnosis[3]. This is yet another reminder of why a positive debate on AI and Ethics is so necessary. Against a backdrop of such rapid change, the AI+Ethics Network will provide a forum to test and challenge ideas, moving us closer to a fully Digital Society where the benefits of AI can be felt by all and HAL 9000 continues to drift away into deep space, safely locked away in the world of science fiction.

While the domain of what AI can achieve continues to expand at pace, the related question of what it should achieve still lags behind.

[2] https://atos.net/en-gb/united-kingdom/artificial-intelligence-and-ethics-report
[3] https://www.ft.com/content/3b64fa26-28e9-11ea-9a4f-963f0ec7e134

Marianne Hewlett, Chief Marketing Officer, Atos in the Netherlands

Collective Intelligence – can human and machine intelligence work in unison?

Artificial Intelligence (AI), automation and robotization have the power to exclude but, more importantly, they have the power to enhance our human experience. Understanding the opportunities and threats posed by new technologies from a human-centric perspective will be key to ensuring their acceptance and delivering the maximum benefit to individuals, organizations and society at large.

Technology is rapidly changing the world of work as we know it, from digital assistants to robot colleagues. However, technologies such as AI and automation are not about replacing people. Instead, they can create new opportunities by elevating certain skills and optimizing specific tasks and activities. By automating routine tasks and using AI to gain faster and better data insights, more time becomes available to carry out tasks that humans are great at, such as complex problem solving, critical thinking and creativity – essential skills for the future workspace[1].

To prosper in this new era, organizations will need humans to learn how to work in tandem with AI and robots. By complementing and leveraging each other's strengths, a collective intelligence will emerge that is greater than the sum of its parts. Thomas W. Malone, professor at MIT, refers to this collective intelligence as *"Superminds – the surprising power of people and computers thinking together"*[1]. Superminds are a powerful combination of many individual "minds" that can accomplish things that individual humans or machines cannot do alone.

As AI systems become ever more sophisticated, new jobs will also be created that do not yet exist today. Large companies already using or testing AI and machine-learning systems are anticipating the emergence of new, uniquely human jobs. MIT research[2] predicts humans in new AI-driven roles will complement the tasks performed by cognitive technology, ensuring that the work of machines is both effective and responsible — that it is fair, transparent, and auditable.

The preparations start now

At this critical time, it is the responsibility of all employers to prepare their employees to adapt and thrive in the workplace. The challenge now is for organizations to develop the appropriate training and reskilling programs that will help their existing workforces adjust and excel in the new working environment.

Preparedness will also involve a willingness to consider new organizational structures, flexible working, accessing an increasingly global talent pool and addressing the challenges of a multi-generational workforce. The priority is for organizations to embrace a human-centric approach that will help to accelerate digital transformation and ensure a more meaningful experience for employees.

The challenge now is for organizations to develop the appropriate training and reskilling programs that will help their existing workforces adjust and excel in the new working environment.

Superminds are a powerful combination of many individual "minds" that can accomplish things that individual humans or machines cannot do alone.

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[1] *Superminds – The Surprising Power of People and Computers Thinking Together*, Thomas W. Malone (2018)
[2] *The Jobs That Artificial Intelligence Will Create*, H. James Wilson, Paul R. Daugherty, and Nicola Morini-Bianzino (2017) http://ilp.mit.edu/media/news_articles/smr/2017/58416.pdf
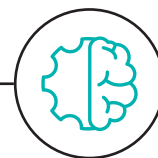
4 steps to embrace a human-centric culture

1 Establish a culture of collaboration

Learning from each other in an environment where it is safe to make mistakes will be essential to ensure new techniques and working practices can be tested.

2 Drive intelligent productivity

Empower employees to focus their time, energy and brain power on the issues that really matter to them and to the organization.

3 Blend artificial intelligence with human intelligence

This is a magic combination. Determine which processes and tasks can be automated and carried out by AI. Start retraining and reskilling employees to deploy their uniquely human skills to translate AI findings into actionable insights.

4 Focus on diversity

Set up diverse teams with a balanced mix of male and female employees and with a mix of technical, analytical and soft skills. This will drive creativity and innovation and avoid bias.

77%

CIOs who are concerned about the impact of automation and digitalization on their organizations.

Atos survey of 100 CIOs (2018)

Soren Juul Jorgensen, Research Fellow, Stanford University

Data ethics and global cultural differences

Artificial intelligence (AI) and the use of data have the potential to provide effective solutions to many of our global challenges. But tech also raises important questions, and we need effective guidelines to curb the risks to privacy, aspects of our daily lives and to society and democratic institutions.

In order to develop global principles which are acceptable across different cultures and traditions, policymakers should base their efforts on the universally accepted framework of international human rights law.

AI is fundamentally changing the game, and how to govern these emerging powers raises important questions and risks to fundamental rights, to which we need to develop general and global answers. We also need to understand how AI and tech is perceived in different cultural and social settings — and how AI impacts these. Big questions such as how bias impacts social fabric, context and mobility — or just the general cultural impact of the fact that algorithms and tech are developed in an English language context.

Data and technology are global in nature and need global standards for the responsible management of data and especially how to govern our dealings with Artificial Intelligence.

We are witnessing the rapid proliferation of ethical standards and governance models; now in their hundreds.

AI is fundamentally changing the game, and how to govern these emerging powers raises important questions and risks to fundamental rights, to which we need to develop general and global answers.

Towards globally accepted ethical principles

Two recent studies are interesting to understand some aspects of this ongoing development.

The Health Ethics and Policy Lab at ETH in Zurich recently examined the existing corpus of ethical codes on Artificial Intelligence. The analysis of 84 international documents provide an interesting list of globally accepted ethical principles. No single principle was present in all 84 documents, but transparency was present in 73. Other generally accepted principles included Justice and Fairness (68/84), Nonmaleficence (60/84), Responsibility (60/84) and Privacy (47/84).

The Swiss study also provides insight into the global geographical distribution of codes for responsible AI. So far, such codes are developed mainly in the more economically developed countries, with the US and the UK accounting for about a third of the ethical AI principles. 19 of the 84 documents were European. No African or South American countries were represented. The world of AI ethical guidelines is still asymmetrical.

It is one thing to adopt general codes; another is how we actually perceive and react to moral dilemmas. The Moral Machine online dilemma experiment developed by Media Lab at MIT in Boston illustrates this. The game was based on a number of variations of the classical trolley dilemma. It was available online and Media Lab collected data on how citizens would want autonomous cars to solve moral dilemmas in the context of unavoidable accidents — who dies?

Read more in two articles in Nature:
Moral Machine Experiment https://www.nature.com/articles/s41586-018-0637-6
Global Landscape of AI https://www.nature.com/articles/s42256-019-0088-2

The passengers or the pedestrians? Children, older people, law abiding or the unlawful? People from 233 countries took part in 40 million decisions. The experiment provides insight into individual preferences, but the MIT team also noted how geographical and cultural proximity allows groups of territories to converge on shared preferences for machine ethics, and it uncovered differences in the preferences between three main clusters; a Western, Eastern and Southern group of countries. People from individualistic cultures showed a tendency to spare the lives of the greater number of characters, and people from collectivistic cultures showed a weak preference for youth.

Both studies are helpful in understanding some of the challenges in developing globally accepted standards for responsible tech and AI.

This is important as we need to promote inclusive and global dialogue in the development of coherent and stringent answers to the many questions we are facing.

So, will it be difficult or impossible to reach global and comprehensive principles? Human rights laws can provide a natural and important global framework for our dealings with the issues of AI and tech. International human rights law is well developed and provides both a universally accepted framework for considering and redressing the impacts of artificial intelligence on individuals and societies, and a useful and natural basis for these efforts — more universal and well defined than the current state of ethics principles.

Neil Milliken, Head of Accessibility & Digital Inclusion and member of the Scientific Community, Atos
Denise Reed Lamoreaux, Global Chief Diversity Officer, Atos
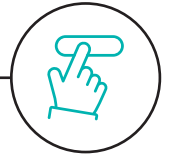
The value of a diverse workforce in inclusive AI development

At Atos, we are making a concerted effort to avoid the pitfalls that arise from negative bias, especially when used to analyze people data.

Given the critical nature of data in the legal, education, finance and transportation spaces, enormous damage could result in the blink of an eye if AI systems are not carefully constructed to eliminate the opportunity for the data to become tainted by discrimination.

The data sets we are using to train AI may also be reflective of pre-existing societal bias, and applied algorithms may amplify them. We must determine and function within the "boundary of acceptability" when developing algorithms so that technology doesn't go rogue and create a situation similar to recruiting tools that were reported in the media to inadvertently be biased against women. Those systems had been trained to rate applicants by observing patterns in data from resumes submitted over a 10-year period, most of which came from men. The tool is no longer used.

Atos does not discriminate on the basis of race, religion, color, gender, age, disability, sexual orientation, or any distinctive traits, and we cannot allow bad AI to negatively influence our recruiting practices. We are taking this to the next level by applying the concept of 'Design for Good' championed by Atos' Scientific Community member John Hall. Design for Good aims to prioritize the design of responsible digital applications. We are aiming for this moral compass — the Design for Good mentality — to be part and parcel of every decision made in the AI arena as well as for other digital technologies.

Accessibility and disability factors

Corporations the world over tend to leave people with disabilities out of the Design for Good phase, and rarely include them in their composition in BETA software testing or on Ethics boards. In fact, Ethics boards rarely include people who are affected by technology. It is critical to include people with disabilities at all stages of the development lifecycle, because it's one thing to observe bias and recognize it, but it's a completely different thing to really understand it from a personal perspective and to have experienced it yourself throughout your life.

AI-driven technologies also hold great potential for solving the challenges faced by people with disabilities. For example, the accessibility of our media-rich, hyper-connected world is being improved by algorithms which deliver automatic subtitle captions and audio image descriptions to include people who are deaf or blind.

Creating AI solutions requires more than diversity. Team members need to feel they are contributing, that their opinions are valued, and that all perspectives and suggestions are taken seriously for the Design for Good approach to produce unbiased results in reality.

We are aiming for this moral compass – the Design for Good mentality – to be part and parcel of every decision made in the AI arena as well as for other digital technologies.

Key take aways for action now!
- Teams to be composed of a variety of people from all walks of life to allow for innovative thinking.
- Put in place checks and balances at all stages of the development lifecycle to ensure that employee initiatives are inclusive, not exclusive.
- Ethics boards to be representative of society to avoid "groupthink".
- Examine data for gaps and pre-existing biases.

Case study
Online finance for all

National Savings & Investments (NS&I), the UK state-owned investments organization, plays a central role in the country's savings system and serves more than 25 million customers. Backed by the UK government, all savings invested with NS&I are 100% secure. That makes the organization a popular savings choice for customers with a low appetite for risk, especially for retirees and the elderly.

As a key technology partner to NS&I since 2011, Atos is helping the organization use digital innovations to communicate better with all its customers, especially with those people who are not confident with online transactions.

When the organization decided to redesign its website, Atos was careful to incorporate the needs of the elderly into the design process. Using eye-tracking technology, we were able to identify potential issues such as the location of the login button and the balance-checking service. Our careful, inclusive approach helped ensure that the new-look website was attractive and accessible to what is a key demographic for NS&I.

Thanks in part to the success of the redesign, last year 76.9% of all NS&I interactions with retail customers were digital, ahead of the target of 75%. NS&I also retained the top spot for the banking and finance sector in the Top 50 Companies for Customer Service awards, for the third consecutive year.

Our work to increase the accessibility of NS&I's online services does not end there. In 2019-20, we will be introducing a secure messaging capability to the NS&I website, allowing the organization to provide targeted help to customers who otherwise might require paper-based interactions.

Jon Mottershead, Client Executive, Atos

Digital ethics in policing

For over 200 years the UK police forces have operated to a set of nine key principles that were first articulated by Sir Robert Peel. They embody values such as building trust and co-operation with the public, preventing crime rather than just responding to it, using minimal force, and demonstrating absolute impartiality.

These principles have stood the test of time in the physical world of policing, but how well do they translate to the digital world that has brought massive changes to the way crime (now cybercrime) is viewed?

At a purely technological level, the Peelian principles arguably have some resonance with the high-level objectives of digital, particularly in the context of digital ethics. We want digital systems to build trust, to be fair, to be efficient and to prevent problems rather than cause them. But certain digital technology developments may raise barriers to implementing and enforcing such values.

When the use of data-generated insights may not be acceptable

One example is the remarkable (and sometimes alarming) insights that can be drawn from data relating to individual behaviors. Retail companies use these insights in highly personalized advertising targeting, banks use spending anomalies to help detect possible fraudulent transactions, and justice departments have even explored the possibility of assessing the probability of ex-offenders being drawn into situations where they are likely to reoffend. While most of us would probably agree that the first two examples could be acceptable use of data, there may be some serious ethical questions to ask when criminal behavior is being predicted before it has actually taken place. The mantra of "innocent until proven guilty" could be turned on its head.

Another potential scenario is where data gathered from wearable health-trackers could potentially be used as evidence that an individual was at the scene of a crime and was experiencing an elevated pulse rate at the time a crime was committed. At what point does the use of such data become an invasion of personal privacy and when is it fair to use any means possible to detect criminals? The situation is further complicated by the use of CCTV facial recognition, as it indiscriminately applies invasive analytics to all. This is already seen by some as a potential restriction to freedom of movement.

We may be astounded by the feats of analytics and AI algorithms to identify crime hot spots or to predict when and where criminal activity is likely to occur, but we have to remember that the "bad guys" have access to the same kind of technology and might use it to work out how to best avoid police presence. In addition, cybercrime has little respect for physical geographical borders: to ensure protection against global threats, the Peelian principle of building trust and co-operation with police forces round the world has to be reimagined.

At what point does the use of such data become an invasion of personal privacy and when is it fair to use any means possible to detect criminals?

Javier Ponce Suarez, Head of Digital Transformation and member of the Scientific Community, Atos

Insurance in the driving seat of change

While other industries are only just beginning to grapple with the challenges and opportunities of the data revolution, digital transformation is already an established reality in the insurance sector.

For some years now, leading insurance firms have been using data analytics, the Internet of Things (IoT) and artificial intelligence (AI) to price risk, profile clients, manage claims and connect better with their customers. For instance, Atos is using its IoT expertise to support a global insurance company in transforming car insurance with a Pay-How-You-Drive (PHYD) scheme which promotes safer driving, reduces premiums and lowers costs for the insurance firm.

As the power of data reshapes insurance, the industry has moved into the frontline in considering the ethical challenges of the digital age. Seemingly abstract ethical questions related to corporate responsibility, data privacy and transparency have become critical realities that will determine the future success of any insurance business.
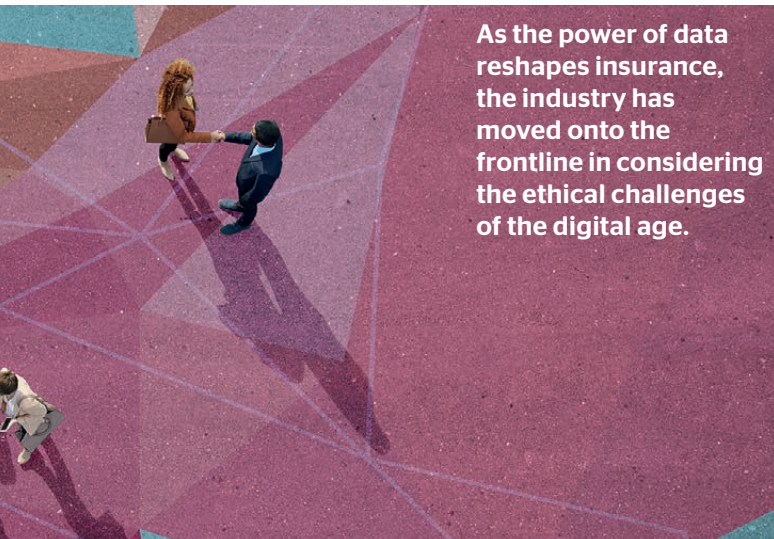
As the power of data reshapes insurance, the industry has moved onto the frontline in considering the ethical challenges of the digital age.

Ethical perspectives for insurers

Across nearly all segments of the industry, insurers face the challenge of using information collected from their customers to create value and remain competitive while scrupulously observing the ethical and legal standards required to maintain fairness, transparency and other key values.

Only if an ethical perspective is preserved will insurers be able to successfully roll out the following potential use cases:

- **Client deep profiling** – combining information from social media with user profiles to better understand consumers and identify possible cases of fraud.
- **Insurance price and claim optimization** – using data to determine the ability of a consumer to pay based on an analysis of their purchasing habits and risk profile.
- **Connected insurance** – for example by applying IoT in healthcare insurance to enable the elderly to live more independently.
- **Insurance packages** – insurers could use data from end users to refine insurance packages and create personalized premiums that add value for their customers.

Applying Atos' framework of Ethics by Design, insurance companies can take appropriate advantage of the possibilities of data by making sure that they are mindful of their ethical responsibilities from the start.

This is an exciting time for the fast-moving, ultra-competitive insurance market. Data and connectivity have the potential to turn insurance into a people-centric business centered on personalized relationships with customers.

With a human-centric design approach that takes into consideration key ethical factors — such as Fairness, Autonomy, Prevention of Harm, Explainability — insurers will be able to reap the full rewards of digital transformation.

Natalia Jimenez, Global Life Science Expert, Atos
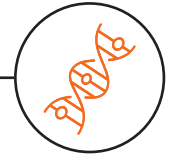
Ethical dilemmas in genetic testing

Some of Spain's leading football clubs and their youth training academies perform annual health and wellness tests on their players to develop targeted training programs and personalized diets to maintain high performance.

Some clubs use genetic testing so they can also identify any predisposition to certain diseases or conditions such as bone fragility, diabetes or heart problems.

The football clubs' health professionals typically look at diet-related insights such as lactose and gluten tolerance, carbohydrate and fat responses, sleep quality, injury risk and recovery profile. Some clubs use genetic testing so they can also identify any predisposition to certain diseases or conditions such as bone fragility, diabetes or heart problems. One of the most significant conditions is malignant arrythmia which can cause sudden death. High impact exercise is not recommended for individuals with this condition.

The health department of one high-profile club recently encountered a big dilemma when it discovered that a highly talented member of its female youth academy, with strong prospects for a future in the main club, carried two gene mutations that could make her susceptible to developing malignant arrythmia.

The doctors and representatives of the club's management met with the young footballer, who was only 15 years old, to explain the situation. After a number of meetings to discuss the issue with her, the club decided that, in spite of her impressive talent and potential, they could not to put her forward for selection for the main team as they wanted to prevent her premature death.

Clearly there are issues associated with genetic testing. The young footballer might never have known about her condition if the club had not performed the genetic testing and she will now have to declare this condition for example in job applications and medical insurance claims. Although carrying a genetic condition does not necessarily mean the footballer will develop the disease, it may mean that other football clubs do not want to take the risk even if she herself is prepared to.

At the end of the day, open communication by those carrying out genetic testing and informed consent from those being tested will be extremely important as genetic health forecasting becomes more prevalent in the workplace.

Paul Moore, Head of Innovation for the Media Market at Atos and member of the Scientific Community

The challenges of perceptive media

As old as civilization itself, storytelling has acquired a new relevance in the world of digital media, helping brands to connect with consumers and create compelling relationships with their customers.

Digital innovation is now enabling organizations to tell their stories in increasingly immersive, interactive and personalized ways. Media is becoming intelligent and perceptive. Each person may consume content in a unique way and enjoy a dynamic and customized experience.

Brands will be able to use insights gained from user behavior, social media, contextual information, AI and even biometrics to create emotionally aware content. In a simple example, the music played in a commercial may change depending on the targeted customer's mood at the time.

However, the arrival of the age of hyper-personalization will create a series of ethical challenges. How much can or should media companies know about you? How much should they be allowed to use such information to influence their customers?

To realize the full potential of this paradigm shift, customers need to be able to consent to this customization. The basic appeal of perceptive media is that it allows the end-user to take control of their media experiences.

If that sense of control is undermined by unethical use of user data, perceptive media may be a non-starter. In exchange for the use of personal, intimate information, content creators and brands need to make sure that the end-user always feels in control. A culture of compliance and an ethical framework which puts humans at its heart will be essential to the success of the perceptive media revolution.

> **The arrival of the age of hyper-personalization will create a series of ethical challenges. How much can or should media companies know about you? How much should they be allowed to use such information to influence their customers?**

Albert Seubers, Director Global Strategy in Cities, Atos

The ethical smart city

In cities of the future, data is collected from multiple sources and organized to help people make better-informed decisions. Already many cities around the world are using real-time information from cameras, sensors, and social media to improve traffic, enhance safety and minimize the environmental impact of urban life.

If smart city solutions are to fulfil their transformative potential, they also need to address the ethical dilemmas inherent in these services.

All smart city projects are based on the sharing between authorities, citizens and third parties of information from sensors and other intelligence. The technology to achieve invaluable insights is now proven. But only if this information is implemented in a way that protects personal privacy and addresses the concerns of local communities will the smart city paradigm prosper.

Privacy by design
In one of the smart city initiatives we have been involved with, we followed the principles of privacy by design. Minimal Data Sets are used so that only data that is needed is captured or stored, and data is always anonymized. Data analytics takes place at the edge — within the camera — rather than using centralized infrastructure.

Although it would be relatively straightforward to identify every person on a camera, by applying privacy by design in this case people are represented as anonymous dots on a map. Analysis of their movement patterns, combined with other sensor data, such as sounds, is used to indicate any potential incidents. This ensures that the authorities have the data they need for rapid decision-making, without invading citizens' privacy.

In more ambitious smart city initiatives, when data is structured and organized into data lakes for multiple use-cases, privacy by design requires strict controls on access to data. An end-to-end cybersecurity strategy will also be critical, in order to prevent cyberattacks and data breaches.

The technology to achieve invaluable insights is now proven. But only if this information is implemented in a way that protects personal privacy and addresses the concerns of local communities will the smart city paradigm prosper.

By itself, however, the technology will not be sufficient to achieve the smart city vision. City leaders, technology partners and local communities need to agree on an approach to data governance that maximizes the value of data while respecting privacy and complying with ethical principles. For instance, in the Sidewalk project supported by Google in Toronto, Canada, an independent civic data trust will control the urban data collected in the neighborhood.

Only with the right approach to privacy and data governance can the data-driven city become a reality that will transform the quality of life for anyone who lives or works in a city.

Production team

Edited and designed by : Atos Global Communications, Atos Scientific Community, and copywriting by Analytica Media

Printing: Diadeis printed this document in respect with nature, which is represented by biological ink, FSC paper and a non-chemical prepress system

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About Atos

Atos is a global leader in digital transformation with 110,000 employees in 73 countries and annual revenue of € 12 billion. European number one in Cloud, Cybersecurity and High-Performance Computing, the Group provides end-to-end Orchestrated Hybrid Cloud, Big Data, Business Applications and Digital Workplace solutions. The Group is the Worldwide Information Technology Partner for the Olympic & Paralympic Games and operates under the brands Atos, Atos|Syntel, and Unify. Atos is a SE (Societas Europaea), listed on the CAC40 Paris stock index.

The purpose of Atos is to help design the future of the information space. Its expertise and services support the development of knowledge, education and research in a multicultural approach and contribute to the development of scientific and technological excellence. Across the world, the Group enables its customers and employees, and members of societies at large to live, work and develop sustainably, in a safe and secure information space.

Find out more about us
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Let's start a discussion together