Status Report on the Societal Impacts of Artificial Intelligence and Digital Technology

2025

HUBS

Law, Cyberjustice and Cybersecurity

Industry 4.0, Work and Employment

Ethics, Governance and Democracy

Arts, Media and Cultural Diversity

Education and Empowerment

Sustainable Health

Digital Sobriety and Socio-Ecological Transition

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Setting the scene

"It is not the machine that thinks; it is the human who thinks through the machine."
— Jean-François Lyotard, *The Postmodern Condition (*1979)

This second Obvia status report comes at a time when Generative Artificial Intelligence (GenAI) is increasingly being deployed within organizations. Since its creation, Obvia has carried out a number of research projects that have shed light on the main issues and problems associated with the development, deployment and adoption of AI. While the technical and ethical concerns surrounding GenAI remain central, we cannot ignore a deeper and more worrying phenomenon that is emerging in parallel: the weakening of the core values of science. Academic freedom and scientific independence are increasingly being undermined, giving rise to serious concern while demonstrating the importance of promoting scientific work. It is against this worrying backdrop that the 2025 edition of our status report is published.

The growing integration of AI tools in our societies is taking place in a context marked by a flagrant lack of regulation, giving way to uses that are all too often opaque, to unbalanced power relations and to technological governance largely dominated by private or state interests. This lack of supervision is underlined in this report by all Obvia's hubs of research which highlight the grey areas surrounding the development and use of GenAI.

Deployment of these systems is still imperfect, and they are far from entirely robust. Despite some progress, this technology is still marked by notorious shortcomings such as hallucinations, algorithmic biases or persisting contextual inaccuracies, affecting the reliability of so-called «generative» agents and decision-making processes. These limitations are often linked to the very design and architecture of GenAI technology, raising major issues as to their optimal integration into the workplace. Moreover, task automation is silently redefining the relationship between humans and machines, while raising fundamental questions about the evolution of the skills and qualifications needed in these new hybrid environments. Before a conversational agent can be celebrated as the «employee of the month»[1], the systemic implications of its integration into work structures need to be questioned in depth. The section of the Industry 4.0, Work and Employment Hub raises important questions in this respect.

Once again, we see that legal, ethical and political frameworks are struggling to keep pace with the frenetic advances of technology, whether in terms of data protection, algorithmic transparency, accountability or fairness. This gap creates fertile ground for unsupervised practices, amplifies power asymmetries between public and private players, and threatens the fundamental principles on which democratic societies are based. The absence of clear, binding standards reinforces ethical and socio-organizational risks, while exposing institutions to abuses that are difficult to anticipate or repair once the damage has been done. In the absence of laws governing GenAI, ethical frameworks and tools can serve as benchmarks to better guide practices and actions. However, there are limits to this type of framework: without common guidelines, training, institutionalization and accountability mechanisms, ethical frameworks may turn out to be symbolic or become merely cosmetic for problematic practices. The strength of a true institutionalization of ethical measures lies in guaranteeing trust, and trust rests on the key aforementioned elements. As a number of our research hubs suggest, trust is a fundamental principle that requires transparency, auditing processes and rigorous evaluation.

1 Expression seen on a few sites celebrating conversational agents by awarding them this mention in the same way as a human.

What's more, the reflections in this report are part of an international ecosystem in full effervescence as witnessed at the Third Summit for Action on AI which took place in Paris last February. It was in this context that Obvia distinguished itself by taking an active part in the discussions, organizing several strategic meetings and participating in major international initiatives aimed at promoting responsible and inclusive governance of artificial intelligence. Through its presence on these different stages, Obvia has contributed to bringing perspectives from interdisciplinary research and civil society, reinforcing its role on important issues. Obvia's scientific team has been particularly active in defending issues that are central to its scientific program and mission.

Among these, recognition of the essential role of civil society in public debate is an inescapable democratic requirement, as is the need to promote digital restraint in response to the growing environmental impact of technological development[2]. Added to this is the imperative to preserve and enhance the diversity of cultural expression, so that AI does not become a vector for standardization, but rather a lever for plurality and mutual enrichment. These priorities redefine the contours of an artificial intelligence which is truly at the service of humankind and the planet. The Summit also saw the unveiling and discussion of a major international report, the *International AI Safety Report*, directed by Yoshua Bengio (Bengio et al., 2025). Despite contrasting reactions from experts, this report has the merit of sparking debate within the scientific and technological community. It is through this kind of commitment and rigorous scientific work that solid benchmarks can emerge to guide the development of artificial intelligence while respecting democratic, ethical and social values.

We are currently experiencing considerable turbulence on the international stage that is part of the post-truth era (d'Ancona, 2017) in which science is weakened and attacked, and opinions take center stage to the detriment of objectively verifiable facts, pitting freedom against truth. This status report proposes findings based on an in-depth analysis of the social, ethical and political impacts of artificial intelligence in relation to Obvia's research hubs. In a context where truth is under threat, this work aims to provide clear, documented benchmarks for all those who closely follow technological developments. It reaffirms the importance of knowledge as a basis for public debate, and calls for collective vigilance in the face of potential misuses.

Lyse Langlois
SEO, Obvia

2 Projects involving Obvia: launch of the Global Coalition for Inclusive AI Governance; launch of the AI@Work_Lab Network with Inria, ILO and OECD; launch of the Coalition for Ecologically Sustainable AI; participation of Véronique Guèvremont (UNESCO Chair on the Diversity of Cultural Expressions) in the 18th session of the UNESCO Intergovernmental Committee of the 2005 Convention aimed at reflecting on the implementation of the Convention in the digital age; launch of the Social Justice and AI Chair with Sasha Luccioni, the new incumbent for 2025-26.

Law, Cyberjustice and Cybersecurity Hub

Under the responsibility of:
Vincent Gautrais, Anne-Sophie Hulin and Sébastien Gambs

Scientific news

A transformation of the law

In this fast-paced 21st century, marked by the widespread rise of digital technology, we are witnessing a profound change in the way the law is articulated and practiced. The era of the law's absolute authority appears to be over, giving way to a systematic shift from hard law to soft law. We **first** observe that, even when the law exists, it is less likely to prescribe; instead, it tends to suggest, recommend, and, above all, require documentation – without specifying how or to what extent. **Second**, the law is shifting toward placing greater value on technical efficiency in general and AI in particular. Having strayed from its traditional social function, the law now find itself in a complicit relationship with economic considerations alone. Its role of arbitrating between conflicting interests has been somewhat diluted by the increasing priority placed on development – a priority that is undoubtedly important, but not the only consideration! **Finally**, the law is questioning its own ability to withstand the test of time. How can we ensure that it is "future-proof"? The acceleration of time can also be seen in the way the law is articulated and practiced.

Between laxity...

A first illustration of this transformation is the moderate reliance on parliamentary work, avoiding the adoption of legislation. Instead, we observe a rising tendency to produce documents with multiple and poorly defined titles that betray a culpable laissez-faire approach. Guidance, guidelines, decrees, principles, policies – you name it! Dozens of terminologies, each as imprecise as the next, abound here and there. Halfway between law and ethics, reflections are certainly taking place, but without really prescribing anything. Advice is given; proposals are made; suggestions are offered. It is as if people are thinking while walking, too afraid to "build the plane while flying it." A sign of conceptual immaturity, the law appears only in a very watered-down form, as it must not be allowed to stand in the way of the highly revered notion of "innovation." This approach is fairly widespread in North America, where there is a tendency toward legislative restraint. Worse still, the new U.S. administration has recently voiced strong opposition to any regional or national legislation that might curb the hegemony of a handful of companies intent on ruling unchallenged, with complete disregard for existing rules of law (privacy, human rights, competition, consumer protection, etc.).

Compliance with the law is therefore often, and sometimes exclusively, a matter of implementing policies, measures, and procedures where efforts can be documented. The law is becoming individualized; it is what each actor decides to contribute to it.

... and delegation

A second source of development is to adopt laws, but to do by proposing constraint frameworks subject to delegation to the actors themselves. As in Europe, a propensity for legislative intervention is often considered in an attempt to control the harmonious development of new AI tools. The advent of the *European AI Act* in 2024 (European Parliament and Council of the European Union, 2024) is a significant turning point that cannot be ignored. That said, it is interesting to note that while the digitization of our activities is inevitably coming under stricter control, it is nevertheless taking place in a fairly new way. Admittedly, this Act does lay down requirements. Facial recognition, for example, is simply made impossible in certain contexts deemed too risky. But more often than not, the Act requires stakeholders to demonstrate due diligence.

The regulatory framework is being developed based on the text itself, but above all on the documents currently being prepared. For example, one of the current challenges companies are facing is precisely operationalizing ethical issues in AI systems, such as privacy, fairness, and explainability. In addition, high-risk AI systems will face the requirement to demonstrate to an external auditor that these issues have been addressed appropriately, without disclosing customer data or information considered to trade secrets, such as model training methods. Even within this more stringent framework, hard law has softened, shifting the normative center of gravity toward internal documentation that companies must produce. Compliance with the law is therefore often, and sometimes exclusively, a matter of implementing policies, measures, and procedures where efforts can be documented. The law is becoming individualized; it is what each actor decides to contribute to it.

Particularities of Quebec

And what about Quebec? Where do we stand? Honestly, despite repeated calls for more action and more intervention, few laws have been passed. Worse still, some recently adopted ethical frameworks are so "soft" that they have at times been interpreted as a refusal to address the issue from a legal standpoint. Of course, the U.S. laissez-faire approach is unthinkable here. It is fundamentally anachronistic, as the technology industry enjoys immunity from liability that is shocking considering that it applies in particular to companies with considerable resources. And as mentioned earlier, it is all the more shocking given that the new U.S. administration has recently exacerbated this tendency to let the industry regulate itself. On the other hand, it is difficult to develop a framework similar to that in Europe. State intervention operates differently there, and in North America, "democracy is more horizontal than republican democracy" (Rocher, 2010). For example, the *European AI Act* (European Parliament and Council of the European Union, 2024) comes with an institutional and administrative framework that is difficult to replicate in either a federal or provincial context. That said, we are seeing progress in the debate on ofther societal projects, such as the implementation of a provincial digital identity, as evidenced by recent expert hearings on *Bill 82* (2024).

One thing is certain: government action is needed.

Illustrations

One area in which strong legislative action has been undertaken is *Law 25* (2021), formerly *Bill 64*, which provides a fairly strict framework for the protection of personal information in Quebec. This framework is sometimes considered more stringent than the one in place in Europe (e.g., with regard to privacy impact assessments (PIAs) and anonymization). This text, which is heavily inspired by European legislation, is not without its critics, particularly with regard to SMEs, few of which are in compliance with the law. Nevertheless, it has the immense benefit of raising awareness within the industry about the issue of personal information, which cannot be handled carelessly, particularly with regard to AI, where several articles specifically address this issue (profiling, automated decision-making, etc.). This law has also had a positive effect beyond Quebec's borders. Some companies are implicitly taking these provisions into account throughout Canada, giving rise to a "Quebec effect," albeit one that is less pronounced than the "Brussels effect" (Bradford, 2020), which has already been quantified. Another example, although it is too early to say what the outcome will be, is the work currently being done by the *Select Committee on the Impact of Screens and Social Media on Young People's Health and Development*[3] at the Quebec National Assembly. This committee will have to determine how to address the harmful effects of screens on the cognitive development of our young people. Faced with this issue, should the government intervene? Should the industry be allowed to self-regulate? Or is a more middle-of-the-road approach, such as that taken by the UK's Information Commissioner's Office, more appropriate? One thing is certain: government action is needed.

3 For more information on this select committee, visit: https://www.assnat.qc.ca/en/travaux-parlementaires/commissions/csesj-43-1/index.html.

Scientific debates

Regulating novelty

As we mentioned earlier, the regulation of digital technologies has been advocated for several years now. It is worth assessing this persistent call for regulation from several perspectives and disciplines. **First**, a comparison is undoubtedly necessary, and it is important to take a closer look at what is being done elsewhere, while recognizing that the situation in the United States or Europe, two jurisdictions that are often referred to, is not the same as in Quebec.

Secondly, the legal purpose must be considered from a multidisciplinary perspective, as a legal perspective alone is insufficient. For example, with regard to AI, the "love/hate" relationship between law and ethics must be reconciled, especially given that this relationship may have deteriorated recently, with mutual ignorance all too often the norm. In much the same way, legal normativity rarely intersects with technical normativity. While the law conceptualizes technical matters rather clumsily, technical circles ignore the law, even within globally recognized bodies (such as ISO), where both the substance and development processes are questionable.

Thirdly, the dual delegation from legislation to technical standards, which themselves refer to internal documentation, needs to be better understood and assessed. While this approach may work under certain conditions for large companies, it is difficult to implement for smaller organizations. Regulation must therefore take these specific contingencies into account. This approach is obviously far from "neutral" and reflects a now widespread tendency for the state to shy away from action, instead delegating responsibility for establishing control rules to other actors, namely individuals and industry. In this context, where standards are undefined or vague, there emerges a risk of ethical whitewashing, whereby a company could "game the system" by selecting the fairness metric that best serves its interests or the form of explanation it wants its learning model to adhere to. In addition, the use of privacy-enhancing technologies is sometimes put forward as a justification for introducing new data collection practices or ethically questionable applications, thus creating a form of privacy whitewashing.

This call for participation is too often instrumentalized to, on the one hand, limit government action and, on the other, justify market-driven initiatives. Participation must therefore be genuine, diverse, organized, representative, and transparent – not a means of legitimizing actions

"Innovating" regulation

Once the question of "what" has been answered, the question of "**who**" must be addressed. Who should be involved in regulating AI? In the early days of the Internet in the 1990s, David Post (1995) identified this as the most important question. Here again, for many years now, the idea of "co-construction" has been in vogue and is seen as an essential step in the development of a new code, new guidelines, and new principles. This "participatory" momentum is also called for in numerous official documents such as international conventions, bilateral agreements, and laws. The term "stakeholder" is one of the buzzwords embodying this new approach to rule-making. Our intention is obviously not to question this, but rather to point out that this call for participation is too often instrumentalized to, on the one hand, limit government action and, on the other, justify market-driven initiatives. Participation must therefore be genuine, diverse, organized, representative, and transparent – not a means of legitimizing actions. This regulatory innovation has given rise to a proliferation of terminologies that warrant critical scrutiny. **Regulatory sandboxes** are a prime example of this trend, where neologisms are embraced as cure-alls for governing AI. While the recent 2024 *European AI Act* (European Parliament and Council of the European Union) is rightly seen as a relatively strict framework for the nascent industry, it too promotes the use of these "innovative" regulatory tools, despite the lack of data on their effectiveness and the organizational conditions necessary for their success. The same is true of terms such as "resilience" and "vigilance," which are becoming increasingly common in legislation and whose very etymology suggests an individual response, whereas these situations would be better addressed collectively.

Questions

1 AI values

In light of the dichotomy that we are fond of considering, the regulation of AI undoubtedly requires a threefold approach. **Firstly**, it is crucial to identify, critique, and, where necessary, correct the values inherent in the development of these tools, particularly in a context where data training is a continuous process of improvement that must be kept under control. These values can be found **first** within the technology itself, within the AI that we seek to create or exploit. Thus, on the basis of criteria developed over decades of case law, particularly by the Supreme Court of Canada, it is important to ensure that a balance is struck between protection and innovation, between fundamental rights and development. In other words, any potential infringements of fundamental freedoms must be socially justified. In digital spaces, as elsewhere, these trade-offs are necessary. There are many examples where a trade-off between competing values must be identified and proposed: can AI be used to prevent shoplifting (the Metro case recently addressed by Quebec's *Commission d'accès à l'information* (2025))? Can AI such as that used by Clearview (Office of the Privacy Commissioner of Canada, 2021) scrape data in all circumstances? Should a school board be required to implement documentation measures when using AI to detect school dropouts (Commission d'accès à l'information, 2022)? Looking at these few examples from case law, the answer certainly calls for prudence. **Next**, beyond this weighing of values, we believe it is important to recognize how this new form of delegated regulation, highly individualized in nature, is itself loaded. It results in a reduced role for third-party oversight, and this distinct "ternality" inherent to law is gradually withering away (Supiot, 2022). Innovation is too often used as a pretext for the emergence of values that encourage collective disengagement (Ménissier, 2021).

2 AI institutions

It is therefore logical to question, **secondly**, the role of institutions. **Firstly**, the role of the state is necessarily predominant, even if there is a noticeable trend toward disengagement. Of course, legislation is undoubtedly the most obvious manifestation of the state's involvement. Legislating means tackling the issue head-on. However, it is also essential that this intervention is not merely a "kicking the can down the road" exercise, i.e. a scenario where the law effectively formalizes its withdrawal. **Secondly**, the state's role is diversifying and, beyond enforcing the rules, particularly through the use of sanctions where necessary, it must play a normative **facilitation role** by fostering dialogue and identifying and promoting applicable texts and tools that can be used by stakeholders. To illustrate our point, *Law 25* (2021) refers to the frequent obligation to prepare PIAs. It also requires reference to best practices for anonymizing personal information. In both examples, industry actors are asking not only to be supported, but also to be guided toward "ways of doing things" that are deemed sufficient. Beyond the guidance that may be issued by certain regulatory bodies, action must be taken at all levels of normativity. **Again**, without claiming to be exhaustive, it seems clear that the industry has a say in the development of more practical standards. ISO, for example, is a long-standing institution whose usefulness has long been recognized, particularly in technical domains. But perhaps AI is not something that can be regulated like electrical wiring. There are situations concerning the former where the consequences of standards will interfere with the law. However, with due consideration, the processes for developing technical standards are hampered by problems such as opacity, lack of representativeness in consensus building, and paid access to standards.

3 AI normativities

The law has changed, as we noted at the outset. Indeed, it is difficult to return to a time when the law alone served to regulate actions. Given the complexity, evolving nature, technicality, and international character of the field, delegation to other levels of normativity is necessary. **Thirdly**, it is important to better conceptualize this systematic reliance of laws on informal norms, and of informal norms on individual norms. In fact, this conceptualization has yet to take hold within legal thinking; grounded in traditional concepts such as usage and custom, the law is ill-equipped to integrate this novelty. This conceptual adolescence is also reflected in the terminological vacuity surrounding these expressions that crop up here and there in legal texts, but the substance of which is poorly understood. Here again, the multidisciplinary nature of our hub, at the crossroads of technology, ethics and law, is the only remedy to better understand this "tomorrow already."

Industry 4.0, Work and Employment Hub

Under the responsibility of:
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Scientific news

Although the rapid evolution of digital technologies and artificial intelligence (AI) holds great transformative potential for workplaces, they tend to take hold rather timidly in Canadian workplaces. In September 2024, analysts at Statistics Canada (Bryan et al., 2024) reported that only 10% of Canadian companies intended to adopt AI within the coming year. Among the reasons given for not adopting it, 72% stated that AI was not relevant to their operations.

However, recent developments on the global economic stage have brought the adoption of new technologies and AI back to the forefront of competitiveness and productivity strategies, as evidenced by public funding measures, such as *the Mesures de soutien aux entreprises québécoises en réponse aux tarifs* announced by Investissement Québec.[4] Thus, whether through productivity gains or automation, AI and new technologies are set to play a key role in this transformation of work. Recent research, notably that conducted by Obvia in the Industry 4.0, Work and Employment Hub, provides essential insight into these transformations and the challenges that accompany them.

AI's effects on work: a gradual but profound transformation

As we know, contrary to certain preconceived ideas, AI is not yet immediately replacing workers, but gradually transforming tasks and work processes. Its deployment occurs in successive layers and affects sectors and professions in different ways. It should be remembered that, although some AI systems may improve productivity and reduce physical risks, their opacity and impact on workers' mental load remain a cause for concern, particularly through algorithmic management, which has the potential to increase surveillance, while reducing workers' autonomy, intensifying work and altering power relationships within organizations (Parent-Rocheleau et al., 2024a).

AI and digital technology regulation: a regulatory and ethical challenge

A balance between innovation and the protection of workers therefore appears all the more necessary. An approach combining legislative oversight and voluntary initiatives, depending on the intensity of automation and its effects, would help ensure responsible use of AI with a view to guaranteeing transparency, ethics and fairness in the workplace. These are some of the positions put forward by Obvia researchers in their brief submitted to the Minister of Labour in response to the consultation on the regulation of workplace transformations through digital technology (Lévesque et al., 2025).

In response to the current regulatory framework, which is struggling to keep pace with technological advances, experts stress the need for clear rules to ensure transparency and fairness in the use of AI in the workplace. Furthermore, the brief recommends the addition of regulatory measures with regard to data protection and surveillance, broader AI governance (including trade union parties via existing structures or those to be created), risk assessment (analysis tools to anticipate effects on employment and work quality) and strengthening negotiation obligations, emphasizing the need for worker protection to ensure AI integration that is both beneficial for organizations and socially responsible (Lévesque et al., 2025).

10%

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4 Mesures de soutien aux entreprises québécoises en réponse aux tarifs, consulted April11, 2025.

Scientific debates

To better understand the need for a regulatory framework, a retrospective look at the work published over the past year by researchers affiliated to the Hub provides us with a scientific and empirical insight into the effects of these technologies on work and employment. It also lays the groundwork for two crucial questions: Which type of work organization is best suited to produce desirable societal effects, and what are the necessary conditions for the implementation of responsible AI?

Work organization

The determination of how work is organized, along with strategic choices concerning the adoption of new technologies, fall within the scope of managerial rights. As such, these choices have a definite impact on the quality of work life and the work experience, and knowing the optimal forms of organization is essential to minimize the negative impacts of AI on work. By way of example, Dupuis and Massicotte (2024) paint a picture of worker participation in the aluminum and rubber manufacturing sector. Although these choices are shaped by market specificities and worker power, two models of work organization – *Empowered Digital Lean* and *Taylorized Digital Lean* – offer contrasting opportunities for participation. While acknowledging that these two practices are becoming more widespread, the authors show that their implementation in practice is marked by contradictions, and that the outcomes in terms of worker participation can be explained by their reliance on different sources of power, including the use of collective agreements.

In the education sector, Bérubé et al. (2023) studied digital innovation through a project involving the co-development of digital tools aimed at preventing work disability among special education students. Their action research highlights the benefits of these innovations, but also the barriers encountered, particularly in relation to the digital skills of teachers and students, workload and organizational support. They emphasize the importance of overcoming these challenges to foster digital innovation in the education sector.

Mosconi and Gagnon (2024), for their part, focused on the creation of teams specialized in artificial intelligence (AI) within companies. They propose a conceptual framework based on digital agility and qualitative comparative analysis to structure these teams, highlighting five key factors: expertise, experience, project complexity, project life cycle and project objective.

Human resources management (HRM) is therefore at the heart of work organization, and recent studies point to the rapid integration of AI into HRM, with all its benefits, but also its risks. Exploring the vast field in which AI and HRM research intersect, Malik et al. (2025) offer a mapping of these transformations, which are occurring at a faster pace than anyone could have imagined. Along similar lines, Bujold et al. (2024) provide an in-depth empirical analysis of responsible AI practices in HRM, emphasizing the need for a multidisciplinary approach to ensure ethical and effective implementation.

Algorithmic management (AM) thus becomes the objectification of AI in HRM. Following several research studies on the subject, Parent-Rocheleau et al (2024) developed a measurement tool to assess workers' exposure to algorithmic management. Drawing on surveys conducted among workers in the entertainment industry, their study reveals that exposure to AM is often perceived negatively due to its impact on autonomy and commitment at work. Results also converge when it comes to algorithmic management in platform work. In a study of Uber drivers, Jabagi et al (2024) find that algorithmic fairness plays a key role in workers' satisfaction and perceived organizational support, influencing their relationship with these platforms.

The transformations brought about by AI require organizations to explicitly define the objectives they are pursuing, the role assigned to AI, and the precise framework governing its integration into work processes. These are the recommendations of Registre and Saba (2024) who, by identifying three types of tasks subject to these transformations – mechanical, intellectual and emotional – stress the importance for human resources (HR) professionals of developing appropriate skills to manage AI responsibly. These professionals will need to acquire the knowledge, skills and abilities required to adapt to these new dynamics and ensure the ethical and responsible use of AI within organizations. Ethics also extends to metaverse data and their analysis. In this regard, as Marabelli and Lirio (2024) argue, these technologies enable more refined assessment of employee performance, going beyond traditional methods, but they also raise concerns related to surveillance and discrimination. Despite the challenges, their study highlights the opportunities that the metaverse presents for enhancing the employee experience in terms of equity, inclusivity, and diversity, particularly with regard to issues of gender and race.

Conditions for responsible AI

Understanding why, how, by whom and with whom AI is implemented in the workplace is the other key question in these debates. Several of the Hub's researchers have therefore focused on the conditions necessary to achieve responsible AI in the workplace. On the one hand, AI plays a critical role in the growth of start-ups, and AI is unquestionably transforming business models, providing potential for value enhancement, foreign market entry, customer loyalty and continuous business improvement (Tanev et al., 2024). As for sustainability objectives, Haidar and Balagué (2025) examined responsible digital innovation (RDI) as a crucial issue for companies wishing to reconcile it with technological innovation. By structuring RDI in five dimensions (responsible digital innovation strategy, responsible by design digital innovation, organizational challenges and key performance indicators, digital responsibility towards end users, and catalysts), the study provides guidance for transitioning from traditional innovation management to sustainable innovation, with a view to fostering social well-being.

The transformations brought about by AI require organizations to explicitly define the objectives they are pursuing, the role assigned to AI, and the precise framework governing its integration into work processes.

For their part, Braunschweig et al. (2024) emphasize the importance of trust as a fundamental principle in the design of artificial intelligence systems, particularly for critical systems (avionics, defense, health care, finance, infrastructures, etc.). Trustworthiness assessment must be integrated into every stage of the lifecycle of these systems, from design to maintenance. The study also highlights the contribution of social and human sciences to better managing the interaction between humans and AI, as well as incorporating ethical values into system design and evaluation.

The explicability of algorithms remains an unresolved issue. In this regard, Gagnon et al (2025) explored the concept of explainable AI (XAI) through a sense-making lens. By analyzing existing literature, they propose a framework that demonstrates that explicability should not be perceived as a mere outcome, but rather as a collaborative process between humans and machines. This framework aims to improve the transparency and efficiency of AI systems by emphasizing the importance of human-machine interactions in the co-construction of explanations.

With regard to soft skills, Psyché et al (2024) examined the development of AI project management skills and proposed a skills repository to guide training strategies to better meet market needs and promote collaborative learning.

Lastly, in a publication intended for the Quebec public, the book *Le management à l'ère du numérique* (Parent-Rocheleau et al., 2024b), to which several of the Hub's researchers contributed, raises a number of burning questions regarding the conditions necessary for responsible AI. These include the need for awareness of EDI issues and the risks associated with the development of discriminatory AI (Cachat-Rosset, 2024), the appropriation of the issue as a subject of collective bargaining and as a check on managerial rights by union actors (Garneau, 2024) and, finally, the integration of these transformations into the renewal of union practices (Pasquier, 2024).

Questions

Researchers in the Industry 4.0, Work and Employment Hub favour a diversity of research designs and conceptual frameworks grounded in contextualized and comparative studies to identify conditions and practices related to AI that are likely to foster an improvement rather than a deterioration in work, particularly with regard to socio-economic risks, autonomy and expressiveness, including the possibility for workers to mobilize their skills and intervene in decision-making processes.

Their work aims to **understand the growing gap** between the promises of AI – namely, to improve work by eliminating tedious and repetitive tasks and boosting productivity – and its actual impact in the world of work, which can manifest itself in a deterioration of work (intensification, control, stress, loss of autonomy).

- Given sectoral and institutional logics, research reveals a significant gap between workers' experiences of their workspaces and the actual impact of AI on work quality.
- How can research account for and bridge this gap?
- Is it a gap between the generally positive discourse surrounding the implementation of AI and the concrete difficulties stakeholders face in dealing with the complexity of work processes?

In this respect, this discourse often extols a human-centered approach. Yet workers are rarely consulted, and their experiential knowledge is not valued either in the design or implementation of AI in the workplace. There is a growing divide between the ways in which knowledge is extracted and valorized – particularly between the technocratic knowledge favoured by AI developers and the experiential knowledge of those in the world of work. Our research seeks not only to understand this discrepancy, but also to reconcile these two ways of learning.

Is this a mismatch between the rapid evolution of AI technologies and the capacity of actors and institutions to regulate this evolution? It is therefore becoming urgent to reflect on the conditions likely to bridge this gap and strengthen the individual but, more importantly, collective capacities of employees to shape the deployment of AI. In line with the proposals made by Obvia researchers to the Minister of Labour in response to the consultation on regulating workplace transformations through digital technology, the work of the Industry 4.0, Work and Employment Hub aims to fill this regulatory gap.

Workers are rarely consulted, and their experiential knowledge is not valued either in the design or implementation of AI in the workplace.

Ethics, Governance and Democracy Hub

Under the responsibility of:
Allison Marchildon, Bryn Williams-Jones and Aliya Affdal

Artificial intelligence (AI) is becoming increasingly important in fields such as healthcare. Its applications – both upstream (e.g., data analysis and synthesis) and downstream (e.g., decision support) – range from clinical care to public health, biomedical research and health systems management. By taking part in clinical decision-making, monitoring patients and managing their health data, AI integration promises more accurate (e.g., precision medicine), efficient (e.g., replacing limited human resources) and accessible care worldwide (e.g., telemedicine in remote areas), transforming healthcare systems and promoting equity (WHO, 2021). However, as we shall see, this development raises major ethical issues in the design of AI-based tools, such as those related to the biases and inequities they engender, but also in implementation, with issues of personal data protection and respect for privacy, among others. We also raise concerns about the normative ethical frameworks proposed to frame the use of AI, but which do not always prove to be adapted to the specific needs and issues of the healthcare field. We will conclude by pointing to some challenges in the governance of AI in healthcare to address potential ethical risks.

Scientific news

Bias and inequity

AI-based tools are expanding rapidly and increasingly guiding healthcare decisions. They can save time, but if they are biased, they run the risk of amplifying **existing inequalities** linked to ethnicity, gender or socio-economic status, among others.

Biases can come from the types of data used or from biases in the algorithms themselves. In the first case, they concern the data sets used to train the algorithms. For example, lack of training with data from marginalized populations (e.g., members of racialized communities, people living with disabilities) would lead to the reproduction of **structural biases** embedded in medical practices and perpetuate invisible systemic discrimination. In the second case, algorithms could privilege certain variables more than others (e.g., being male vs female), and for example induce false results (e.g., ignoring the specificity of women's health). Thus, the design of AI systems that rely on learning data that are incomplete, biased or inherited from historical dynamics of prejudice could restrict access to quality care for various groups, including those who are already marginalized (Iloanusi, 2024; Lansiaux, 2025). In particular, research has shown that the **potential impacts of biased technologies** in oncology could lead to misdiagnosis and limit equity of care for cancer patients, thereby exacerbating health disparities between different populations (Hoffman & Podgurski, 2019; Istasy et al., 2022).

Another bias-related issue is that of "AI hallucinations," which are characterized by the production of incorrect or nonsensical data and can lead to an inability to distinguish accurate from erroneous information generated by AI tools (Brender, 2023). In the context of reproductive health, for example, such erroneous information could encourage intentional targeted misinformation to discourage access to abortion services and thus lead to inequitable access to health services (WHO, 2024). In other cases, it could call into question the place of clinical or ethical judgment. Imagine a clinical ethics committee in the healthcare sector working with an AI-based decision support tool. We might question the level of **reliability of its decisions and recommendations**, even if this machine were trained on the basis of moral theories such as utilitarianism or classical bioethical principles such as autonomy, beneficence, non-maleficence and justice (Beauchamp & Childress, 2009), since an over-rigid application of such principles may not be appropriate when faced with the complexity of real-world contexts. This situation also calls into question the **responsibility** of the clinician or ethicist in relation to the decisions made, in particular in the case of a problematic decision resulting from an error in the algorithm. It also reinforces the importance of ensuring that humans are always involved in decision-making: can they trust the recommendations produced, and if these turn out to be wrong, who is ethically (and legally) responsible for the error, the person or the machine?

For AI-based tools to improve patient health, reduce disparities in access to care, contribute to a more efficient and equitable healthcare system, and improve patient and public confidence in these systems and the services provided (Ueda et al., 2024), it is vital to take ethical issues into account right from the design stage of an AI-based tool, and to do so by considering the various possible biases and highlighting potential consequences such as diagnostic errors or unequal access to treatment.

Data protection and privacy

As the percentage of public funding allocated to healthcare continues to rise, governments are increasingly interested in deploying systems that can improve efficiency and reduce costs. AI, which is seen as one of the possible solutions, is already widely used in healthcare provision, notably through healthcare providers.

Yet one of the potential problems with AI tools in healthcare relates to the marketing that can be done with the data collected. For example, using the data available through medical transcription or consultation platform tools, the doctor's clinical judgment can be influenced, such as recommending a type of medication to be prescribed. This situation points to how clinical data could be sold and cross-referenced with pharmaceutical marketing databases, which constitutes a serious breach of **patient confidentiality**.

These practices may call into question the clinician's ability to exercise independent judgment. They also expose patients to the risk of their data being exploited without their consent, since it subtly modifies their care in a way that may be sub-optimal at best. Yet this data is also sensitive, and doctors and patients are not always aware of this type of data collected, how long it is kept or even its commercial purpose (Wetzels et al., 2018). Thus, although these AI-based tools can facilitate the work of healthcare professionals and improve the provision of care, they raise issues relating to the control of patient data and confidentiality. Moreover, clinicians have a **professional and ethical obligation** to protect patient confidentiality, which can be undermined by these systems. It is therefore necessary to strike a balance, when implementing these tools, between on the one hand protecting personal data and recognizing essential professional obligations, and on the other, promoting the benefits of their use for people's health (e.g., reducing administrative responsibilities to free up time for patient care).

Although these AI-based tools can facilitate the work of healthcare professionals and improve the provision of care, they raise issues relating to the control of patient data and confidentiality

To avoid the risk of abuse, **transparency and consent** are essential. This implies that patients – and healthcare professionals, who are key partners in decision-making – are fully informed of the purposes for which their personal health data will be used, and that they are able to consent (or not). But consent is not enough to protect patients and clinicians. It is also necessary to improve and strengthen **ethical governance** and **regulatory oversight** to ensure that AI systems deployed in the healthcare network actively promote the health of individuals and populations, but not at the expense of individual rights or professional responsibilities.

Scientific debates

The challenge of ethical frameworks

To avoid this type of problem, the previous decade saw the development and rapid deployment of numerous high-level ethical principles to both frame the ethical issues of AI and guide regulatory frameworks and practices of AI development and implementation in a range of contexts. In the more specific context of healthcare, bioethicists (e.g., academics, professionals, national ethics committees) have thus set out to provide **analytical tools** to healthcare professionals and policymakers (CCNE, 2022; CEST, 2023; NCB, 2018), while healthcare systems are increasingly regulating AI implementation.

Several countries have thus implemented measures to regulate AI in healthcare. In Great Britain, for example, the Department of Health and Social Care (DHSC), in collaboration with the National Health Service (NHS), has developed principles to govern the use of data that could be used for health innovation. For example, under the principle of transparency, any commercial agreement – connected to AI in health or to health innovation – must be transparent, clearly communicated and not undermine public trust (DHSC, 2019). The aim is to provide tools to guide the decision to accept or reject commercial agreements in order to protect patient data while promoting the beneficial effects of such agreements. In France, the goal has been to encourage access to health data and promote its use in research by establishing the Health Data Hub **platform, specifying that any use of AI should comply** with the FAIR (*Findability, Accessibility, Interoperability and Reusability*) criteria.

However, as some researchers have shown (Goldberg & Zins, 2021), the application of major ethical principles in the use of these AI systems is not without difficulty, which is all the more the case considering the complexity of healthcare situations.

Thus, the challenge for these frameworks based on general ethical principles is to make them **operational** in order to respond realistically and effectively to the concrete ethical issues posed by the use of AI in healthcare, from the design of AI systems through to their implementation. Some researchers even go so far as to question the use of these "classic" ethical principles, which are not all suited to certain contexts and realities in which AI systems are deployed in healthcare. For example, recourse to the principle of autonomy – a key principle in bioethics – is questioned, as it might fail to consider the wider range of AI-related harms rooted in the legacy of colonization that affect people who are already marginalized and vulnerable. Instead, these researchers suggest drawing on theories of relational autonomy from feminist moral philosophy and Ubuntu ethics (Mhlambi & Tiribelli, 2023). From another perspective, Sofi et al (2025) also invite us to revisit our understanding of what characterizes patient autonomy, situating it within the new dynamics imposed by AI and highlighting what this implies for presumed consent and decision-making.

In addition, ethical principles and frameworks would not be sufficient without the deployment of training courses for stakeholders likely to be confronted with AI-related ethical issues, such as healthcare professionals, researchers from different disciplines involved in healthcare AI projects, and bioethics professors and students (Aucouturier & Grinbaum, 2025). The aim is therefore to **generate robust and contextual empirical information** on the implementation of AI in healthcare, in order to facilitate the subsequent deployment of ethical tools (e.g., for decision-making or public policymaking) that are well-suited and relevant to the real-world issues raised by AI, in various healthcare contexts.

Ethical principles and frameworks would not be sufficient without the deployment of training courses for stakeholders likely to be confronted with AI-related ethical issues, such as healthcare professionals, researchers from different disciplines involved in healthcare AI projects, and bioethics professors and students (Aucouturier & Grinbaum, 2025).

Ethical governance of AI in healthcare

Policymakers and regulators play a crucial role in the ethical governance of AI in healthcare by establishing guidelines, standards and regulations to govern its development and deployment. But as we have seen, the challenge of governing AI through ethical principles and frameworks is a difficult one, as the consequences – i.e., the risks and benefits of its use – vary according to the evolution of the technology and the social, cultural and political context in which it is deployed (WHO, 2021). It is therefore necessary to avoid overly rigid approaches and instead favour **collaborative governance** that enables benefits to be considered and risks to be mitigated, notably through strategic monitoring of ethical issues and an international and multistakeholder cooperative approach to AI policies (Rajpurkar et al., 2022).

Furthermore, good ethical governance of AI in healthcare means not seeing AI as a magic solution that can solve complex problems with simple solutions. In fact, many healthcare issues are social, relational and organizational. For example, rather than deploying a *Chatbot* to improve the patient-doctor relationship (Kanter & Packel, 2023), a more effective measure might be to reimburse doctors for longer consultations, enabling them to spend more time with their patients. Indeed, an AI-based digital tool would run the risk of masking structural problems by directing resources towards tools that are ill-suited to the context and fail to meet real needs. Clinical judgment involves taking into account a multitude of values and contextual elements that AI tools are unable to grasp.

Good ethical governance of AI in healthcare means not seeing AI as a magic solution that can solve complex problems with simple solutions.

Finally, **ethical governance of AI in healthcare** must take into consideration that one of the main risks in the deployment of AI in healthcare is the potential loss of trust, both on the part of patients and healthcare professionals (Quinn et al., 2021). Indeed, AI systems are often opaque: they produce results without anyone being able to understand how these were obtained. This lack of clarity and transparency – the explainability or "black box" problem – is likely to reinforce distrust of AI in healthcare, as professionals are reluctant to trust a technology they can neither question nor explain to their patients (Sahoo et al., 2025). The challenge for AI in healthcare is therefore to implement AI governance that will take seriously the vital importance of the trust relationship between professionals and patients. To do this, it is not enough to declare that we want to deploy "responsible AI" or "trusted AI". Instead, we need to adopt a governance approach capable of highlighting all the ethical issues that AI raises in all the particular situations in which it will be mobilized, and responding to them with all the complexity that this requires, and involving all the players concerned, starting with healthcare professionals and patients.

Questions

The potential of AI to improve the health of individuals and populations, while reducing costs for governments faced with ever-increasing healthcare expenditure, has sparked enormous interest in AI systems. These benefits are increasingly well documented. But they also come with a host of ethical challenges – upstream in the way AI systems are developed and downstream in the way they are deployed – that need to be addressed by bioethicists and healthcare regulators. If countries are to reap the rewards of AI innovations for their healthcare systems, these must be developed and implemented in an ethically and legally responsible manner, so as to maintain the trust of healthcare professionals and the public alike.

In this regard, it is essential that the research community addresses (or continues to address) the following questions:

1. How can policymakers and regulators minimize the risks of AI in healthcare, so as to maximize its benefits for society?
2. How can we ensure that healthcare AI systems undergo a robust risk analysis, and then are adjusted to mitigate any such risks?
3. What ethical principles and safeguards need to be put in place to govern AI in healthcare environments?
4. How can we ensure that these ethical principles are operationalized for AI in healthcare
5. Is this kind of operationalization of ethical principles enough to ensure responsible AI in healthcare?
6. How can we better involve patients and healthcare professionals in ethical discussions about the relevance and acceptability of AI systems that will directly affect care delivery and clinical practice?

Arts, Media and Cultural Diversity Hub

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Scientific news

The interaction between AI and the creator is a research subject in its own right.

Culture

On the calendar of major AI events, the start of 2025 was marked by the Artificial Intelligence Action Summit held in Paris on February 10 and 11 (Piquard, 2025). This second global summit on AI devoted *some* attention to culture, a first for an international event of this scale. In a panel discussion entitled "Creating a virtuous circle between AI, information & creation," participants discussed a range of topics, including the development of large language models and linguistic issues, but the heart of the debate was copyright protection. Underlying the discussions were concerns about the future of human creativity.

While the use of AI for creative purposes is not completely unprecedented – consider, for example, the work of Harold Cohen and his robot AARON in the 1970s (Grba, 2024) – the debates around this topic have recently gained in intensity, not least because of the democratization of AI systems and their rapid expansion within the cultural and creative industries (CCI). "Artists are not afraid of AI!" declared filmmaker Nabil Ayouch during the Paris Summit. Many creators are indeed experimenting with this technology to understand how it works, following the example of hub member François Giard, who directed the film "La première image du monde"[5] this year.

But while creators, in the exercise of their artistic freedom, may choose to explore or use AI, or conversely to ignore it, it must be acknowledged that AI cannot do without creators (López-Forniés & Asion-Suñer, 2024).

The interaction between AI and the creator is a research subject in its own right. While a variety of terms are used to describe this dynamic, such as "artificial creativity" (Runco, 2023) or co-creativity (Wingtröm et al., 2024),[6] authors and scientists seem to agree on one thing: humans must remain at the heart of creation, while AI should be no more than a tool at the service of the creator (CNC, 2024). For only humans are a source of originality; AI possesses no creative autonomy, and machines are incapable of inferring subjectivity and assigning meaning to the creations they generate (Flogliano & Leote, 2023). Artistic creative consciousness remains a unique feature of the human being: its existence is rooted in the creator's feelings, experiences and way of thinking. And while some AIs appear to be endowed with autonomy and capacity, the lack of consciousness suggests that they are bound to stagnate, as they are devoid of the ability to generate originality on their own (Fogliano & Leote, 2023; Yang, 2025). AI is therefore totally inseparable from humans, from their creative hand (Wingström et al, 2024), yet it holds the potential for a creative renaissance. AI paves the way for the emergence of new forms of cultural expression and, consequently, diversity.

5 This film is currently being distributed worldwide at various film festivals and has won numerous awards.
6 These notions were developed in the 2024 Status Report.

Among the other issues raised in the literature on the use of generative AI in CCIs, the question of bias also occupies a prominent place. Beyond the impacts in terms of discrimination and the perpetuation of prejudice, biases are also likely to have negative effects on the diversity of cultural expressions. This risk stems in part from the characteristics of the available content ingested by AI systems, marked by a predominance of Anglo-Saxon content (CNC, 2024). The use of this content to produce new content leads to a form of homogenization of cultural expressions. Many researchers are working on reducing bias in the various artificial intelligence models (Essonne, 2025), and it will be important to monitor these developments in order to assess the extent to which any positive spin-offs could benefit the CCI sector.

Media

One of the major challenges in research is understanding how AI is used in journalism in relation to the context, particularly the nature of the media system. Up until now, studies on the use of AI by journalists have been heavily focused on the West, due to the history of the development and use of AI. But as Wu (2024) points out, it is necessary to include the context under study (or that of AI use) in order to better understand the implementation, effects, and impacts of these systems.

Recent scientific literature reveals these gaps in the use of AI in different media, technological, economic and social contexts. India is a case in point. As Das and Upadhyay (2024) point out, the specificity of AI development in the Indian media is that it coincided with a later digitization of the print media than in the West, thus significantly disrupting the work of journalists. As a result, the profession is undergoing an even greater transformation, with journalists being required to work with a vast array of new tools. It is also affecting working relationships, with a sharp increase in workloads and the need for collaboration with AI engineers. From the public's perspective, this massive digitization increases the digital divide, with rural and disadvantaged populations having limited access to new technologies. We can also cite the case of Brazil, where the development of LLMs since 2023 raises serious questions about the independence and sovereignty of Brazilian media, rendered dependent on AI systems developed in the United States (Pinto & Barbosa, 2024).

From the public's perspective, this massive digitization increases the digital divide, with rural and disadvantaged populations having limited access to new technologies.

The year 2024 has also seen a major research focus on the limitations of LLMs, which are detrimental to the quality of the content produced. First of all, LLMs produce numerous biases. For example, Fang et al (2024) have shown that the major publicly available LLMs systematically exhibit biased representations of socially marginalized groups, and may even engage in violent or hate speech (Cheng, 2025). These biases stem from LLM being trained on initially biased data (Loru et al., 2025; Morehouse et al., 2025; Röttger et al., 2025). LLMs then reproduce biases, but unlike human journalists, they have a very limited capacity for error correction and adaptation (Loru et al., 2025). In addition, the issue of hallucinations – factual errors, yet credible to an uninformed public – can also pose problems in terms of content quality (Sun et al., 2024a). When the LLM cannot find an answer to a question, it tends to fabricate a credible answer (Cheng, 2025; Sun et al., 2024a), despite the existence of *prompting* techniques to minimize these hallucinations (Cheng, 2025). Finally, the last two issues with LLMs relate to their obedience to the expectations of commercial enterprises, prioritizing user experience over the quest for truth that is fundamental to journalism, as well as the delay in news implementation, which lags six months behind current events (Cheng, 2025). Despite the existence of significant means of improving LLMs to meet the high standards of journalists (Cheng, 2025), the massive use of these systems is increasingly raising concerns. These limitations of certain AI systems used in journalism thus bring up the issue of public receptiveness to the use of AI in journalism, and the public's trust in the media.

Scientific debates

Culture

The rise of artificial intelligence in the field of CCI raises multiple ethical and legal concerns. While concerns are diverse, the transparency of training models (Bensamoun, 2024) is currently attracting particular attention. AI systems based on deep learning use content derived from human creativity, which is usually protected by copyright. However, the major companies developing these systems operate in total opacity, often disclosing no information about the works used to train their models. This modus operandi calls into question the scope of copyright and related rights protection offered by national regimes and poses a threat to the economic and social rights of artists and other creators of cultural expressions.

The use of AI is also affecting the CCI job market. The impact is such that no creative profession appears to be spared (CNC 2024). For example, some data on the music sector suggests that AI may be responsible for income losses of up to 27% for creators in this sector (Kulesz, 2024), and up to 21% for the audiovisual sector (CISAC, 2024). These issues must be taken into account in the development of public policies on AI, as state support may prove necessary to support artists and cultural professionals affected by these upheavals in CCIs.

More generally, we must question whether emerging initiatives and ethical and legal frameworks are capable of taking into account the specific nature of CCIs, as well as the vulnerability of artists and cultural professionals, in the face of the disruptive effects of AI on a sector that has long been weakened by the digital revolution. One of the aims of the February 2025 Paris AI Action Summit was to initiate discussions on "an international AI governance structure [...] that combines the many challenges linked to this technology" (Élysée, 2025). But the *Statement on Inclusive and Sustainable Artificial Intelligence for People and the Planet* (Élysée, 2025) adopted at the end of this meeting does not even identify respect for intellectual property rights as one of the five priorities of the signatory states. So far, the European Union has set a good example, having adopted an AI law that came into force on August 1, 2024, which imposes an obligation of transparency and requires AI providers to comply with European copyright legislation (art. 53.1.c). However, it remains silent on other cultural issues specific to CCIs. In comparison, Canada's Artificial Intelligence and Data Bill (Bill C-27) – which will not move forward due to the federal election call in spring 2025 – proved more disappointing, as it did not require AI providers to comply with Canadian copyright law, prompting criticism from several cultural organizations (ACTRA, 2023; CDCE, 2024).

These shortcomings call for reflection on UNESCO's potential role in encouraging states to adopt standards to regulate the use of AI in the field of CCIs, particularly with a view to protecting and promoting the diversity of cultural expressions and the status of artists. The Reflection group on the diversity of cultural expressions in the digital environment, whose work took place over the course of 2024, submitted eleven recommendations to the 18th session of the Intergovernmental Committee for the Protection and Promotion of the Diversity of Cultural Expressions in February 2025, which could lead the Parties to take action in this direction (UNESCO, 2024). These recommendations will be discussed again at the Conference of the Parties in June 2025. This meeting will, however, take place against a backdrop of uncertainty, with the United States advocating widespread deregulation and the rise of a free market virtually devoid of any form of state intervention (Kilpatrick, 2025). The evolution of this movement and its effects on initiatives to protect the diversity of cultural expression in the age of AI will need to be closely monitored.

AI may be responsible for income losses for creators of:

27%
in the music sector

21%
in the audiovisual sector

Media

Public trust in media institutions is a major issue, and this was the case even before the development of AI systems in newsrooms. According to Sinclair (2025), public trust in the media depends on three main factors: the credibility of the media outlet, its objectivity and its accuracy. These three aspects are likely to be affected by the development of AI in journalism, and initiate numerous theoretical debates (Morosoli et al., 2025), as well as numerous studies on the subject (Sinclair, 2025).

On the one hand, some researchers see AI as an opportunity to increase public trust in the media. Robertson and Ridge-Newman (2022) see automated fact-checking, known and understood by the public, as a model of objectivity and procedural impartiality enabling journalism to regain users' trust. This idea is echoed by Sophia Cheng, who believes that, if used appropriately, AI can help reduce the erosion of public trust in the media by raising standards of honesty, accuracy and transparency, particularly through the personalization of models (2025). For others, this means developing tools designed to identify and reduce journalistic bias, such as the "Media Bias Detector" (Wang et al., 2025).

However, some studies suggest that the public shows a certain reluctance to the use of AI in journalism, particularly for dealing with "complex" topics. While the public generally accepts the use of AI to cover sports, fashion, stock market prices or the weather (Fletcher & Nielsen, 2024; Sinclair, 2025), it seems much more reticent and skeptical about its use to report on more complex topics such as international affairs, politics or investigative journalism (Fletcher and Nielsen, 2024; Sinclair, 2025; Sun et al., 2024b). The public perceives AI as lacking substance and empathy, preventing it from addressing issues related to human rights, social justice or politics (Sinclair, 2025). Fletcher and Nielsen (2024) note that young people are significantly more favourable to the use of AI in journalism across all topics, which they attribute to their greater knowledge of AI. However, according to an opinion survey on public rejection of AI carried out by Morosoli et al. (2025), the level of knowledge does not appear to have any influence on trust in AI, nor on the credibility of AI when used in journalism. And distrust of AI leads to acts of "resistance" (refusal to use it) on the part of the public. Finally, the many biases and hallucinations of AI limit its interest for fact-checking (Dierickx et al., 2024; Loru et al., 2025). The issue of the effect on public trust of the use of AI in journalism therefore remains highly debated, with the public remaining very reticent about the use of AI in certain areas.

[...] public trust in the media depends on three main factors: the credibility of the media outlet, its objectivity and its accuracy.

Questions

Culture

1. How does AI influence artistic creation, as well as the perception of authenticity of the works it generates?
2. What are the effects of AI on the CCI job market, as well as on the income of artists and cultural professionals?
3. How can the impact of AI – and in particular generative AI – on the diversity of cultural expressions be measured? How can its effects on the linguistic diversity of cultural content be assessed?
4. Does AI contribute to a democratization of access to culture and the arts, or does it reinforce existing inequalities? What are the effects of AI on the digital and creative divides already perceived in CCIs?
5. Beyond CCIs, how is AI changing practices in other cultural sectors? When it comes to heritage, what are the emerging practices in the use of AI for the protection of cultural property, or for the conservation and restoration ofworks of art?

Media

1. After the initial hype and fears of replacement related to LLMs, what role will these tools play in the routine practices of journalism and in specialized practices such as fact-checking?
2. Does Gartner's hype cycle (Floridi, 2024; LaGrandeur, 2024; Ananny & Karr, 2025) apply to the adoption of artificial intelligence systems by the media?
3. How can transparency be ensured for AI systems used in the news media?
4. Considering that artificial intelligence holds a significant place in the media landscape, how can the media address AI-related issues in a way that promotes informed public debate?
5. How can a more effective scientific approach to artificial intelligence applied to journalism be ensured, taking into account media, social, economic, political and cultural contexts?

Education and Empowerment Hub

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Scientific news

Adoption of AI: Where do education stakeholders stand when it comes to AI?

Adoption by teaching staff

Rapid advances in artificial intelligence (AI) and digital technologies are transforming teaching practices at all educational levels. In research by Lee et al. (2024) and Tashtoush et al. (2024), teaching staff generally perceive AI systems as a potential ally for improving their teaching methods and administrative management. The integration of AI technologies raises fundamental questions about the role of teachers, the skills to be developed and the recommended uses for teaching and learning with these new technologies. The adoption of AI in education is therefore not without its challenges, and it raises questions about a number of aspects:

1. **Lack of concrete training:** A majority of teaching staff feel insufficiently prepared to exploit the full potential of these systems. In this context, teachers feel powerless and express the need for concrete training focused on integrating AI into their daily teaching practices (Bower et al., 2024).

2. **Update of teaching practices:** The emergence of generative AI (AIgen), such as ChatGPT or Bard, has profoundly disrupted traditional assessment methods. Teachers are calling for time to rethink their assessment practices, so as to preserve academic integrity while also harnessing the potential offered by these new AI technologies (Lee et al., 2024).

3. **Limited resources:** Budgetary and organizational constraints often hinder the effective integration of these systems by teaching staff (Bérubé et al., 2023).

Adoption by learners

Recent research also highlights the growing and diverse adoption of AIgen systems by learners, particularly in higher education, where these technologies are massively used to support their studies (Stöhr et al., 2024; Johnston et al., 2024). These systems enable them to expedite certain tasks, such as writing or information retrieval (Valeri et al., 2025). However, here too, several challenges emerge:

1. **Lack of a pedagogical model in AIgen systems:** "Generalist" AI models such as ChatGPT are not specifically designed to meet the educational needs of learners, which can hinder their learning and reinforce certain cognitive biases (Bastani et al., 2024).

2. **Excessive dependence:** Intensive use of these tools can lead to a form of dependence among learners. Learners express concerns about algorithmic bias, risk of discrimination and loss of autonomy in the learning process (Johnston et al., 2024).

Emergence of EdGPTs, a new form of GPT fine-tuned for the field of education

To provide more tailored and ethical learning, developers and researchers working in the field of AI in education have used so-called "generalist" AIgen models as a foundation for developing more specialized or domain-specific models (UNESCO, 2024). Some members of the scientific community have proposed renaming these generalist models as "foundation models" (Bommasani et al., 2021) to distinguish them from fine-tuned models, which they refer to as "EdGPT" (UNESCO, 2024). EdGPT models are trained on smaller amounts of high-quality, domain-specific educational data. A notable example of EdGPT is Khanmigo, developed by Khan Academy to: (1) support students in their learning; and (2) assist teachers in their professional tasks. The Canadian organization Contact Nord (2025a; 2025b) has taken the same direction for its two EdGPT models – *AI Tutor Pro* and *AI Teaching Assistant* Pro – also designed for learners and teachers. These AIgen based tutors are also deployed on supports, extended realities (Sarshartehrani et al., 2024), enabling the creation of inferences to explore learning content in a concrete way (Radif et al., 2024). They also enable the acquisition of specific actions remotely using immersive systems (Reyes-Consuelo et al., 2024).

Ethical issues related to the use of AI in education

Ethical issues related to the use of AI in education include the protection of personal data, biases and stereotypes, territorial divides, algorithmic discrimination, the use of emotion recognition systems, the lack of explicability of AI systems and respect for the autonomy of learners. To address these issues, education experts recommend the active involvement of education stakeholders (school staff, school principals, school administrators, parents, learners) in the creation of clear ethical guidelines (Psyché et al., 2024; Collin & Hennetier, 2024). Initiatives to develop a thorough understanding of the ethical and pedagogical implications need to be implemented to ensure responsible adoption (Singh, 2025).

AI and digital empowerment in the workplace

In a context of accelerated transformation of the workplace, empowering individuals with AI and digital skills represents a fundamental challenge for organizations (Khamis, 2024). This technological evolution is redefining not only the skills expected, but also learning modalities and approaches to professional development.

AI and digital technology are profoundly transforming learning modalities in the workplace, generating both opportunities and challenges for organizations (World Economic Forum, 2024; Babashahi et al., 2024; Li & Yeo, 2024). These technologies offer the potential for personalizing learning paths, while supporting the overall development of individuals and organizational structures (Bayly-Castaneda et al., 2024). They thus fit into a logic of lifelong learning (Stanistreet, 2024; Ahn, 2024).

At the heart of this transformation, informal learning plays a key role in establishing a link between the perception of the opportunities offered by these technologies and employee well-being (Xu et al., 2023). Indeed, by disrupting jobs and organizational processes, AI and digital technology require continuous learning and a capacity for innovation to ensure successful integration into professional environments (Li & Yeo, 2024). Moreover, these technologies can enhance individuals' agentivity by providing them with work-regulation resources that allow them to influence their environment. These resources are essential for both trainers and learners, facilitating real-time adaptation to the changing needs of individuals and organizations (Dutta & Poyil, 2023; Marr, 2024).

In a context of accelerated transformation of the workplace, empowering individuals with AI and digital skills represents a fundamental challenge for organizations.

This reality manifests itself concretely in current practices, as highlighted in the report "AI at Work Is Here. Now Comes the Hard Part" (Microsoft and LinkedIn, 2024). The adoption of AI by staff often occurs discreetly, with 78% of employees introducing their own AI systems at work, a trend even more pronounced in small or medium-sized enterprises (80%). However, this practice is accompanied by significant concerns: 52% of employees are reluctant to acknowledge their use of AI to perform essential tasks, while 53% fear it could make them replaceable. Conversely, this practice could reflect new opportunities for employees to regulate their work activity in such a way as to preserve their health and cope with the ever-increasing demands of organizations in a neoliberal system centered on the hegemony of performance.

At the same time, executives have significantly stepped up recruitment of technical AI talent, with a 323% increase in hires over the past eight years (Microsoft & LinkedIn, 2024). They are now also interested in non-technical profiles capable of effectively using AIgen systems such as ChatGPT and Copilot. In this context, advanced AI users generally benefit from ongoing training, covering both universal tasks and uses tailored to their role. The aim of this training is to optimize the benefits of these technologies while limiting the risks associated with unregulated adoption.

Despite these advances, several challenges remain when it comes to empowering individuals with AI and digital technology skills in the workplace. These challenges include training in ever-changing environments, ethical integration from a human and socio-technical perspective, developing the skills of learning professionals, as well as assessing the real impact of these technologies (Dalat, 2023; Suntharalingam, 2024; Park, 2024). A particularly worrisome challenge is the potential impact of AIgen on the professional skills and critical thinking of individuals in the workplace (Lee et al., 2024).

Beyond these immediate concerns, the development of digital sobriety is becoming a central priority in AI empowerment, particularly regarding the use of large language models (LLMs) and their environmental implications (Luccioni et al., 2024). The sub-optimal use of these models generates excessive and often unjustified energy consumption. To better prepare the workforce for the potential benefits and challenges of AI and digital technology, it therefore seems essential that training programs go beyond simply raising awareness, and become part of a structured and thoughtful professional development pathway.

Finally, another important aspect to consider in this empowerment process is the impact of IAgen on the existing digital divide. Intra-regional disparities particularly affect less technologically advanced areas, reducing professional opportunities for people living in or originating from these areas (OECD, 2024). These inequalities have a more severe impact on aging and/or marginalized populations, who are generally slower to adapt to new technologies (Guner & Acarturk, 2020).

This reality highlights the need for an inclusive and equitable approach to AI and digital empowerment in the workplace, to ensure that the benefits of these technologies are accessible to everyone, regardless of age, background or geographical context. Thus, the challenge of AI and digital empowerment in the workplace is not just about acquiring technical skills: it also involves taking into account ethical, environmental and social considerations, which must be consistently integrated into any professional development strategy.

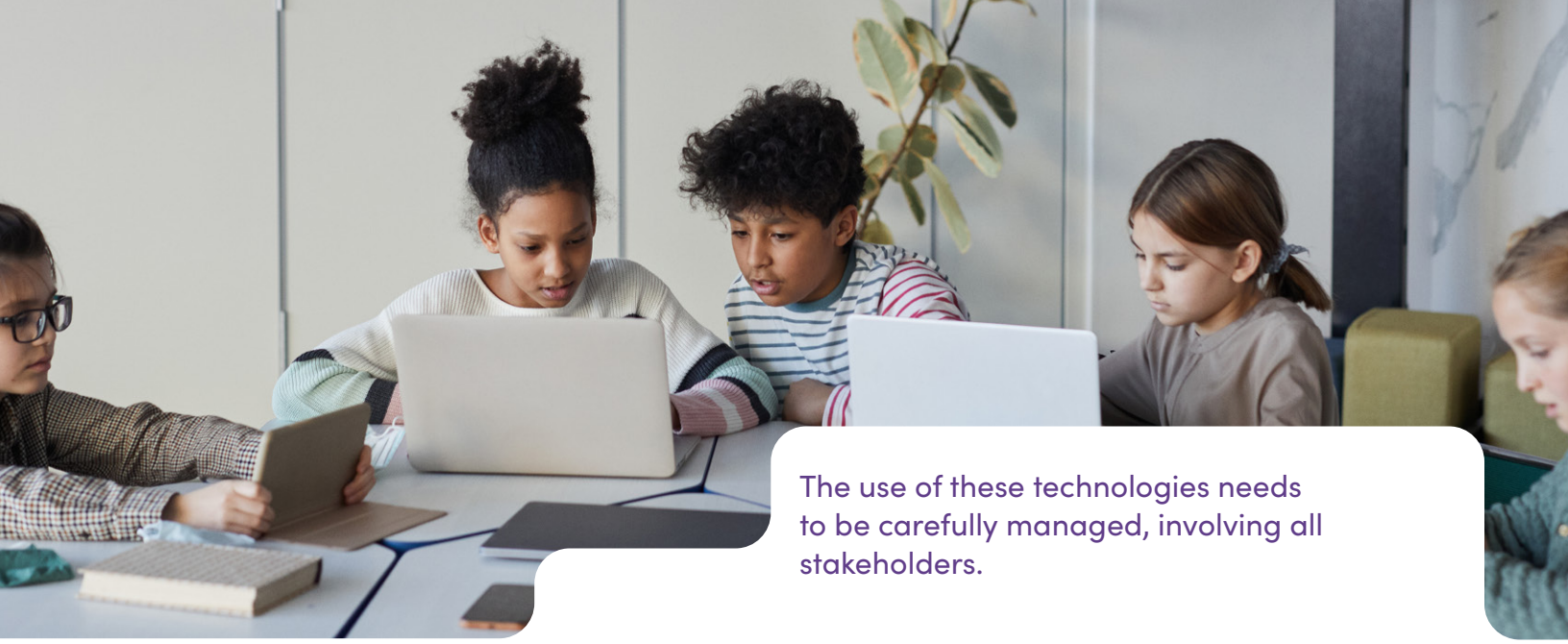
Scientific debates

The impact of screens and social networks on young people: harmful overexposure or opportunity for inclusion?

While the harmful effects of excessive screen exposure are recognized and well documented (Muppala et al., 2023; Panjeti-Madan & Ranganathan, 2023), the scientific community remains divided on the best solutions. Several countries and regions are responding to this public health issue, either by banning cell phones in schools, as in Quebec (Government of Quebec, 2023), urging parents to significantly limit their children's screen time, as in France (Government of France, 2024), or setting a minimum age for the use of social networks, as in Australia (Ritchie, 2024). Research has yet to identify the most effective means of preventing excessive exposure to screens and social networks. Some suggest, from an empowering perspective, directly involving children by setting clear limits on usage time and modeling good parental practices for managing screen time at home (Muppala et al., 2023; Panjeti-Madan & Ranganathan, 2023). Others rely instead on a more structuring approach that calls for the deployment of formal programs involving the school, parents and child (Vilardell-Dávila et al., 2023).

On June 6, 2024, the National Assembly adopted a motion creating a *Select Committee on the Impact of Screens and Social Media on Young People's Health and Development* (Assemblée nationale du Québec, n.d.). This committee is examining a number of issues, including screen time, screen time control measures at school and on the Web, access to digital learning tools, access to social networks via video games, cyberbullying, access by minors to online pornography, mechanisms used by certain applications to create addiction, and advertising targeting children on platforms and applications.

That said, while excessive exposure to screens is often associated with negative effects on young people's health and development, it is essential to recognize that, for many children facing challenges with social integration and participation, digital technologies can offer significant opportunities for inclusion and development.



The use of these technologies needs to be carefully managed, involving all stakeholders.

Digital devices can serve as a means for these young people to establish social connections that they might find difficult to make in traditional contexts. Far from being solely problematic, digital tools can also provide avenues for educational inclusion, not only for these young people, but also for those with linguistic or cultural difficulties or juggling atypical family situations as well.

In any case, the use of these technologies needs to be carefully managed, involving all stakeholders. It is crucial that parents, educators and health professionals work together to select appropriate content and establish suitable screen time limits, ensuring that the use of technologies is beneficial and does not replace the in-person interactions essential to development. For decision-makers, it is recommended to promote a critical and balanced approach that recognizes both the risks of overexposure to screens and the benefits these tools can offer to young people with specific needs. This could include more funding for research on this topic, to identify best practice in the use of technologies in a variety of educational contexts, as well as the development of guidelines for the healthy and productive integration of digital tools including screens into young people's lives.

Training learners in AI: between an instructive and a profession-oriented vision

In the face of the democratization and subsequent proliferation of AI systems, training learners in AI literacy seems to be a priority, but stakeholders appear divided over which pedagogical approach to adopt.

On the one hand, some members of the scientific community adhere more to an "instructive" vision of AIgen education, advocating the development of high-level skills such as critical thinking, collaboration and creativity (Bower et al., 2024). Through the development of such skills, many argue that human beings will not only be better equipped to deal with the potential excesses of AI and digital technology, but will also be able to distinguish themselves from them by valuing "collective intelligence" over "artificial intelligence." On the other hand, other voices favour instead a "profession-oriented" vision of AI and digital technology education, adapting school curricula to better prepare young people for a labour market undergoing profound transformation since the advent of these technologies (Walter, 2024; Ma et al., 2024).

However, in both cases, questions remain about the effects of such practices on the development of learners' skills. For example, in the case of computer science students, is there a risk that their programming skills will atrophy or be lost as a result of using IAgen to assist them with coding? If so, what might the long-term consequences be? More research in this area seems necessary.

The same applies to the use of AI and digital technology by learners in assessment contexts. Research suggests the need to go beyond traditional assessment methods in order to preserve academic integrity (Akintande, 2024), although challenges remain as to how to guarantee this integrity (Audran, 2024). To overcome these challenges, clear assessment policies on acceptable (and unacceptable) uses of AI and digital technology are essential (Audran, 2024).

Questions

1 The emergence of synthetic individuals or digital twins

The advent of synthetic individuals raises profound ethical questions in education. Also known as a digital twin, "digital double" or "AI clone," this concept refers to a virtual representation of an individual, like a twin of their own self (digital twin), capable of participating in meetings, online interactions or generating reports, opinions and views that can influence decision-making on their behalf (Yang et al., 2025). Zoom CEO Eric Yuan has suggested that this could help optimize time and resource management (Patel, 2024).

Symbiotic cyber-physical systems, which combine physical and digital elements and enable real-time interaction between the two worlds, have been discussed for many years (McIntire Boyd, 1993; Fortinet, n.d.). However, AI developments over the coming years could make these interactions even more sophisticated by allowing, among other things, digital twins to adapt their responses, simulate more natural human behaviours, and even learn from past interactions.

However, the use of digital twins raises both pedagogical and ethical questions.

- How does their integration transform interactions in classrooms and online platforms?
- What are the issues regarding what is actually learned (or declarative knowledge), compared to social skills (or procedural knowledge)? (Omrany et al., 2025)
- Can we think of new rights for these digital twins, considering that they represent learners or teachers who actively participate in discussions? What are the responsibilities of these dual entities?
- How can we ensure that these technologies complement the educational experience without replacing direct human interaction, which is fundamental to students' social and emotional development?
- What safeguards need to be put in place to protect confidentiality, data hosting and data security?

These questions highlight the importance of authentic interactions in ensuring responsible and beneficial use of these innovations.

2 Ethics: user responsibility in the face of AI and digital technology

When it comes to the ethics of artificial intelligence, we find a strong focus in the field of education on one particular approach: that of the ethical design of AI systems. While this angle is essential, it leaves in the shadows another equally crucial dimension, that of the ethics of the people who use these technologies (Amah & Okesipe, 2025). AI ethics is not limited to the responsibility of designers: it must also include reflection on the ethical stance of users (Fernholz et al., 2024). In order to better grasp the issues surrounding user ethics in relation to AI and digital technology, several questions need to be asked:

- What are the responsibilities of users of these technologies when it comes to making decisions for others (education, justice, employment, health, etc.)?
- How can we guarantee fair, non-discriminatory use of AI by individuals and organizations?
- How can we train users to recognize certain algorithmic biases and to think critically about the recommendations suggested by AI and digital technology?
- How can we prevent over-reliance on AI in decision-making and maintain individuals' capacity for judgment?
- How can we make users aware of the environmental implications of using technology?

All these questions advocate for the adoption of a framework for training and raising awareness among users, so that they can adopt an ethical and responsible stance towards AI and digital technology, rather than relying on the design teams to ensure the intended use of a technology.

3 Conceptual variability of AI and digital technology

There is also great variability between the concepts on the basis of which a person understands a digital phenomenon involving AI (Löhr, 2023). These concepts oscillate between verified facts and, in some cases, misinformation (Saeidnia et al., 2025). Yet all these elements are treated the same way in the digital space, making knowledge approximate and sometimes biased (Peterson, 2025).

- What are these concepts? What do they mean? What happens to our relationship with knowledge?
- How can we ensure that information systems process and present facts in a way that takes into account their degree of veracity and reliability?
- In what ways do digital tools influence decision-making in educational institutions, both in terms of teaching and learning at all levels, whether in workplace training, lifelong learning, corporate settings, public administration, or other institutional contexts?

Sustainable Health Hub

Under the responsibility of:
Marie-Pierre Gagnon and Martin Cousineau

In collaboration with:
Marianne Ozkan and Émilie Dionne

Health care, with its wealth and plurality of data, is a field particularly well-suited to artificial intelligence (AI) techniques. The promises of optimized and more accessible health care provide an especially fertile ground for the proliferation of AI tools. The adoption of AI in health care still faces certain obstacles, such as a lack of staff training and difficulties related to data access or system interoperability (Hughes, 2023). Nevertheless, the overall perception of AI is positive among health professionals (Bresge, 2024; OECD, 2024). Several professional bodies converge on the idea that artificial intelligence is an essential tool for medical practice, one even going so far as to judge that it would be "unethical to do without the help of these tools" (OECD, 2024; Académie nationale de médecine, 2024; Collège des médecins du Québec, 2024).

Scientific news

To illustrate recent advances in AI in health care, we have identified four achievements or projects in various health care sectors.

1 Clinical study

A large-scale clinical study of AI-based imaging tools for breast cancer detection has been launched in the UK (UK Government, 2025). The study involves 700,000 women and aims to assess the effectiveness of these tools in reducing mortality and optimizing the imaging analysis process (UK Government, 2025). **Medical imaging remains a key area for the application of artificial intelligence in health care**. Radiology remains predominant among AI tools approved by the Food and Drug Administration (FDA) in the United States (FDA, 2024; Mesko, 2024).

2 Virtual assistants

In general, the adoption of AI has seen a spectacular surge since the advent of generative AI, particularly large language models (LLMs) (World Health Organization, 2024a; Singla, 2024). In the field of health care, the potential applications of generative AI are diverse and can take the form of virtual assistants. These include training for professionals, medical outreach to patients and mental health support. To improve access to medical information, the World Health Organization (WHO) has launched its own virtual assistant, SARAH (World Health Organization, 2024b). **SARAH provides medical information; however, the WHO warns, the tool can provide erroneous information** (World Health Organization, 2024b). This soon became apparent, as probabilistic models such as SARAH proved to be prone to "hallucinations" (Heaven, 2024). Optimization techniques can be used to reduce hallucinations. For instance, the GPT-4 Medprompt model optimizes model performance, achieving an unsurpassed score of 90.2% on a test of 60,000 medical questions based on the MedQA repository (Maslej et al., 2024).

3 Fundamental research

A third major achievement is the development of AlphaFold 3. This open access AI model is capable of predicting, with unprecedented accuracy, not only the structure of proteins, but also that of DNA, RNA and ligands (molecules) (Abramson et al., 2024). This model helps reveal fine molecular interactions, opening up promising avenues in drug development and genomics research (Google DeepMind, 2024). The two researchers behind the development of AlphaFold 3 were awarded the Nobel Prize in Chemistry in 2024 (Heikkilä, 2024).

4 Scribes

Finally, the last achievement we highlight concerns health administration. **Within health facilities, the level of AI adoption is most pronounced in health administration**, as tools in this sector require less data and are easier to integrate into the existing technological ecosystem (Medscape, 2024). The adoption in Quebec of AI-assisted clinical note-writing tools such as CoeurWay and PlumeIA exemplifies the potential for rapid gains offered by AI (Gaior, 2025; CoeurWay, 2024; PlumeIA, 2024). These "scribes" aim to reduce the administrative tasks of health professionals, leaving more time for direct interaction with patients.

Economic and regulatory models

Beyond its impact on care, AI is shaking up established economic and regulatory models in the health sector. Personalized medicine is a good example. Relying on predictive models and the analysis of massive biomedical data (e.g., real-time data collection from sensors and genetic, demographic or lifestyle data), personalized medicine aims to fine-tune medical risk stratification and develop personalized treatments (Li et al., 2024). "Digital twins," personalized computational models that simulate a patient's response to a given treatment, are a good example of personalized medicine (Ringeval et al., 2025). **The impact of personalized medicine is felt at both regulatory and economic levels.** Whereas the evaluation of a treatment's efficacy and its cost-benefit analysis are traditionally based on large-scale clinical trials, personalized medicine assessment methods must take into account small populations, or even individual patients (Burrows et Li, 2025).

Risk management

AI in health care is also shaking up risk management models. As AI systems deliver new capabilities, risk assessment and mitigation methods need to adapt. Collaborative multi-agent AI systems, for example, require consideration of the interactions between the agents themselves, and as such may create complex new risks or exacerbate risks such as cyber-attacks or privacy breaches (Acharya et al., 2025; Murray, 2024; Bengio 2024).

Although a precise definition has yet to be firmly established within the scientific community, **agentic AI can be described by its ability to autonomously solve complex problems in a dynamic environment using a variety of resources** (Acharya et al., 2025; Heikkilä, 2024). Table 1 summarizes the differences between traditional AI and agentic AI. Agentic AI is capable of autonomously breaking down complex problems into steps ("chain of thought"), drawing on a variety of data sources (e.g. electronic patient records, laboratory results or medical guidelines) and activating other agents to perform specialized tasks, such as medical imaging analysis (Qiu, 2024; Zou, 2025). The complex journey of a cancer patient through several departments (oncology, radiology, surgery) serves as a compelling use case to illustrate the potential of this technology to optimize clinical decisions based on multiple data sources (Sheeran et Kass-Hout, 2024).

Given the evolving capabilities of AI and its increasingly widespread implementation in the health sector, where data is particularly sensitive and the potential for harm high**, calls for the prudent use of AI and for research into the risks of AI are being heard** (Bengio et al., 2025; Académie nationale de médecine, 2024; Collège des médecins du Québec, 2024).

Table 1: Features of traditional AI and agentic AI (from Acharya et al., 2025)

Feature	Traditional IA	Agentic IA
Autonomy	Limited, often requires human supervision	High, can operate independently over time
Goal complexity	Single or limited goals	Multiple, complex and dynamic goals
Environmental adaptability	Low, suited for static environments	High, designed for dynamic environments
Decision-making	Rule-based, predefined actions	Contextual, autonomous reasoning
Learning approach	Mainly supervised or rule-based learning	Reinforcement and self-supervised learning

Scientific debates

In the debates that dominate both public and scientific spaces and discourse, we find what could be called **ongoing debates**, as well as **new debates** related to emerging technologies, in a context of creative velocity, such as generative AI. Debates on conversational agents, which we discuss below, fall into the latter category.

Media and public coverage:

- The impact of artificial intelligence and emerging digital technologies on the **delivery of services, the work of professionals** (including work overload; the continuous adoption of new technologies, requiring constant adaptations; and digital literacy including security and safe behaviour when handling sensitive data) (Lyubareva et al., 2021; Dupré & Soubiale, 2023; Bastanes, 2024; World Health Organization, 2024a; Alexandre 2024);
- **The protection and confidentiality** of citizens, the data collected and their private life; the risks of data leakage (Brotcorne & Valenduc, 2009; Casilli, 2016; World Health Organization, 2024a);
- **The digital divide**, i.e. the reproduction and reinforcement of health and access inequalities, in data, both at national and international level (Brotcorne & Valenduc, 2009; Vidal, 2013);
- **The fulfilled and unfulfilled promises of AI**, for example precision medicine and early diagnosis.

Transversal to these debates are specific technologies and advances, and the debates and questions they raise (and even impose). **The electronic medical record** continues to feed and fuel the debate, raising considerations as to its implementation, adoption by professionals, platform usability (including the possibility of inter-professional and even inter-sectoral collaboration; inclusion of patients and their relatives; interoperability), the protection of individuals (privacy, data protection; confidentiality; uses).

Conversational agents

We should also mention the increasing use of new conversational agents (ChatGPT, Gemini, Copilot, Deepseek), which last year drew numerous and significant warnings from industry "giants" (Bengio et al., 2025). Their introduction into our lives, however, has spread at lightning speed, and these new tools are already part of our daily lives, becoming "must-haves" in many areas of human activity. In the health care context, for example, conversational agents are already widely used both by professionals (diagnostic assistance; communication with patients) and by people seeking care (self-diagnosis; self-treatment).

These concerns arise in a context where the vast majority of new AI and digital technologies come from the private sector. Increased use of these technologies in both professional and personal practices is therefore likely to create situations of dependence, and consequently vulnerability, toward technologies that belong to third parties, both private and commercial, but which are becoming essential to practices and care

Tools such as **smart, connected objects** also raise concerns, questions and debates. According to some, they may also reinforce and exacerbate the **digital divide** and health inequities, for instance the issue of access, in a context where (1) in Quebec alone, still nearly 25% of the population does not have a family doctor (Plé et al., 2024). For these individuals, the increased use of connected objects means that they could benefit from superior preventive care compared to the rest of the population (early detection). Then (2), connected objects raise debates about the **accuracy of measurements and indicators**, how reliable they are, and how they should be used by citizens and professionals alike (Alexandre, 2024).

Low digital literacy, particularly in terms of measurement accuracy, could lead to errors in suggestion, processing and behaviour (e.g., healthy lifestyle habits adopted by users who place too much trust in the accuracy of their "data"). Finally, connected objects also raise concerns about data "dissemination" (sharing, leaks, re-identification): where is this data stored and how is its security ensured in a context where attacks are becoming increasingly diverse and sophisticated, putting all security systems to the test? As the literature on AI ethics and responsible AI attests, there is no such thing as "zero risk." These concerns arise in a context where the vast majority of new AI and digital technologies come from the private sector. Increased use of these technologies in both professional and personal practices is therefore likely to create situations of dependence, and consequently vulnerability, toward technologies that belong to third parties, both private and commercial, but which are becoming essential to practices and care.

The impending debate on digital literacy and AI therefore remains critical – all the more so in the context of the rapid pace of AI developments. Professionals and citizens alike are far from having the knowledge or expertise required to fully understand all the risks, consequences and dangers – often real and already present – of these new technologies, but they use them nonetheless.

Massive investment in digital solutions by the health sector is also opening up important debates about the **place granted to the private sector** in these developments and investments (Who manages this data? Where is it stored? With whom is it shared?). These investments are also increasingly prompting stakeholders to advocate digital sobriety, i.e., "prudent and modest use of technologies with the aim of reducing their environmental impact" (Is this the right solution? Is this a reasonable, ethical, democratic investment?) (Office québécois de la langue française, 2022; International Observatory on the Societal Impacts of AI and Digital Technologies, 2024).

Questions

Major questions remain, and new ones are also emerging in digital health:

1. How are digital and AI innovations being integrated into care practices, prevention, services and organizations (Yousefi & Gagnon, 2024; Bardhan et al., 2025)? More specifically, **which innovations should be prioritized, and for which medical or health issues**?

2. What role should digital innovation play in disease prevention?

3. What are the impacts and considerations (and of what kind) for health professionals and workers who are required to use these technologies and innovations, particularly on their working conditions, their fields of expertise, their workload and their interprofessional relationships and relationships with their patients?

The velocity of digital and AI innovation also brings increasingly powerful intelligent technologies into our lives, usually propelled by "giants" from the private, tech industry sectors. As a result, **the public sector (e.g. health, education) and the civil community have, strictly speaking, no say whatsoever** in innovation, investment or what will populate their world and everyday lives. Innovations such as conversational agents are now part of our daily lives across a wide range of sectors, and are shaping usage patterns and behaviours. However, we remain in the dark about the diversity of consequences and impacts, both positive and negative, that will arise from the use of these new tools.

Thus, with these and many other innovations, the questions that remain and dominate are those relating to regulation, data protection and the protection of citizens' rights. This is all the more true in a context where citizens and health professionals alike are being propelled into using new technologies and tools, while digital skills and knowledge of what we might call "digital hygiene" remain weak, limited, or even, at times, entirely non-existent.

Consequently, the regulatory route appears unavoidable to ensure the protection of individuals and civil society as a whole. And when it comes to digital literacy and AI, concerns about the risks of reproducing or creating new social biases, the invisibility of certain socially, culturally and historically under-represented individuals and communities, and, consequently, the production or reinforcement of health inequities remain dominant issues for many authorities and stakeholders.

Digital Sobriety and Socio-Ecological Transition Hub

Under the responsibility of:
Christophe Abrassart and Stéphane Roche

The contribution of the Digital Sobriety and Socio-Ecological Transition Hub to this new *Status Report* on digital technology and the environment begins with an update of current knowledge on the environmental footprint of digital technology. This is based in particular on the study by the French Agency for Ecological Transition (ADEME, 2025), which relies on a global life cycle approach, and reports from the International Energy Agency (IEA, 2024; 2025), which present projections for global data center energy demand in light of the strong growth in AI usage. Secondly, we present and discuss an emerging issue, one that has received very little attention and yet is essential to the ecological transition of digital technology. What we propose to call "eco-numerical literacy" describes the minimum skills that citizens need to acquire in order to understand the environmental dimension of digital technology.

Scientific news

Digital technology's environmental footprint: towards an ecologically unsustainable trajectory?

In the 2024 Status Report, we drew on the first major study on the environmental footprint of digital technology uses, carried out in 2022 by the French Agency for Ecological Transition, in collaboration with ARCEP (ADEME-Arcep, 2022). Despite its depth and highly innovative nature, this study did not consider the environmental footprint associated with the use, by French residents, of data centers located abroad, particularly for cloud data storage and artificial intelligence applications. An update of this study was published in early 2025 (ADEME, 2025), based on 2022 data, confirming the significant environmental footprint of a digital technology-user country like France or Quebec (where much of the equipment is imported and not all data storage services are hosted locally). This update relies on a global mapping of data centers, their energy consumption, the energy mix of each country and associated environmental emissions. It also takes into account the growing trend toward large OLED TV screens, the manufacture of which has a significant environmental impact, as well as the arrival on the market of virtual reality headsets.

The results are measured across eleven environmental indicators (including climate change and the depletion of abiotic resources, such as minerals and metals) over the entire geographic life cycle. In summary, the carbon footprint for one year's consumption of digital goods and services in France in 2022 represented the equivalent of **4.4% of the country's carbon footprint**, or 29.5 Mt CO_2 eq, and 14.3% of the country's electricity consumption, corresponding to **434 kg CO_2 eq per inhabitant per year** (ADEME 2025, table. 9, p. 17). The breakdown of impacts within the system shows that **devices account for 50**% of the digital sector's carbon footprint**, data centers 46**% and **networks 4**%. Over the geographic life cycle, the equipment manufacturing and use phases respectively account for 60% and 40% of the carbon footprint.

Breakdown of the digital carbon footprint:

50%
for devices

46%
for data centers

4%
for networks

Putting it into perspective

1 This annual carbon budget of **434 kg CO_2 eq per inhabitant per year** for digital technology is likely to increase further by 2030 with the rise of generative AI. This is a significant and worrying figure when viewed in the perspective of a target budget (to avoid global warming in excess of 2 degrees) of less than 2 tonnes of CO_2 eq per inhabitant per year in 2050 worldwide (covering food, clothing, transport, housing, health care, education, adaptation, leisure, etc.).

Further analysis is awaited: the rise of **generative AI** in the world between 2022 and 2025 has not been taken into account in this update. Yet it is likely to lead to a significant increase in the environmental impact of digital technology. In two recent studies, the International Energy Agency (IEA, 2024, 2025) anticipates that global electricity demand for data centers will double between 2022 and 2026, reaching 800 TWh per year in 2026 (or four times more than Quebec's annual electricity consumption) and 945 TWh in 2030, despite efforts to improve the energy efficiency of these facilities. In a country like Ireland, data centers could account for a third of electricity demand by 2026. These reports cite the rise of generative AI and cryptocurrencies as the main drivers. However, these estimates are hampered by the lack of data disclosure from companies developing generative AI.

2 This trend illustrates both the importance and the limitations of eco-design initiatives for data centers. They are important, insofar as gains in energy efficiency must be sought whenever possible, even if they lead to rebound effects. But they **fall short from the standpoint of "digital sobriety,"** as they do not question the relevance of the uses of generative AI or cryptocurrencies.

From an intergenerational equity perspective, the current production of servers dedicated to AI generation of attention-grabbing entertainment images on smartphones with programmed obsolescence contributes to the depletion of natural resources and GHG emissions. This, in turn, will make it more difficult for future generations to manufacture essential digital equipment (e.g. medical equipment) and to live in a temperate climate.

Further investigation could focus on the environmental impact of networks, particularly at a time when low Earth orbit satellite constellations (between 500 and 2,000 km altitude) are expanding exponentially, against a backdrop of global geopolitical tension. A recent investigation by *Le Monde* (Fattori et al., 2025) reported that, at a rate of 15 to 60 satellites per rocket, SpaceX has managed to launch 7,100 Starlink satellites into orbit, out of a planned constellation of 12,000. China, for its part, is planning a constellation that could eventually include 14,000 low Earth orbit satellites. For reasons of strategic independence, Europe is also planning its own network of satellite constellations, with the IRIS² program.

3 In addition to their energy consumption and GHG emissions (from launch and ground operations), all these satellite projects, whether for civil or military use, raise a major environmental issue: space debris. Given the risk of collision, this issue could eventually render certain orbits unusable by future generations. On this subject, the *Kessler syndrome*, formulated in 1978 by Donald J. Kessler, a NASA consultant, describes a scenario of collisions cascading at an exponential rate to the point of making it impossible to use certain orbits without a high probability of collision (cf. Wikipedia, n.d.).

Scientific debate

The emergence of a new concept: "eco-digital literacy"

In this second part, we propose to explore an issue that has received very little attention and yet is essential to the ecological transition of digital technology, which we propose to call **"eco-digital literacy"**: what are the minimum competencies that citizens need to acquire regarding the environmental dimension of digital technology and AI, and why? What does it mean to be an "informed user," endowed with a minimum of autonomy and sufficient critical judgment without having to be an expert, and capable of individual or collective initiatives on socially innovative digital sobriety?

Eco-digital literacy is presented as a **"crossroads concept,"** situated at the intersection of digital literacy, environmental literacies and futures literacy. **Digital literacy** can be defined as "the knowledge and skills that enable a person to use, understand, assess, engage and create in a digital context and, more generally, to participate in society" (Government of Quebec, 2019). However, digital literacy can lead to abundant digital use without consideration for environmental impacts. It must therefore be associated with **environmental literacy**, which can be described as the ability to understand and critically evaluate the complex interaction between human activities, ecological systems and climate. We can also draw on **futures literacy**, insofar as the continuous evolution of digital technology is constantly generating new ethical, environmental and societal challenges.

Futures literacy, as presented by UNESCO, is a critical and collective skill that enables us to better imagine desirable futures in an uncertain world: it "helps people understand why and how we use the future to prepare, plan, and interact with the complexity and novelty of our societies" (UNESCO, 2023).

Eco-digital literacy definition

We propose to describe **eco-digital literacy** as the ability to understand and anticipate the environmental and social challenges of digital technology, from a perspective of energy efficiency and environmental sobriety, in order to individually and collectively invent desirable forms of digital life that are socially just and compatible with planetary boundaries, while ensuring intergenerational equity.

Eco-digital literacy **adds a new dimension to the debate on the links between digital technology and the environment**, by providing an original framework. First rather than entrusting this issue to experts who will intervene to **offer eco-responsible solutions,** it complements this approach by considering **the skills of digital technology users.** In the face of the increasing environmental impact of digital technology, one approach is to develop guidelines for the eco-design of digital services (Arcep, 2024), or the eco-design of frugal AI (AFNOR 2024), or even eco-labels to guide users toward the most energy-efficient or least impactful digital equipment or AI systems for a given use. However, these approaches overlook the creativity of users and the need to train them to be more autonomous and capable of taking initiatives in the digital society: are all uses of digital technology and AI relevant? How can we repair and extend the lifespan of our devices? How can we adopt intelligent low-tech practices at home or within our organization that offer alternatives to the most impacting and non-essential digital solutions?

A number of online **calculators** enable the general public to simulate the CO_2 footprint of their digital activities (ImpactCO_2, 2025) or the impact of using an LLM (EcoLogits-GenAI Impact, 2025). However, while these knowledge tools are indeed necessary, they are not sufficient for envisioning an eco-responsible or sober digital life. For this second level, a number of **guides** have been developed over the past few years (e.g. ADEME, 2024), **providing a narrative of digital sobriety in everyday life**. These narratives can also be engaged and creative (De Certeau, 1990). For example, an essay by researcher Léa Mosseso (2022) recounts experiences of living with an obsolete smartphone. Taking part in a **collective workshop** also enables valuable exchanges between participants.

Eco-digital literacy:

- adds a new dimension to the debate on the links between digital technology and the environment;
- makes it possible to better link the environmental and social challenges of digital technology;
- enables us to reflect on the capacity for initiative at both individual and collective levels.

Examples include "repair cafés" for domestic digital or electrical appliances (Repair Cafés Montréal, 2025), courses offered by Insertech (2025), and the **Fresque du numérique** (2025), where participants discover the environmental challenges posed by digital technology through a convivial workshop. In Quebec, over 2,000 people have taken part in dozens of Fresque du numérique workshops since 2022.

Eco-digital literacy also makes it possible to **better link the environmental and social challenges of digital technology**, which are usually considered separately. This connection becomes apparent when the working conditions in the highly polluting activities of the supply chain are documented, particularly mineral extraction and purification, and assembly in equipment manufacturing plants. The digital sobriety approach also redefines and broadens the ways in which environmental and social issues are linked: phenomena such as attention capture and the overexposure of young people to screens are part of a new vulnerability that calls for both care and ecological sobriety (reducing the number and size of screens, which have a high environmental impact during manufacture and lead to energy-intensive use).

Finally, eco-digital literacy enables us to **reflect on the capacity for initiative at both individual and collective levels.** Ecological gesture guides often focus on individual action. But as sociologists specializing in responsible consumption point out (Dubuisson-Quellier & Martin, 2019), this leads to a risk of over-responsibilizing individuals. What is often overlooked is the collective rules and infrastructures that make individual initiatives possible or difficult. For example, if an employer promotes the systematic use of generative AI, how can an employee who uses more sober tools, yet who is just as effective in his or her professional practice, be recognized? Or if a public administration recommends the use of new digital equipment, how can one advocate the renovation of refurbished equipment? In France, the "Les interconnectés" network (2025), for instance, supports local collective initiatives on sober and responsible digital technologies, with the aim of bringing about change in action frameworks. The AltImpact (2025) guide for employees offers ways of transforming organizational practices.

Questions

How can the deployment of eco-digital literacy be measured?

In Quebec, a number of periodic surveys deal in part with eco-digital literacy. These surveys could be refined and systematized.

On the topic of eco-digital literacy, the barometer of **the Académie de la transformation numérique (2025)** looks at digital usage in Quebec households. The 2024 edition of the periodic NETendances study on the **digital portrait of Quebec households** takes a detailed look at the environmental issues surrounding the purchase, replacement and repair of digital devices. This survey provides some very interesting highlights on eco-responsible digital actions, the evolution of which could be tracked on an annual basis: one user in four considers repairing an electronic device that no longer meets his or her needs; nearly three out of four Internet users (75%) prefer to buy their smartphones, computers and tablets new rather than second-hand (and between 14% and 11% prefer refurbished devices); the average replacement cycle for smartphones is 4 years and 1 month, and only 38% of users wait until their phone is no longer functional before replacing it; 58% of Internet users give a second life to their still-functional electronic devices (donation, sale…) and 54% bring their non-functional electronic devices to a dedicated drop-off location; 44% of 18-34 year-olds would like to try the experience of spending a week without access to technology.

Quebec's Act to protect consumers from planned obsolescence and to promote the durability, repairability and maintenance of goods, or **"Law 29,"** was passed in 2023. Under the legislation, consumers in the province will find it easier to have their electronic products repaired, as merchants and manufacturers are now required to provide replacement parts and repair services at a reasonable price and for a prescribed period after purchase. With this in mind, the consumer protection organization **Protégez-vous** (2024) has developed an interactive map of repairers in Quebec (with nearly 800 listed). Another initiative, the **Insertech** electronics repair organization **(2023),** has published a practical guide to extending the life of a computer.

On the link between energy-climate literacy and digital literacy, the ***Baromètre de l'Action climatique du Québec*** (2024) assesses Quebecers' knowledge of climate issues, their perception of the urgency to act (82% of the population according to the 2024 barometer, p. 10), their understanding of climate-related environmental policies, and their ability to take climate action. The issue of digital technology is addressed through the role of digital platforms as spaces where climate denial is amplified, notably through misinformation (p. 11). The report also measures the phenomenon of "climate fatigue" (34% of the population in Quebec): "when individuals feel excessively exposed to alarmist messages, they may experience a form of emotional overwork or powerlessness, which can lead to a progressive disinterest or minimization of the climate emergency" (p. 11). This phenomenon of "climate fatigue" speaks directly to the idea of eco-digital literacy: an imbalance between too much knowledge about an issue and too little ability to act can lead to a counter-productive effect.

A recent survey by the UNESCO-PREV Chair at Université de Sherbrooke (2025) provides an overview of climate misinformation, disinformation, and denial in Quebec and Canada. A section of this report entitled "How to moderate climate denial and misinformation" (p. 11-12) qualifies the "information deficit model," which links skepticism towards science to a lack of objective information, fact-checking or scientific literacy. According to the review of scientific knowledge set out in this chapter, moderation efforts should follow more targeted strategies for greater effectiveness against misinformation. These include message framing, i.e. tailoring messages to the context and target audience, or appealing to emotions such as empathy for the victims of climate disasters; the preventive role of education in critical thinking or, on the vaccination model, exposure to refuted cases of misinformation, or challenging underlying beliefs; another approach involves deleting social media accounts that disseminate misinformation. These strategies suggest that eco-digital literacy, like climate literacy, is not solely a matter of information policy – it must mobilize specific approaches to reach and protect all audiences.

To conclude, we put forward several questions for a public policy on eco-digital literacy:

1. How can a public survey or periodic barometer to be completed be set up, in order to make issues and initiatives more visible?
2. What types of training could be offered across Quebec to promote digital sobriety? And how could public libraries contribute through their programming activities?
3. What financial assistance could support social entrepreneurship focused on smart, low-tech and socially innovative solutions for society?
4. Could participatory foresight workshops and citizen conferences be developed to support the development of a literacy of sustainable and desirable futures for digital technology in Quebec?

Conclusion

After a technological revolution triggered by the arrival of ChatGPT and generative AI in 2022 and 2023, the year 2024 marked a decisive turning point: that of the gradual, concrete integration of these systems into the many facets of our societies. With the shock caused by the arrival of ChatGPT now behind us, the focus has shifted from an apprehension of the societal stakes of generative AI to a concrete consideration of its real impact on society and professional circles.

This second edition of Obvia's status report reflects the above-mentioned shift towards an analysis of the tangible consequences of the growing penetration of generative AI tools, particularly within organizations. In keeping with the interdisciplinary and cross-sectoral approach that characterizes Obvia, this document brings together contributions from the seven research hubs of which it is comprised. Based on these major themes, it takes stock of what we know about the societal impacts of AI, highlights the major scientific debates in the field and paves the way for collective reflection structured around key questions, with a view to devising courses of action to address the issues raised.

A number of major findings emerge from this 2025 edition. In terms of the advancement of scientific knowledge, many of the risks and issues raised in the 2024 edition are now confirmed in practice. These include the persistence of bias, discrimination and errors generated by AI models, as well as their lack of transparency. More generally, systems that are still imperfect are contributing to accentuating certain social and economic inequalities. We also draw attention to the considerable environmental consequences of the rising use of AI, particularly GenAI. The growing integration of these tools, which are often increasingly autonomous, lead us to reflect more broadly on the growing technological dependency of our societies.

In addition to these various concerns, benefits linked to the use of AI systems have also been highlighted by several hubs. Indeed, AI tools appear to increase productivity within organizations, as well as lighten the workload of many professionals, including various administrative tasks in education and healthcare. In healthcare, the effectiveness of AI in the field of medical imaging continues to prove itself, while the improvement of predictive models opens up unprecedented possibilities for research.

Finally, while AI systems can contribute to amplifying and reinforcing inequalities, adapted tools can also have the opposite effect, for example, by facilitating access to healthcare services, or improving educational and professional inclusion.

Although many of the issues addressed thus far are not new to the field of AI, and have been identified by Obvia since its creation, this report confirms and demonstrates the extent to which they can have a major impact on individuals and on society as a whole. The report also highlights the persistent absence of a truly structured framework for the use and development of AI technology. Indeed, for a variety of reasons, the current legal framework appears inadequate, insufficient or, in some cases, totally absent. While it is undeniable that the rapid evolution of AI makes its supervision particularly complex, it is essential to highlight the role of private interests and the lack of political will on the part of States in the persistent absence of solid legal frameworks. Without ruling out the need for legislative regulation, this context also calls for reflection on alternative or complementary solutions.

In this respect, education and training appear to be essential levers, widely put forward by the majority of our research hubs. They are essential, both for professionals called upon to adapt to the integration of AI tools, and for all citizens confronted with these profound technological transformations. The development of technical knowledge, the reinforcement of ethical skills and the promotion of a critical mind are all bulwarks in the face of technology deployed at high speed, often without any real consideration for the concerns and interests of the individuals and groups they are supposed to serve.

In a context where science and academic freedom are increasingly under threat, and where the development and deployment of AI technology is concentrated in the hands of a handful of large corporations, the interdisciplinary perspective taken by Obvia - combining scientific rigor and critical thinking - is proving more essential than ever. Without denying the remarkable capability of these tools or the benefits they can potentially offer in many fields, Obvia reaffirms, through this overview, its commitment to ensuring that AI technology is at the service of collectively defined ends, aligned with the values, needs and aspirations of our societies.

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