TRENDS RESEARCH & ADVISORY

TRENDS Annual Guide to Monitoring Future Trends

First Volume

(2024-2025)

Issue No. 01

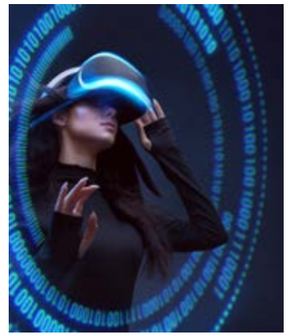
(August 2024)

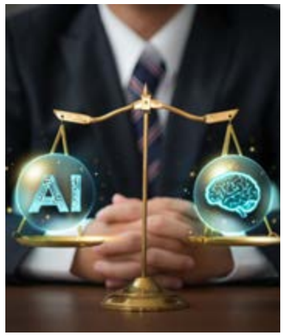
TRENDS

FUTURE TRENDS

Report

Issue No: 01
August 2024





Future Trends Report

Future Trends Report, published in English and Arabic by TRENDS Virtual Office in Montreal, stands out as a distinctive publication dedicated to highlighting:
1. the most important forward-looking studies that aim to identify future trends, analyze various variables that may influence these trends, and determine the best future scenarios.
2. the most important applied studies that explore the application of knowledge, scientific theories, and information to solve current problems and overcome future challenges.
3. the most important illustrative and graphic forms that visually summarize significant studies, helping readers understand the trends and challenges of the future world.

Editorial board

Contents

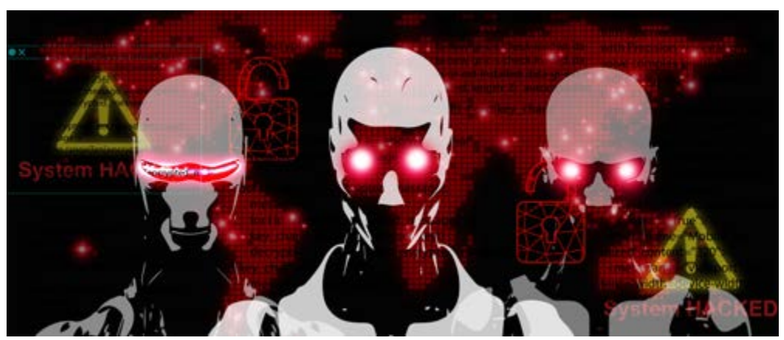
1 Prospective research

“Only those who innovate responsibly will thrive” – mitigating the risks of the increasing use of Large Action Models

Large Action Models – New types of risk? – July 2024 – Kamley et Vyakarnam – Dubai Future Foundation

"The imminent deployment of LAMs means that we are likely to see a blurring of jurisdictional boundaries, changing liabilities, and increased numbers of cross-border disputes."

Lidia Kamleh and Rajesh Vyakarnam, both affiliated with the Dubai Future Foundation, which is dedicated to exploring innovation and shaping the future of the Emirate of Dubai, discuss the use and mitigation of the risks implicated by the Large Action Models (LAM).



LAMs are AI models which have been designed to understand better the users' experiences and visions. They can execute physical actions, retrieve and manipulate data. Their use can be deployed wherever there is a customer assistance need. For example, if could process customer service from beginning to end, whether it be initial contact, customer returns, or actioning refunds. They allow nuanced and human-like interaction, which is what differs from AI systems, designed to work on a 2-dimensional rendering. LAMs can create dynamic environments, enabling autonomous decision-making.

The authors question the risks behind the increased use of LAMs. They list a variety of risks, such as data protection, data leakage, intellectual property, confidentiality, to name a few. These were risks discussed while 'traditional AI' technology has started to expand. LAMs, seen as a more "generative" form of AI, has complexified these risks. In many ways, the increasingly autonomous models, such as the 'My AI' chatbot used by Snap Inc, could lead to a greater trust placed by the customer in the systems. The article imagines that, with the increasing use of LAMs will come a "blurring of jurisdictional boundaries, changing liabilities, and increased numbers of cross-border disputes" (p.15). The questions of liabilities, which are currently subject to little or no legal supervision, will become more and more crucial. The examples for liabilities-related risks are numerous. In the workplace, LAMs could amplify discriminatory treatment of individuals or groups, triggering liability under employment laws.

Kamleh and Vyakarnam remind that the "Navigating Megatrends Shaping Our Future in 2024" report published by the Dubai Future Foundation has already advised that specific uses of AI should be at the center of regulation, rather than the technology itself. The authors insist that it is becoming crucial to create regulatory frameworks, through "cross-sector collaboration, transparency and security" in order to safeguard innovation and its use.

Only those who innovate responsibly will thrive.

"The imminent deployment of LAMs means that we are likely to see a blurring of jurisdictional boundaries, changing liabilities, and increased numbers of cross-border disputes."

Prospective research

“Arts & Foresight – Collaborative experiments for artists to explore the Future(s)”

Envisioning Futures Together – May 2024 – The Journal of Futures Studies. E. Christophilopoulos

Human beings cannot live without thinking about the future. The future is constantly present in our lives, and our consciousness is increasingly aware of the possibility of envisioning the future in different ways. We plan, schedule, envision, and constantly weigh the pros and cons of various situations to decide on our actions. Arts, in their various forms, are expressions of human creativity (Gillon, 2000) and therefore allow us to envisage the future in a very personal way. Arts give people opportunities to express their emotions uniquely, sometimes far from all forms of rationality.

In this publication, the Journal of Futures Studies presents an innovative and collaborative initiative between foresight experts and a selection of artists, all guided by the same gleam: that of better envisioning the future, or rather futures. The MOMus-Museum of Contemporary Art, Thessaloniki (Greece), was at the heart of this project, in the form of workshops for young artists, led by recognized artists from all over Europe. INSPIRE 2023 aimed at offering a creative platform for young artists to explore the future(s) all together, while expressing their creativity through a collective framework for thinking and acting on many alternative future universes. This edition of the event was organized in collaboration with the UNESCO Chair on Futures Research and the Millennium Project. Two resident artists, Mikhail Karikis and Albert Barqué-Durant, led a series of workshop, culminating in an exhibition titled “Tension. Future scenarios and other stories” ran over a period of six months, which ran from April 7, 2023, to September 28, 2023, welcomed more than 9000 visitors in total, making it one of the most successful exhibition at MOMus for 2023. The prototype artworks were produced during various innovative activities, such as a simplified Polak game activity (Hayward & Candy, 2017), introducing the “images of the future” as a basic property of both cultures and individuals. Other activities, such as the infamous Cadavre Exquis, or tasks designed to ignite the creativity of artists to imagine objects belonging to different futures, allowed the participants to think broadly about future possibilities and to conceptualize diverse outcomes for humanity and the world.

This multidisciplinary project has, without a doubt, been a real success, and is paving the way to the creation and imagination of innovative activities that will initiate exploration of the future(s), an example of creativity through collaboration between arts and foresight.

“The future is a safe, sterile laboratory for trying out ideas in, a means of thinking about reality, a method” (Gunn, 2014).

An innovative and collaborative initiative between foresight experts and a selection of artists.

References:

Gillon R. (2000). Welcome to medical humanities–and why. Journal of medical ethics, 26(3), 155–156. https://doi.org/10.1136/jme.26.3.155

Gunn, E. (2014). How America’s Leading Science Fiction Authors Are Shaping Your Future. Smithsonian Magazine. https://www.smithsonianmag.com/arts-culture/how-americas-leading-science-fiction-authors-are-shaping-your-future-180951169/

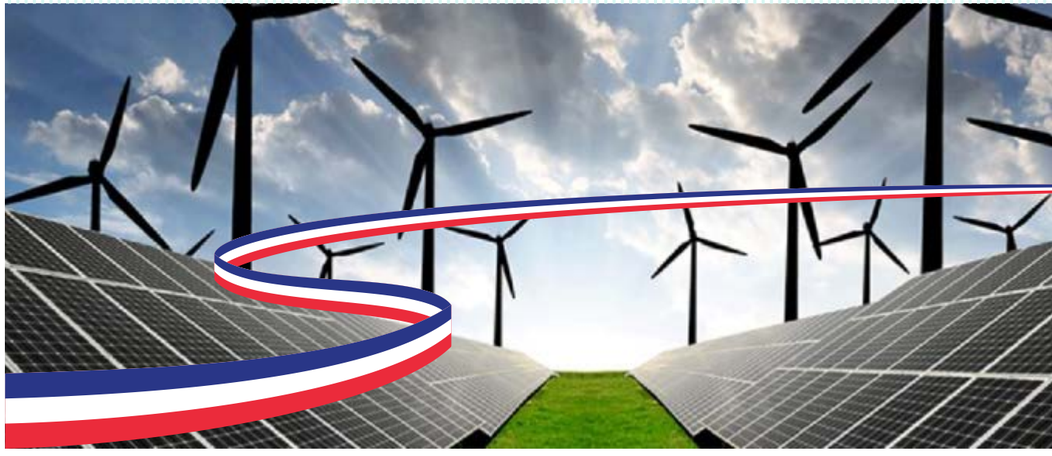
Hayward, Peter & Candy, Stuart. (2017). The Polak Game, or: Where do you stand?. Journal of Futures Studies. 22. 510.6531 .14-/JFS.2017.22(2).A5.

Prospective research

What will the digital world do to the environment? – a prospective analysis for 2030 - 2050 in France

“While digital technology is a vector for improvement and progress, it must not be a source of negative environmental impact“. (p.65)

This study entitled “Assessment of the environmental impact of digital technology in France and prospective analysis” has been published in 2022, as a result of a collaboration between the French Agency for the Ecological Transition (ADEME) and the Electronic Communications, Postal and Print media distribution Regulatory Authority (ARCEP). It answers the needs shaped by a study published by the ADEME which suggested four scenarios for achieving carbon neutrality by 2050.
Using the “Life Cycle Assessment” (LCA) methodology, focusing on the three thirds of the digital world – user terminals, networks ans data centers – the report explores through 3 tasks the medium- and long-term courses of action on the matter.



The first task evaluates the current situation and avenues for action following the initial study. The second task then evaluates the environmental impact of digital services in France. The third task finally plans this impact of the digital sector in prevision for the 2030 to 2050 period, according to a trend scenario and makes various projections for the mitigation of this impact.
The findings of the 2030 - 2050 trend scenario are the consequences of a digital consumption pattern that does not really challenge the ways in which digital goods and services are produced and consumed. This situation is therefore unable to meet the challenges of, among others, energy control, carbon impact reduction in line with the guidelines set by the IPCC, or the consumption of natural resources (p.65). ADEME and ARCEP predict a change in consumption habits of digital equipment, in particular with the increase in connected objects, which will have an ever-increasing impact on CO2 emissions.
The report suggests three scenarios to respond to the prospective analysis for 2030: 1- digital sobriety; 2- eco-design of installations, equipment and systems; and 3- generalized eco-design. The study then proposes four scenarios for achieving carbon neutrality for the entire French economy by 2050, each distinguished by its ambition. The “Génération frugale” scenario (scenario 1) is broadly similar to digital sobriety, proposing far-reaching transformations in the way we rethink the use of digital technology. Scenario 2, entitled “Territorial Cooperations”, would re-establish shared governance, linking the principles of digital sobriety and eco-responsibility, by engaging society in a search for solutions for responsible digital use. Scenario 3, “Green Technologies”, would see the development of technologies that respond to environmental challenges, making the most of natural capital to preserve nature, recalling the widespread eco-design scenario proposed for 2030. Finally, the fourth scenario, “Pari réparateur”, is based on a principle of “digital headlong rush”, the paroxysm of the digital revolution, a radical vision that implies the need to master other energy production and storage technologies.

While digital technology is a vector for improvement and progress, it must not be a source of negative environmental impact.

Focusing on the three thirds of the digital world – user terminals, networks and data centers – the report explores through 3 tasks the medium- and long-term courses of action.

References:

Transition(s) 2050. Choisir maintenant, agir pour le climat, ADEME (Agence de la transition éco - logique), 2021. URL: https://librairie.ademe.fr/cadic/6531/transitions2050-rapport-compresse.pdf?modal=false

Prospective research

Podcast «La Boussole des Futurs» (The Compass of Futures): What will the training of the future look like? – July 2023

This podcast, part of the series entitled "La Boussole des Futurs" (The Compass of Futures), looks at the trends redefining the world of vocational training, the shapes it could take, and the transformations that the global approach to learning itself could undergo.
The guest speaker, Gregory Gallic, Manager Offer & Expertise at Cegos, a major player in professional training in France, brings his expertise to bear on the issues surrounding training, in particular through the results of research conducted as part of his work. Together, the speakers attempt to answer the crucial question: should we repair the future?

Gallic discusses new trends in education, developments in training such as immersive learning, the increasingly widespread use of virtual reality, and the importance of artificial intelligence. The latter is particularly important when it comes to creating adaptive learning models, through content generation for example. The speakers stressed the importance of behavioral anchors. This applies not only to learning methods, but also to the application of acquired knowledge in the workplace. Herein lies the key to this discussion: how can training be better adapted to the needs of the workplace, from both the employee's and the company's points of view? Today, it seems that it makes more and more sense to train only when you need it, so that the learning process takes less time, autonomy is increased, and there is a major, positive link between employment and training.
Technological innovation is everywhere, all the time. In France, in 2021, more than 500 start-ups were created, with 17 of the top 20 focusing on training. Using digital technology to improve training services would give users a greater sense of agency and independence. The individualization of training, while questionable in terms of equality, is, for the speakers, a major challenge for the future.
While Gallic mentions the growing appetite for vocational training, he also states that France remains a victim of cultural passivity when it comes to acquiring new skills and competencies. Participants are sometimes in a wait-and-see posture, with no clear objectives or pro-activity. Learners should set up their targets and have the hand on their training. In addition, teachers, who are still indispensable, need to show openness and accept that they are no longer the sole owners of content. The co-creation of knowledge must become the key to the training of the future.
For Gallic, we need to focus on skills that make us more human, as they will make us more capable of meeting the challenges of the future and learning how to work with artificial intelligence. In his view, the three skills that should form the basis of training are: 1- critical thinking and transdisciplinarity, 2- ethics and responsibility, 3- creativity.
Without a doubt, this podcast opens up the discussion on the approach that training should take in the future and gives concrete food for thought on how to improve learning and its methods to make the process more relevant, useful and effective for all.

How can training be better adapted to the needs of the workplace, from both the employee's and the company's points of view?

In France, in 2021, more than 500 start-ups were created, with 17 of the top 20 focusing on training.

Prospective research

How to make a future scenario as immersive and explorable as a videogame – June 2024 – McGonigal – APF Compass June 2024

Jane McGonigal, Ph.D, researcher at the Institute for the Future (IFTF), wonders how to make hypothetical scenarios feel as realistic, immersive and explorable as popular video games. She reminds the agency provided by video games, where the user feels powerful, completely in charge, and confident. Using her knowledge of positive psychology of games and the art of designing immersive virtual experiences, McGonigal tries to apply the same gameful creative agency to the imagination of the future.

The author explains that her ambition was initiated above all by the desire to give people the opportunity to feel as involved in their potential future as they do when they launch a video game. In particular, she refers to the game "Portal", in which the player wakes up in a strange room, unsure of how he got there, and just has to act, explore and figure out for himself how to move forward. With this in mind, McGonigal wanted to approach her work in a format she calls "the first-person future". This image is borrowed from the world of video games, where the player doesn't take on the traits of a fictional character, but instead finds himself moving around, from his own body and point of view.

McGonigal gives the example of one of the IFTF projects, entitled "The Road to Zerophoria", a world where zero waste is the new normal. The scenarios proposed always take the form of an initial story-telling, with suggestions for action. This is one of the keys the author is talking about: giving people the opportunity to make decisions, guided by their values, hopes, fears or personal experiences. This gives people a sense of personal agency. McGonigal mentions one of the obsessions of video game designers that inspired part of "The Road to Zerophoria": the emphasis on creating positive emotions: "How do we want players to feel when they play?" Curiosity, excitement, joy, hope, satisfaction and love are all examples of positive emotions that can guide the creation of scenarios. In "The Road to Zerophoria", Zerophoria refers to the sense of joy and pride initiated by the new normal of "zero waste", in short, an avenue to combat climate change anxiety.

The author concludes with some advice and food for thought for those wishing to embark on scenario creation: make it personal, relatable and accessible; add a ‹moment of choice› that gives a feeling of agency to the player and invent ways of reaching new positive emotions.

The player wakes up in a strange room, unsure of how he got there, and just has to act, explore and figure out for himself.

Scenario creation: make it personal, relatable and accessible.

2 Applied research

Humor & propaganda or how videographers convey their extremism

Vey, V., & Perrier, Z. (2022). L'humour antiféministe du Raptor et de Papacito: analyse d'une stratégie énonciative de l'extrême-droite en ligne. Cahiers de recherche en politique appliquée, 64- 81.

In this paper, Vey and Perrier, both students at the École Normale Supérieure in Lyon, France, examine the use of humor in the production and dissemination of right-wing extremist and anti-feminist content online. While humor has long remained on the periphery of social science studies, it is becoming increasingly important when it comes to studying new mediums such as YouTube. To answer their questions, the authors have based their work on 39 videos published by two French far-right video artists: Raptor and Papacito. The former has been active on YouTube for several years, commenting on current affairs with violence and vulgarity. The latter, initially a blogger and writer, made a name for himself with two viral videos that racked up over 10.5 million views.

For the authors, antifeminism in fact serves as an ideological basis for the deployment of fascist-masculinist content. The links between masculinism and the far right have been demonstrated before, but the aim here is to understand how discourses on the crisis of masculinity are shaped by antifeminism. The authors highlight three aspects of this so-called crisis: an alarmist diagnosis of the state of the Masculine (p.68), an indictment of feminism (p.70) and a call for the mobilization of men (p.72). Using electrifying quotes from the videos posted by the two video producers, the authors illustrate the extreme ideas they promote, such as the idea of a gendered version of the "great replacement" theory, a racist and sexist idea that the nation, overly feminized, would be at the mercy of the violence of overly virile non-white masculinities (p.70). Positive references to far-right men such as the politician Jean-Marie Le Pen are also evidence of the explicitly extremist orientation of the content studied here.

More specifically, the authors examine the two content creators' use of humor as an effective political tool in their far-right propaganda. By using humor, the video makers blur the boundary between speech and reality. They blend the lines between sincere and clumsy speech, and between political position and humorous discourse. In their stylistic analysis, the authors identify two recurring humorous tools in Raptor and Papacito: the "punchline" and the "portrait".

The punchline evokes physical violence, the kind that strikes with its force, bringing the target back to order. With punchlines, laughter is provoked by a game of repetition/variation, coupled with excessive violence of expression, in search of originality. Through a precise analysis of syntactic structures, the authors explain how punchlines materialize the bicategorization and hierarchization of the extreme right-wing social world (p. 77). The portrait, a caricatured description of individuals or groups, at times meliorative or pejorative, maintains a tension in the content between fidelity and exaggeration, while claiming to "tell the truth". Once again, precise syntactic and semantic analysis enables the authors to demonstrate that videographers make a genuine ideological polarization using these portraits, such as when Papacito refers to Saddam Hussein as an example of masculinity.

Antifeminism in fact serves as an ideological basis for the deployment of fascist-masculinist content.

Certain habits, such as the use of humor, allow extreme ideas to be transmitted without appearing to be propaganda.

Applied research

Applied research at the service of design

Neuman, M., Perrone, C., & Mossa, A. (2021). Applied research by design: an experimental collaborative and interdisciplinary design charrette. European Planning Studies, 30(6), 1013–1033.

The authors, all three affiliated with university architecture departments (London, UK & Florence, Italy), report on a case of collaborative design charrette aimed at creating more healthy and sustainable cities. The project was a two-week long interdisciplinary urban design charrette, where participants examined urban and regional issues and opportunities for the Metropolitan Area of Florence, Italy. The charrette, which could be described as short, collaborative meeting, tried to respond to the research question: "To which extent is it possible to simulate in a multi-disciplinary design and planning studio the context, conditions and principles for the preparation for a spatial / general / master / comprehensive plan that addresses sustainability in the built environment with a holistic, multi-factor and multi-scalar approach?" (p.1014).

18 architecture students took part in the international workshop, focusing on how to improve the environment, health and well-being of the chosen area. The project was built around lectures, site explorations, discussions, data analysis as well as design, to interrogate practices of sustainable urbanism and rethink the concept of sustainability.

The chosen area, situated at the outskirts or northwest Florence, is not urban yet not properly rural. The students were asked to simultaneously address issues of development, ecology, economy, agriculture, transport and infrastructure by "developing integrative analyses and solutions that were intended to improve health and wellbeing of humans, other species, ecological habitats and the overall metropolitan area" (p.1021). Climate change, globalization and urban growth, and the way they interact with each other, were at the center of the projects. Many stakeholders were engaged in the project, such as municipalities or NOGs.

After a detailed description of the project, including the day-to-day activities carried out by the group, the authors review the challenges posed by such a project. First, an educational challenge arose when groups from two different traditions had to work together: the UK and Italy. The organization of the charrette was able to explore these differences, putting them at the service of the project's initial objective: to find avenues for collaboration where they seem laborious. That being said, the language was sometimes a challenge, and may have limited certain exchanges. Then, the interdisciplinary variety of the working groups, seen at first as a challenge, enabled fruitful dialogue between participants, work on finding connections and mutual acquisition of skills. The experimental nature of the project sometimes challenged participants, who may have found it difficult to implement innovative techniques that were less structured than traditional processes.

Finally, the authors conclude with implications for applied research. For them, these implications can be summed up as: the acquisition of relevant data, the use of critical and analytical skills to tackle problems, coherent and revealing exchanges and argumentations between participants, the communication of results and their originality.

The interest of this article resides in the fact that it details a methodology and initial assessment on the process employed, as well as learning outcomes and opportunities for improvement for similar projects. The project is extremely valuable in that it uses applied research as a means of discovering and creating new knowledge.

18 architecture students took part in the international workshop.

Develop integrative analyses and solutions intended to improve health and wellbeing of humans.

Applied research

Sustainable development in academia

Koivunen, T., Konst, T. and Friman, M. (2024), "Building a sustainable future: ideas and perceptions of university staff", Foresight, Vol. 26 No. 2, pp. 241- 252.

This article looks at the importance of applied research in academia. To understand its ins and outs, the authors conducted qualitative research with employees of universities of applied sciences (UASs) in Finland, asking them about how their institutions could play a role in sustainable development.

The authors first remind us of the importance of education and higher education institutions (HEI) in "providing the platform and mechanisms needed for all human beings to be active agents of change" (p.242).

According to other authors, sustainable development implies the implementation of "cross-cutting, multidisciplinary, interdisciplinary and multisectoral collaboration, reorganization and rethinking" (Agbedahin, 2019). Among the key players in the transition to sustainable development are the staff and members of HEI. Their role in this transformation is unquestionable.

Their "perception of sustainability will influence if and how they teach it and, in turn, influence the quality of their students' understanding and potential practice of the concept" (p.244). As such, this study naturally turned to them, to understand their ideas and perceptions of the UASs' work towards sustainable development. Following a presentation of the theoretical framework concerning sustainability in higher education, and in particular the objectives set out in the United Nations Agenda for Sustainable Development 2030, the authors point out that a sustainable future requires UASs to be able to anticipate as well as possible, by promoting distinct and effective scenarios. The aim of the survey was to compile clear perspectives and proposals from UASs' members concerning their responsibility in terms of sustainable development in the years ahead. The data was collected through an anonymous survey, sent to 24 UASs in Finland in January 2021. 1791 responses were compiled, covering a variety of employee categories (45% in education, 32% in administration, 24% in research and development). The data collected was analyzed using qualitative content analysis, with a deductive approach framed by sustainability themes in HEIs drawn from the literature.

The responses collected were categorized as follows: education & curricula, societal impact and research, development and innovation, management and staff competence, campus activities, comprehensiveness and the importance of setting an example. The main elements of response concern the need to integrate SD into the strategies implemented by the UASs, as well as into "dynamic and holistic" RDI and campus life activities. The importance of staff collaboration, support and encouragement is also one of the key elements identified by the study. Likewise, the promotion of SD objectives and the importance of setting an example would enable better communication, understanding and opportunities for sharing best practices.

The authors conclude on a positive note, namely that the responses obtained suggest that the promotion of SD in HEIs is very encouraging, and that, while their role is undeniable, it is vital that progress and management support are provided by the relevant bodies, in order to achieve a sustainable future.

Provide the platform and mechanisms needed for all human beings to be active agents of change.

24

UASs in Finland in January 2021

1791 responses were compiled, covering a variety of employee categories (45% in education, 32% in administration, 24% in research and development).

References:

Agbedahin, A.V. (2019), "Sustainable development, education for sustainable development, and the 2030 agenda for sustainable development: emergence, efficacy, eminence, and future", Sustainable Development, Vol. 27 No. 4, pp. 669 - 680.

Applied research

Collaboration between industry & academia – a case study

Kettunen, P., Järvinen, J., Mikkonen, T. et al. Energizing collaborative industry-academia learning: a present case and future visions. Eur J Futures Res 10, 8 (2022).

In this paper, the authors investigate a large-scale, 4-year Industry-Academia Collaboration (IAC) and Research, Development and Innovation (RDI) program case, called Need for Speed (N4S) from a knowledge creation and learning perspectives. All the authors participated in the program, with the second and third authors leading it while representing respectively the industrial and academic perspectives. They present and evaluate a knowledge repository they called "Treasure Chest" compiled during the case program.

The authors start by presenting the challenges and successes factors of effective collaboration between industry and academia. Collaborative learning capabilities will be more and more required in the future, as "no innovation can be done in isolation" (p.2). The Need for Speed (N4S) program, which took place from 2014 to 2017, gathered 11 large industrial organizations, 14 SMEs, and 10 research institutes or universities.

The goal of the program was as stated: "N4S will create the foundation for the Finnish software intensive businesses in the new digital economy" (p.2). Business cases (x49) were compiled in addition to the strategic research goals.

Initially called a "toolbox", the Treasure Chest was compiled then disseminated through a website, available to the public, and consisted of six sections: 1- Main strategic themes, 2- Guiding and triggering questions to explore each theme from typical angles, 3- Solutions for the different research focus areas in each theme, 4- Narratives from industrial and academic partners, 5- Book publications, 6- Keyword selectors to explore the research publications. Attractive visuals help you visualize the repository through the paper (p.4, 5, 7 & 8), as well as example of "Gold Nuggets", tangible benefits of the research. For instance, the website compiles scientific conference papers co-authored by academic researchers and industrial company partners.

In the discussion, the authors detail the ins-and-outs of the Treasure Chest, mentioning for instance that one of its goals was to "produce actionable knowledge for industrial use" (p.9). All the papers published were co-authored by both academia and industry representatives. One of the results of the program was the publications of more than 15 theses, for which the students worked with both industrial and academic partners, illustrating the collaborative work of this research. The authors mention that the N4S program responds to one of the priorities set by the Finnish government to build "internationally attractive knowledge clusters, networks, and innovation systems with leveraging the skills in higher education institution to accelerate RDI for supporting and revitalizing businesses by 2030" (p.10).

The paper suggests practical pointers for further research, such as "coaching and uniting leadership", "supporting ICT and communication infrastructures, competences and resources", "alternating between exploration and exploitation", "balancing between theory and practice". The authors also draw attention to points that could prove detrimental, such as the uncertainty of the funds allocated to projects, which could lead to a loss of competitiveness. They remind that setting specific agenda for the projects are key to their success. Finally, they advise that, in the future, large-scale IAC projects should become more and more common, as they will lead to innovative work, and contribute to setting beneficial, energizing and long-term fruitful collaborations.

The challenges and successes factors of effective collaboration between industry and academia.

Setting specific agenda for projects are key to their success.

Applied research

Where will climate change hit hardest?

Aldhous, P. (2024), "Where will climate change hit hardest? These interactive maps offer a tellgate glimpse", Proceedings of the National Academy of Science (PNAS)

"What we remember is the drought, the flood, the heatwave, the storm. That's how we can help to connect these targets with people's lives." (K.Hayhoe, climate scientist, Texas Tech University)

Peter Aldhous, a data journalist, presents in this article a series of interactive maps created by PNAS (Proceedings of the National Academy of Sciences of the United States of America) using projections compiled by Probable Futures, a non-profit climate literacy initiative that makes tools, stories and resources to understand the climate challenges ahead. The maps illustrate that many countries are likely to face multiple climate stressors in the future, which will have dreadful consequences on populations. Life-threatening heat and disastrous floods are only examples of these challenges.

Aldhous first focuses on the potentially fatal dangers of heat and humidity. In hot weather, the body cools itself mainly by evaporating sweat. However, this natural cooling process is not possible in periods of high heat and humidity. The author refers to the "wet bulb temperature", or when wrapping a thermometer bulb in moist muslin, as a means of assessing humidity. Until recently, experts "considered a wet bulb temperature of 35°C as the limit of survivability". This has been questioned by researchers such as Jennifer Vanos and her colleagues of Arizona State University, who have highlighted much higher, life-threatening risks related to the limits of people's ability to sweat due to humidity levels.

The section on devastating droughts doesn't give any better hope, since it is estimated that these will increase drastically as temperatures rise. For example, the Cairo region in Egypt, where the current probability of experiencing a prolonged drought over a year is 25%, would increase to 75% with a warming of 3°C.

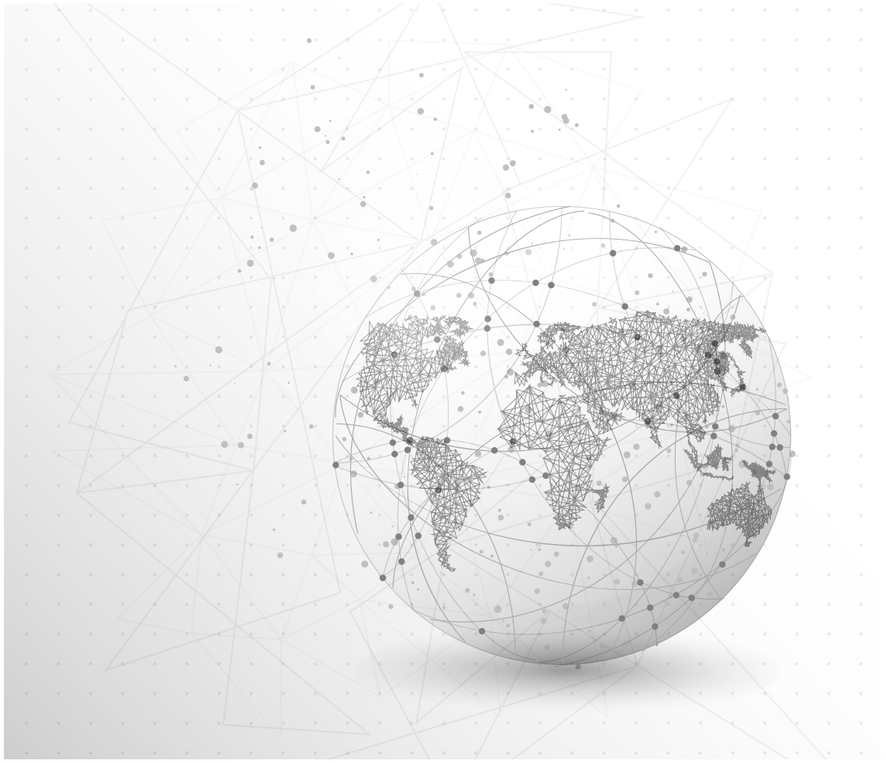
The increasing risks of destructive floods mentioned in the article are hardly more encouraging. According to research, severe precipitation is set to become increasingly frequent. As Aldhous mentions: "it's a simple consequence of atmospheric physics: Warmer air is capable of carrying more water vapor, which ultimately gets deposited as rain".

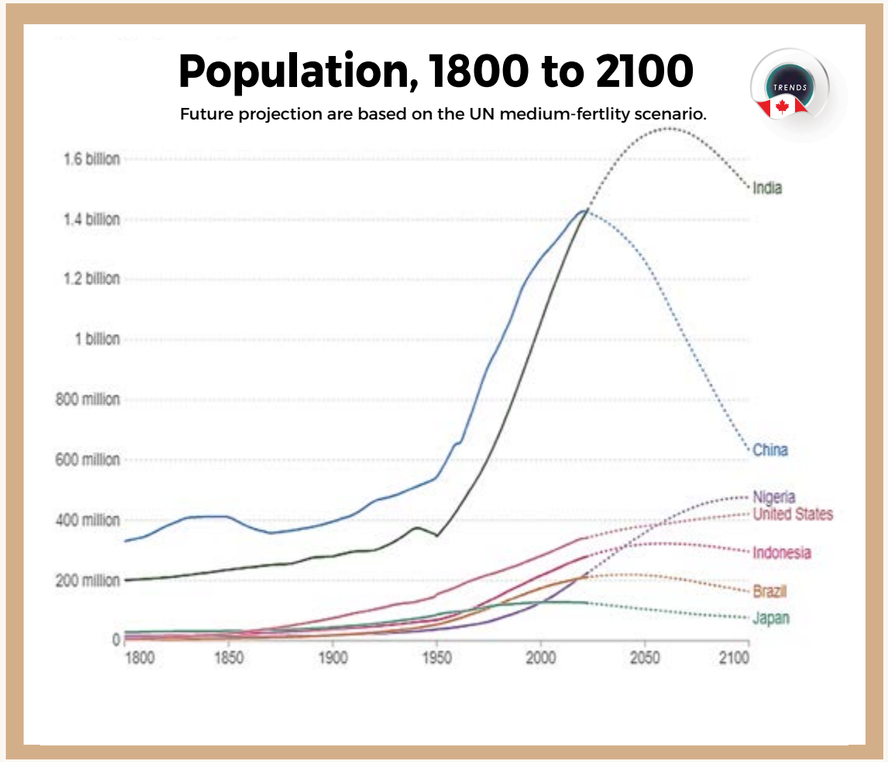
To conclude, the data journalist mentions that these projections are not inevitable. He reminds us that the predispositions countries take will have a real impact on the path global warming takes. Today, policies are not meeting the targets set out in the 2015 Paris Agreements (1.5°C), however, nations could manage to limit the average global warming and its consequences. A final point is made about the importance of changing the conversations focus, from a global perspective to a local one if we want decisions to be fully efficient.

"What we remember is the drought, the flood, the heatwave, the storm. That's how we can help to connect these targets with people's lives."

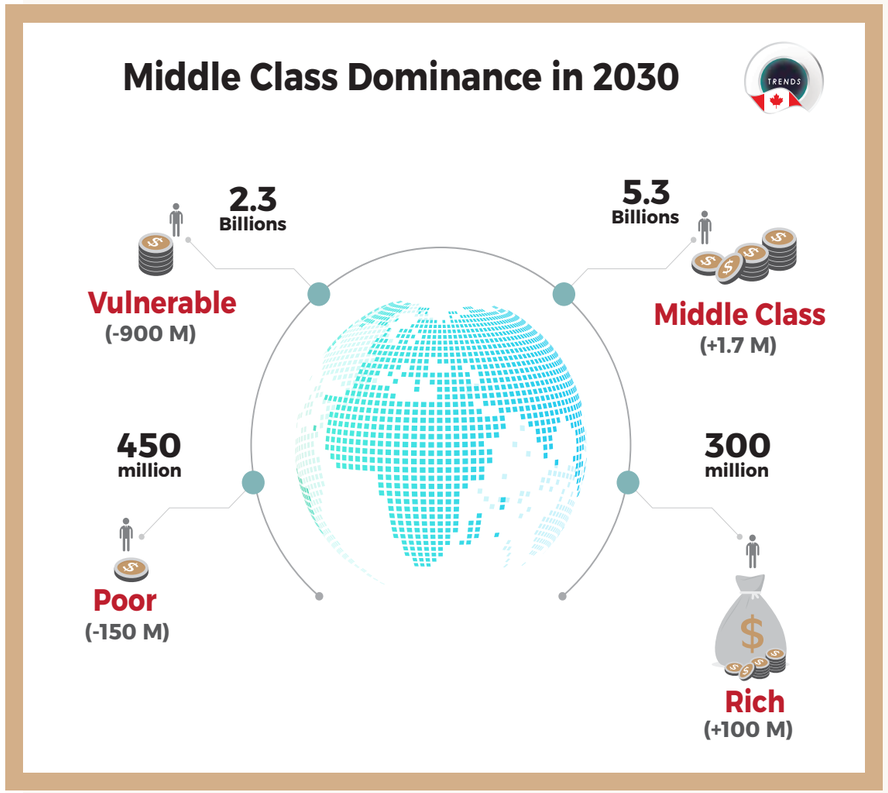
The probability of experiencing a prolonged drought over a year is 25%, would increase to 75% with a warming of 3°C.

3- The future in numbers



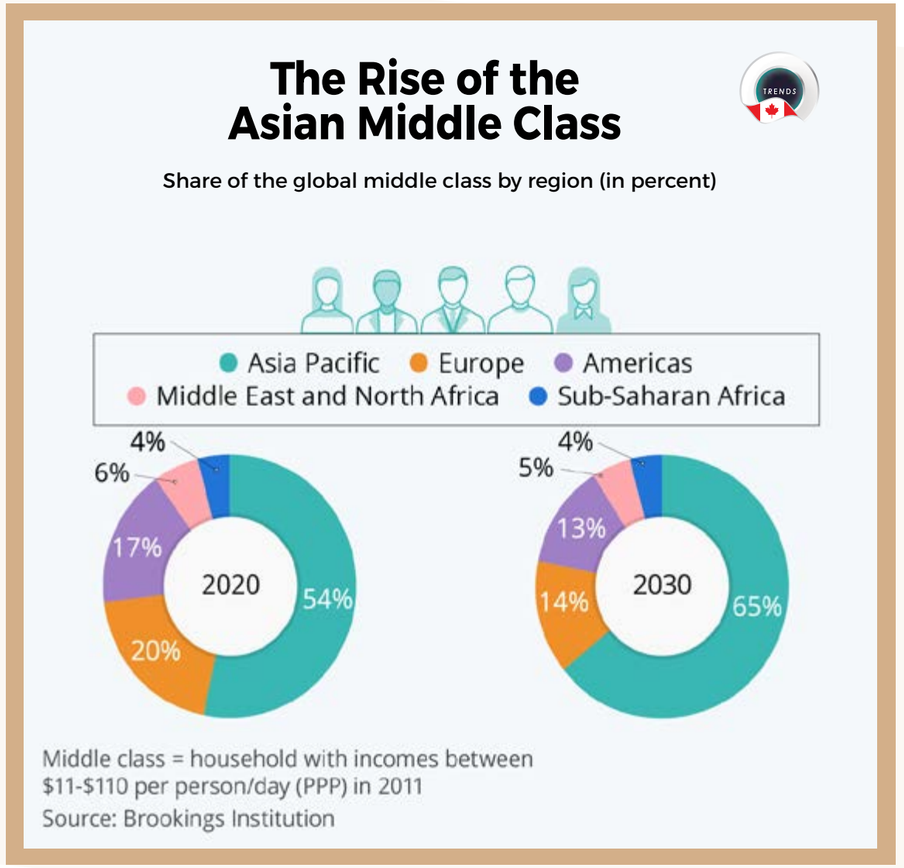


Data source: HYDE (2023); Gapminder (2022); UN WPP (2024)



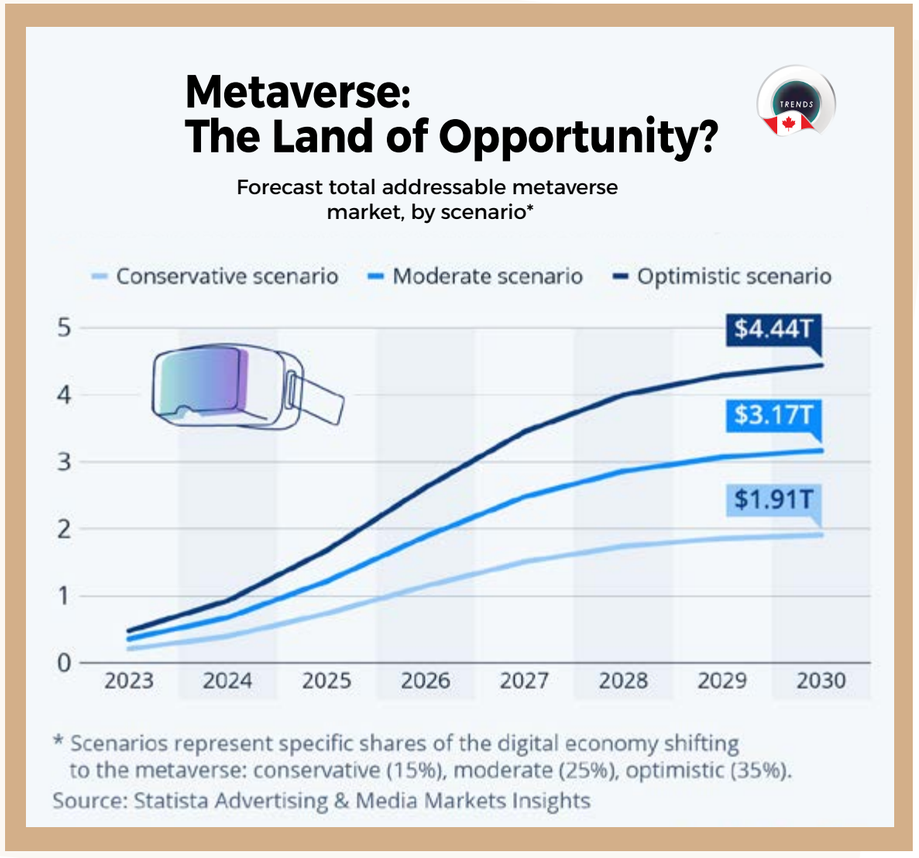
European Strategy and Policy Analysis SystemTHE MEGA-TRENDS, WELCOME TO 2030,

https://ec.europa.eu/assets/epsc/pages/espas/chapter1.html



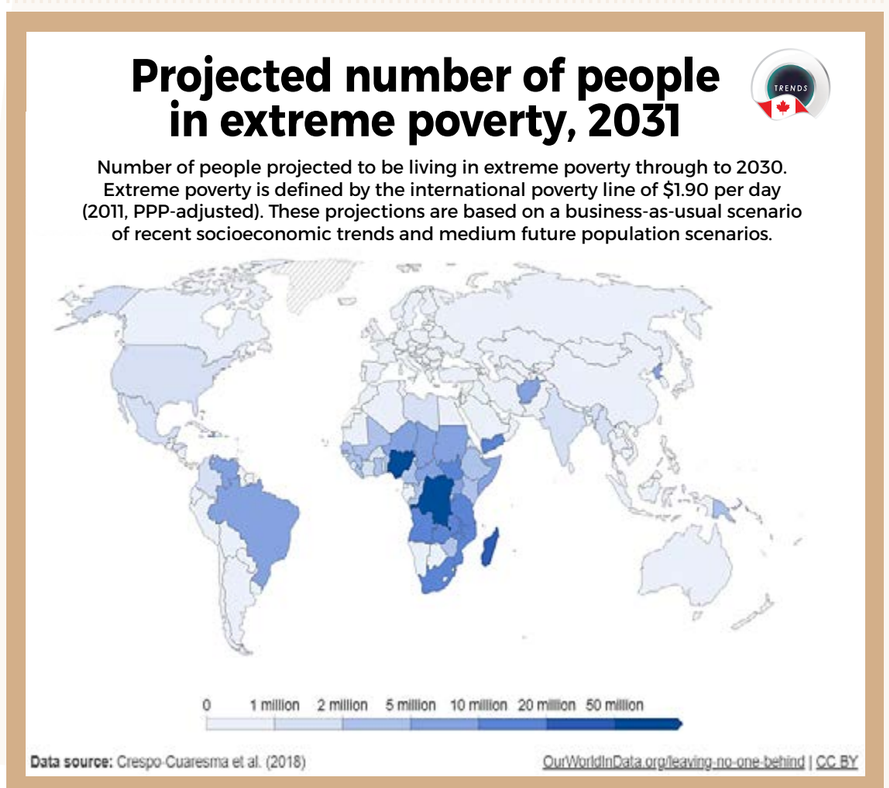
World Economic Forum With the collaboration of Statista. This chart shows the rise of the Asian Middle Class

https://www.weforum.org/agenda/202007//the-rise-of-the-asian-middle-class/



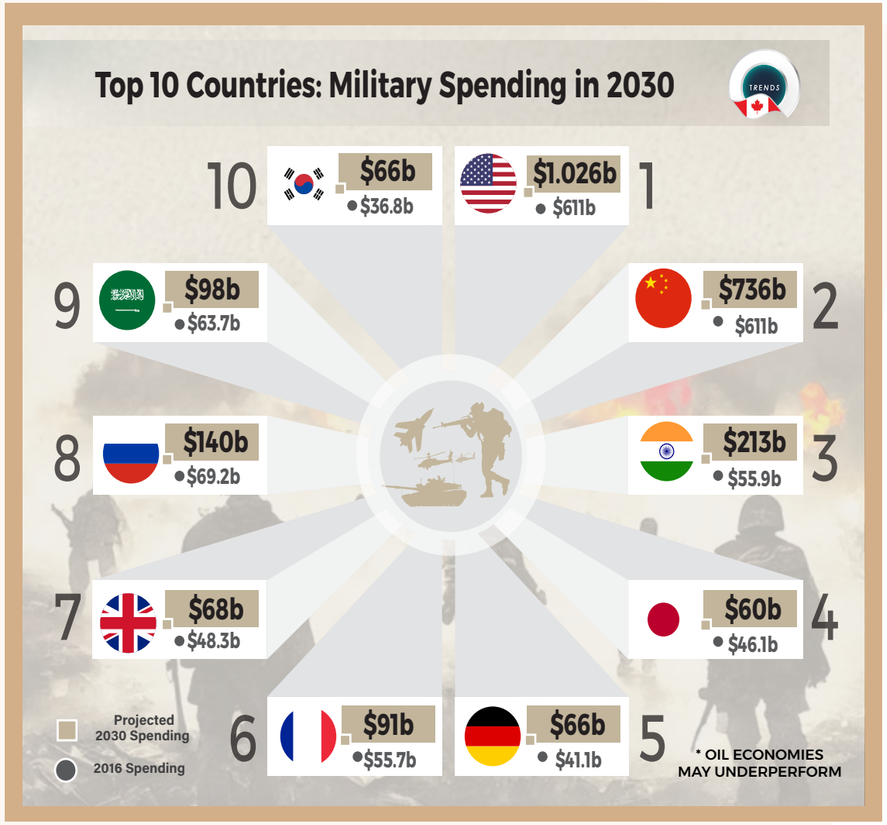
Martin Armstrong, Metaverse: The Land of Opportunity? Feb 3, 2023

https://www.statista.com/chart/29239/forecast-total-addressable-metaverse-market/



Our World in Data, Projected number of people in extreme poverty, 2031

https://ourworldindata.org/grapher/extreme-poverty-country-2030

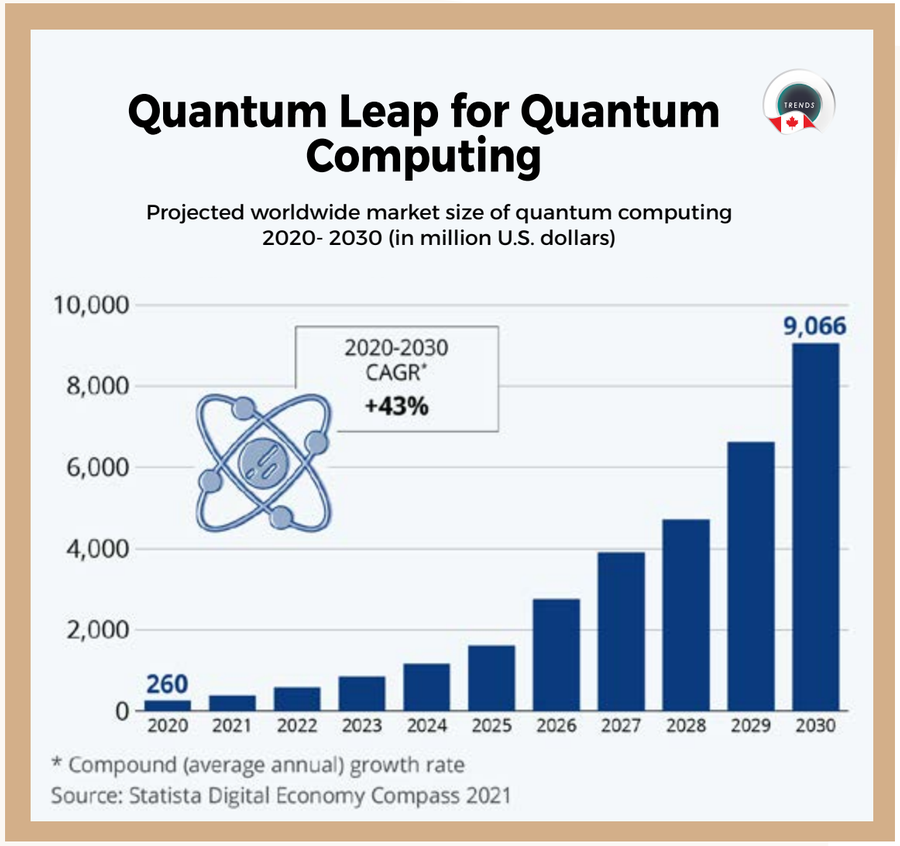


European Commission, VISUALISATION, Top 10 Countries: Military Spending in 2030 04 SEP 2018

https://knowledge4policy.ec.europa.eu/visualisation/top-10-countries-military-spending-2030_en

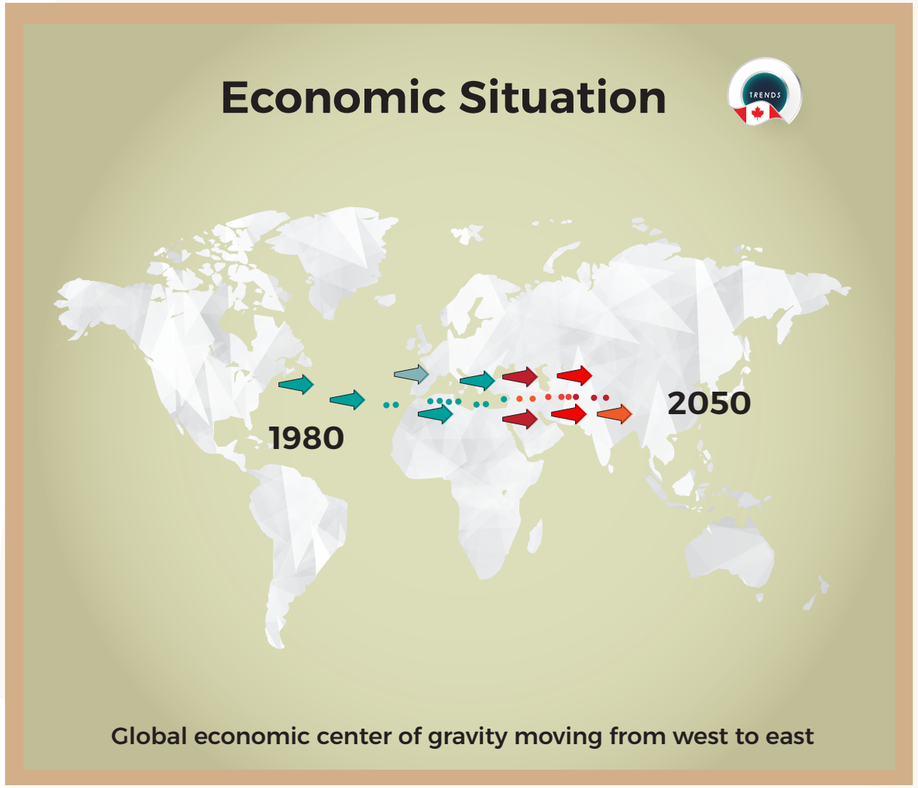
Katharina Buchholz, BIGGEST ECONOMIES Continental Shift: The World's Biggest Economies Over Time, Statista, Apr 20, 2023

https://www.statista.com/chart/22256/biggest-economies-in-the-world-timeline/



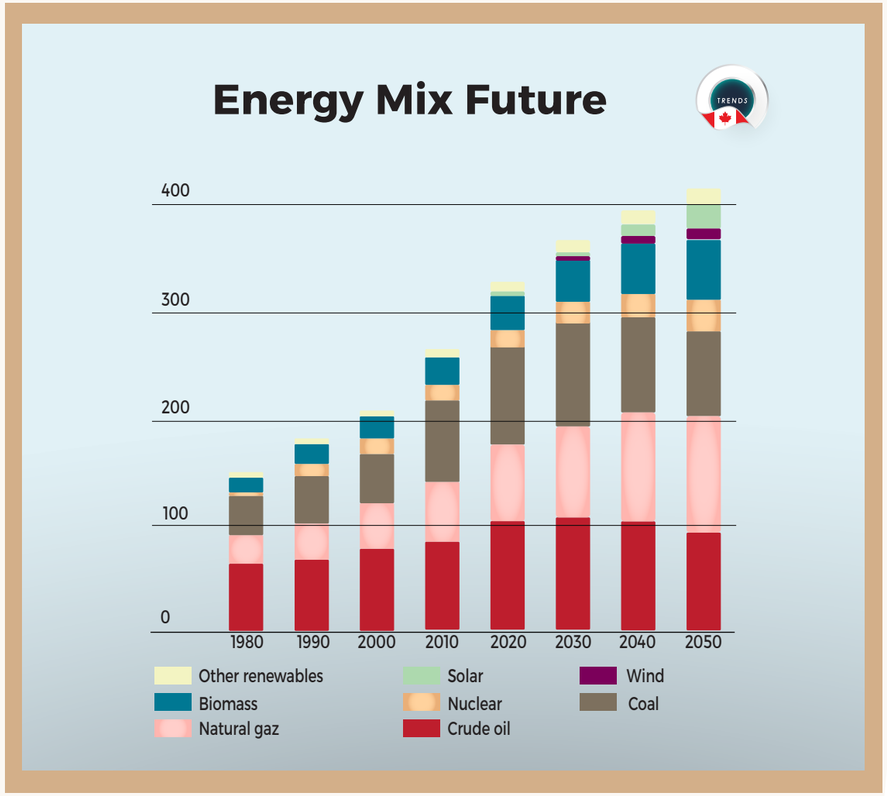
Statista, Katharina Buchholz, Quantum Leap for Quantum Computing, Dec 2, 2021

https://www.statista.com/chart/26317/quantum-computing-market-value/



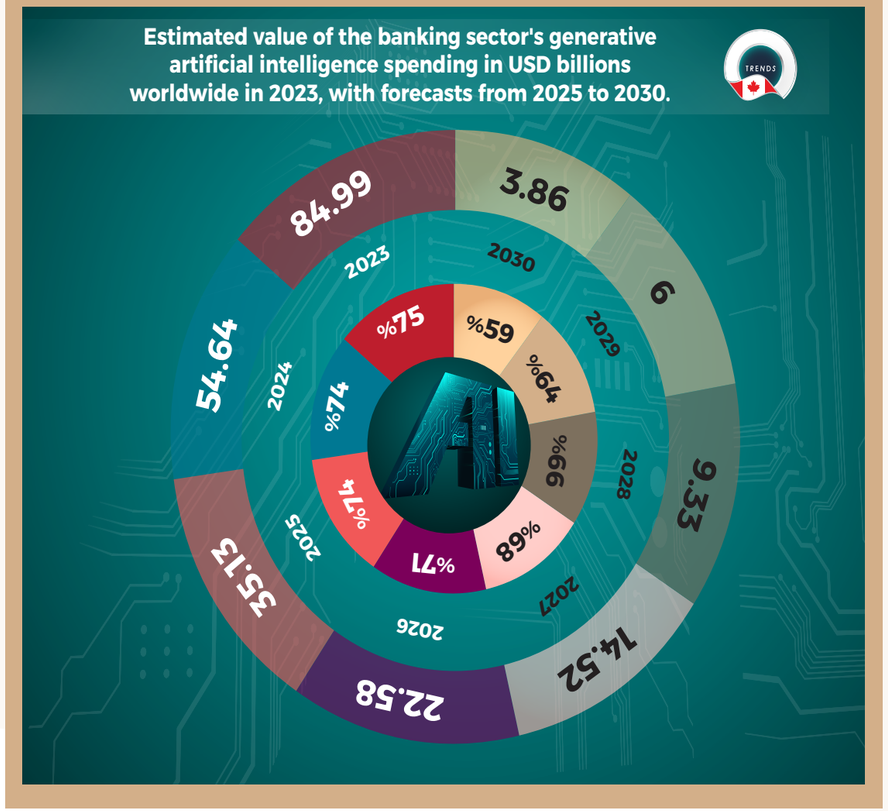
Unece. The World in 2050, Some ideas,

https://unece.org/fileadmin/DAM/timber/meetings/201820180123//The_World_in_2050.pdf



European Commission, VISUALISATION, Top 10 Countries: Military Spending in 2030 04 SEP 2018

https://unece.org/fileadmin/DAM/timber/meetings/201820180123//The_World_in_2050.pdf



Estimated value of the banking sector›s generative artificial intelligence (AI) spending worldwide in 2023, with forecasts from2025 to 2030 European Strategy and Policy Analysis System (ESPAS), WELCOME TO 2030: THE MEGA-TRENDS,

https://www.statista.com/statistics/1457711/banking-sector-estimated-gen-ai-spending-forecast/

2

Issue No. 02

(September 2024)

Issue No.: 02
September 2024

Future Trends Report

Future Trends Report, published in English and Arabic by TRENDS Virtual Office in Montreal, stands out as a distinctive publication dedicated to highlighting:
1. the most important forward-looking studies that aim to identify future trends, analyze various variables that may influence these trends, and determine the best future scenarios.
2. the most important applied studies that explore the application of knowledge, scientific theories, and information to solve current problems and overcome future challenges.
3. the most important illustrative and graphic forms that visually summarize significant studies, helping readers understand the trends and challenges of the future world.

Editorial board

Contents

1 Prospective research

A framework to answer the challenges posed by migration

Migration Policy Framework for Africa and Plan of Action – Migration for Development in Africa. (au.int)

The Migration Policy Framework for Africa (MPFA) is the result of a consultation held by the Organisation of African Union Council of Ministers in July 2001. Its aim was to respond to the new challenges posed by globalization and migration. Ten years after its implementation, the African Union Commission reviewed the results, challenges, and potential improvements of the MPFA, resulting in the "Migration Policy Framework for Africa and Plan of Action (2018- 2030)," discussed in this executive report.

The main objective of this new version was to respond to the dynamic and changing nature of migration in Africa while taking into account the Sustainable Development Goals (SDGs) as well as AU priorities. The MPFA 2018- 2030 offers application paths, as well as tools and resources to better manage migration on the continent. Indeed, "better migration governance is the overarching objective of the MPFA."

This report covers, among other things, eight key migration issues:

1. Migration Governance as a starting point for the MPFA, which works for the good of migrants and societies while respecting international laws and standards.

2. Labor Migration and Education, which encourages structures, legislation, and policies to facilitate the movement, integration, and development of workers and students, resulting in "brain gain" and "brain circulation."

3. Diaspora Engagement, which provides institutional and environmental frameworks to better involve diaspora members on the continent, for example by offering them facilities in terms of dual citizenship, investment protection, or facilitating knowledge exchange.

4. Border Governance, which restores the importance of border management actors such as states, companies, and non-state actors by establishing rules, techniques, and procedures to regulate the movement of goods and people across borders.

5. Irregular Migration, such as migrant smuggling, is a major scourge that involves a variety of crimes harmful to the continent's stability and security. A series of measures will be taken to eradicate human trafficking, including prevention and awareness-raising, protection and assistance, and increased cooperation and partnerships between states.

6. Forced Displacement, which is also addressed through integration and reintegration strategies, crisis prevention, and conflict resolution management through dialogue and cooperation, in order to ease the situation of refugees, asylum seekers, internally displaced persons (IDPs), and stateless people.

7. Internal Migration, addressed in order to leverage the economic and social development potential represented by globalization, by strengthening the local dimension of migration policies.

8. Migration and Trade, which will be by the implementation of the Continental Trade Area and the AU Free Movement of Persons Protocol.

Other issues are addressed by the MPFA, such as health, research, environment, and gender. Finally, the MPFA gives member states a clear action plan to build and maintain intra-state synergy on the continent and respond more effectively to the challenges of tomorrow.

"Migration is dynamic, and migration trends and patterns in Africa have changed."

"Better migration governance is the overarching objective of the MPFA."

Prospective research

Should AI be embodied?

Embodying Artificial Intelligence – July 2024 – Josh (Sims, Farsight (cifs.dk

As machine learning systems rapidly accelerate in their advancement, the need to ground their computational understanding in our physical world only increases. This article, published on Farsight by the Copenhagen Institute for Future Studies (CIFS), Denmark, reflects on the idea of "embodied AI," which suggests that "as cognitive science and psychology indicate, human-level intelligence in AI programs cannot be fully realized unless they are able to interact with and learn from their physical and linguistic environments, much as human babies do."

Up until now, AI has been part of our lives without many of us even realizing it. It's present just about everywhere, all the time, but virtually invisible, in the form of algorithms and other digital processes. AI as we know it isn't physically tangible. So, Josh Sims asks about the need to embody AI in order to improve not only its use but also its interaction with humans. The author believes that "embodied AI will gradually learn about [the] environment through its exposure to it; it will have to explore to make its own map." In short, a way of improving AI's efficiency is by exposing it to the world around it, just as humans are exposed to more or less harmful environments.

Quoting Josh Bongard, professor of computer science at the University of Vermont, US, the article affirms that "AI can't understand cause and effect very well without being embodied (...), without embodiment, AI is unsafe."

If the reader naively imagines an embodied AI in the form of a supersonic robot or a bloodthirsty Terminator, the author points out that self-driving cars or certain agricultural equipment are examples of embodied AI. For Bongard, one of the best illustrations of what embodied AI could resemble is the "micro-bot swarm" depicted in Big Hero 6.

Andrew Philippides, professor of bio-robotics at the University of Sussex, UK, believes that "natural intelligence is embodied, and if we want to understand that, then we need to think of AI in the context of embodied systems." Big companies like Meta, Amazon, BMW, and Mercedes-Benz have already set this in motion, but major challenges remain. "Think of the energy efficiency of our biological sensors alone," reminds Philippides, who asserts that the AI embodiments we have right now "aren't very good yet."

Finally, the article recalls a crucial point: the ethical considerations that such technological innovations must entail, to which Bongard responds, "Bring it on! The robots [of sci-fi] unsettle us and that's a good thing. (...) Humans need help, and safe AI is possible."

As machine learning systems rapidly accelerate in their advancement, the need to ground their computational understanding in our physical world only increases.

tFUS, which is a non-invasive neuromodulation therapy, could give access to and improve levels of communication between models and humans.

Prospective research

How will neural technology be used in the future?

Podcast: Humanity's Next Leap: Thoughts on the Frontiers of Neural Technology - Dean Woodley Ball

This podcast, presented by the Foresight Institute, a research organization supporting the development of high-impact technologies, is part of a series of seminars given online about neurotechnology and its application in improving cognition. The guest, Dean Woodley Ball, a research fellow in the Artificial Intelligence & Progress Project at George Mason University's Mercatus Center (Virginia, US), focuses on how digital technology might become the first widespread consumer of neural technology in the coming decades.
Ball initiates the conversation by mentioning the lack of positivity in the vision of AI use in the future. He mentions the deep connection between AI and humans and how that relationship should become increasingly symbiotic. For him, it is essential to improve the way users communicate with AI.

Therefore, he asks if language, as it is now, is sufficiently developed. His answer is negative, and he even insists that language, or rather the lack of it, is the major limit to the application of AI today. Language, being the product of a variety of thought processes, which remain hidden or internal, raises the question of how we can implement this thought process into AI use. This has been explored in a few recent papers, such as Zelikman et al. (2024), who present Quiet-STaR, "a generalization of Self-Taught Reasoner (StaR) in which Language Models (LMs) learn to generate rationales at each token to explain future text, improving their predictions." Essentially, the authors discuss a model that reads between the lines and creates a rationale that can help generate data and improve communication.
This podcast, rooted in the world of neuroscience, gives access to questions surrounding the use of certain technologies in the future, such as Transcranial Focused Ultrasound (tFUS), which, according to the guest, could embody the future of technological tools enhancing the user experience. For Ball, the communication models should "go both ways: we can discuss with AI models, but they should be able to communicate with us, at a faster and more efficient rate." Indeed, Ball thinks that on an intuitive level, brain-computer interfaces might improve this matter. Therefore, tFUS, which is a non-invasive neuromodulation therapy that uses ultrasound waves to stimulate deeper brain regions, could give access to and improve levels of communication between models and humans. The use of non-invasive technology is, to the guest, non-negotiable, or at least it would avoid certain challenges posed by invasive technologies, such as ethical, regulatory, cybersecurity-related, or logistical issues. While Ball confesses that the literature currently available is largely impervious to the general public, he uses accessible examples to illustrate his point. For example, the use of already existing devices, such as glasses, headphones, or VR headsets, which would be sufficiently powerful to analyze the user's brain activity, could enhance their experience.

"I do think that the next couple of decades will be the most technologically transformative times of any time in human history."

"AI can't understand cause and effect very well without being embodied. Without embodiment, AI is unsafe."

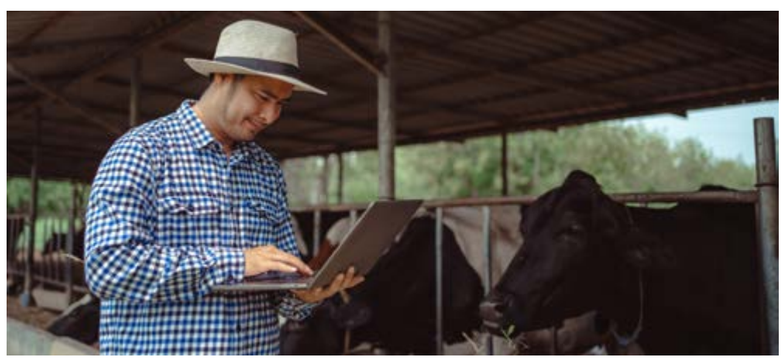
Zelikman, E., Harik, G., Shao, Y., Jayasiri, V., Haber, N., & Goodman, N. D. (2024). Quiet-star: Language models can teach themselves to think before speaking. arXiv preprint arXiv:2403.09629.

Prospective research

Livestock farming in the future?

Torpman, O., Röös, E. Are Animals Needed for Food Supply, Efficient Resource Use, and Sustainable Cropping Systems? An Argumentation Analysis Regarding Livestock Farming. Food Ethics 9, 15 (2024). https://doi.org/10.1007/s410559-00147-4 02-

The authors, affiliated respectively with the Institute for Future Studies (Stockholm, Sweden) and the Swedish University of Agricultural Sciences (Uppsala, Sweden), address the question of the need for livestock farming to feed the world's population, use land more efficiently, and produce manure, thereby improving the sustainability of cropping systems.
The paper focuses on analyzing data in light of arguments in favor of livestock farming in relation to food production. Three main arguments are presented: the nutrition argument, the resource use argument, and the crop production argument.



The **nutrition argument** is divided into two sub-arguments: 1) that livestock farming is needed to supply all the different nutrients required for humans to live healthy lives, and 2) that livestock farming is needed to supply the amounts of food required to feed a growing human population. The first sub-argument is demonstrated to be weak. Above all, the authors point out that it is entirely possible to obtain all the nutrients needed for a healthy life from a diet free of animal products. They do note, however, that it is necessary to provide proper education, support, and sometimes supplementation of some nutrients. The second sub-argument is also demonstrated not to be acceptable in general, based on how livestock farming is performed today. They argue that some livestock farming may be used to address certain specific needs, such as food supply in terms of fat, but not in the way it is currently done.
The **resource use argument** is also divided into two sub-arguments: 1) that livestock farming provides a way of producing food from land that is not suitable for growing crops for human consumption, and 2) that livestock farming provides a way of producing food from crop residues and agri-food byproducts. The first sub-argument is concluded to be acceptable and relevant for justifying livestock farming "given that it provides the only way to use these areas for food production" (p.10). However, the authors mention that this argument can still be questioned, as some of the discussed land could be used for other, non-food-related purposes. The sub-argument related to crop residues and agri-food byproducts is more or less acceptable since, on the one hand, humans could consume more of these residues and byproducts, but on the other, the quantity of animals reared in current livestock systems is not necessary.
The third and final argument, the **crop production argument, is also divided into two sub-arguments: 1)** that livestock farming contributes to more sustainable cropping systems through the inclusion of perennial crops in crop rotations, and 2) that it produces manure needed as fertilizer in crop-based food production. The first sub-argument is valid "only for grass-eating species such as ruminants and horses, and only given that the perennial forage crops are integrated with the cultivation of annual crops in mixed cropping systems" (p.16). The last sub-argument, related to manure, is not acceptable to the authors, especially because livestock farming does not produce phosphorus, nitrogen, or potassium, or at least not in sufficient quantities.

If the nutrients in the crops produced currently worldwide are divided upon the global population, these contain the equivalent of approximately 5810 kcal energy, 143g protein, and 152g fat per person per day. (Ritchie et al. 2018)

Prospective research

Trending 2024 – reckoning with reality – Foresight Factory - (foresightfactory.co)

The report published by the Foresight Factory, entitled Reckoning with Reality, focuses on four main fields: humanity, health, sustainability, and belonging. For each topic, the team of researchers introduces definitions and presents current available data, a case study, and a strategic imperative.

In the first part, the report reflects on what makes us human while we see other forms of intelligence evolve. Introducing trends such as "beyond human," "choice partners," "tech anxiety," and "human encounters," the authors remind us that AI is becoming part of life, even as the conflict between nature and technology continues to grow. The case study listed under the "humanity" chapter shows examples of companies already enhancing human interaction with AI, while others choose to reject AI entirely.

25% of US consumers would be comfortable turning to AI for brand/advisory interactions (e.g., to get customer service help or financial advice), 15% would be comfortable using it for more personal tasks (e.g., to talk to a therapist or get relationship advice), and 13% would be comfortable with both.

In response to the ethical issue's raised by the growing presence of AI, the report offers a number of suggestions, including the establishment of rules and guidelines within organizations, discussions on AI governance, and openness with customers and employees on how to embrace new technologies.

In the part dedicated to health, the report questions the utility of accepted truths and the need to refer to a "back-to-basics" approach. The data presented explore the links between income and wellness. Even though access to resources is still a problem, data show that those with higher income tend to feel healthier. The strategic imperative supported by the researchers is to increase the accessibility of wellness-related activities in order to "reach those more in need" (p.15).

In terms of sustainability, the Foresight Factory questions the responsibility of consumers and brands in protecting the environment. The data presented on p.18 show that globally, many consumers support climate activists, but this feeling is far from universal. Innovations in commercial activities, such as in the car industry, show that companies tend to recalibrate their sustainability shifts, sometimes "scaling back on environmentally friendly products" (p.19). The report advises that attention should be focused on finding ways to reach consumers who might be more resistant to adopting sustainability-friendly behaviors.

The last section is dedicated to the sense of belonging. It questions the ways consumers can feel "part of something bigger than themselves" (p.22) while constantly having to "dance between individualism and community." According to the data presented, it seems that consumers are blaming the increasing influence of social media and technology for decreasing social connection. The authors advise their clients to find ways to engage with their consumers while giving them opportunities to better connect with each other.

Although the report mainly promotes the Foresight Factory's activities, it provides food for thought regarding what should be at the center of companies' priorities in order to deal with future challenges.

25% of US consumers would be comfortable turning to AI for brand/advisory, 15% would be comfortable using it for more personal tasks, and 13% would be comfortable with both.

Globally, many consumers support climate activists, but this feeling is far from universal.

2 Applied research

A label for the ecological transition? Reflections on a government tool.

Penser la transition dans les collectivités locales : les ressources des acteurs du label territorial Cit'ergie – 2022 – M. Pinguat-Charlot - Les réformes de santé en Suède : quelles leçons pour le Québec (usherbrooke.ca)

This article examines the resources available to the French state in the creation and implementation of a targeted "environment and energy" territorial label, entitled "Cit'ergie," aimed at facilitating environmental transition within local authorities. The approach of this paper is interdisciplinary, as the author is affiliated with a geography department (Université de Pau et des Pays de l'Adour, France) but uses a framework drawn from political science.
The Cit'ergie label is the French version of the European Energy Award, a tool introduced by ADEME (Agence de la Transition Écologique) in 2008 to motivate local authorities' commitment to the energy transition.

While the author refers to Foucault (1993) to define the use of the label as a tool of remote governance, she also points out that the processes of decentralization of power by the French state, underway since the 1980s, have given more and more power to the private sector, thereby establishing a logic of territorial competition and rivalry. If the Cit'ergie label is indeed a tool of remote government, it implies a "competitive regulation of territorial cooperation" (Epstein, 2015).
The label provides a framework for local authorities while ensuring that energy transition is put on the political agenda. According to the author, the use of such labels implies and maintains a competitive territorial context, with local authorities committing themselves to ever more projects in order to obtain more funding. A real lever for the state, the Cit'ergie label adds constraints to public action while seeking to reduce negative impacts on the environment. Based primarily on quantitative measures, the label attempts to operationalize the transition by combining technical and sustainability innovations. It acts as a benchmark by assessing solutions for limiting energy consumption by local authorities, for example, through a list of priority indicators such as production rates.
According to the author, the "label serves not only to set limits for supposedly autonomous local agents but also to remind them that decision-making is the responsibility of others" (p.10). Label actors have little room for action and must contend with structural limits. The article focuses on the role of reflexivity in such a situation. According to Pinguat-Charlot, the answer lies in training and the opportunities it can offer, enabling people to evolve in other knowledge systems and thus become vectors of innovation.

"The idea of transition is also the idea of movement. To set oneself in motion is to mobilize, to question."

Epstein, R. (2015). La gouvernance territoriale: une affaire d'État. La dimension verticale de la construction de l'action collective dans les territoires. L'Année sociologique, 66(2), 457- 482.
Foucault, M (1993), Surveiller et punir : naissance de la prison, Paris, Tel Gallimard.

Applied research

Metaverse & extended reality in higher education: analysis

Pregowska, A., Osial, M., & Gajda, A. (2024). What will the education of the future look like? How have the Metaverse and Extended Reality affected higher education systems? Metaverse Basic and Applied Research, 3, 57- 57.

What are the possibilities offered by Metaverse applications in higher education? This is what the authors of this article attempt to answer, on the basis of available data (86 studies were analyzed), as well as their own experiences.

New technologies, ever more present in our lives, have revolutionized many sectors, including education. This article discusses the impact of two of these new technologies: the Metaverse and Extended Reality (XR). The Metaverse, "defined as an open system which contains both augmented objects and mapped objects in the created human scene" (p.2), is based on Web 3.0 technologies, called the successor of the mobile Internet. This paper analyzes the pros and cons of the implementation of the Metaverse and its XR-based system in the education sector, as well as its threats and limitations.

The COVID-19 pandemic accelerated the use of the Metaverse in higher education. Engineering courses are an example of the use of Metaverse and Virtual Reality (VR), especially as a tool to help students understand the theory of introducing machine tool operations. Another example is civil engineering studies, which until recently gave students little or no opportunity to experience real-life environmental disasters (earthquakes, hurricanes, etc.), thus depriving them of an in-depth understanding of resilient building construction systems. The Metaverse application allows students to create a virtual building and expose it to extreme weather conditions, enabling them to better understand margins of error and effectively plan their projects.

The healthcare and medical education sector is by far the most inclined to use technological innovations such as the Metaverse and XR. With these tools, students can simulate real-life situations such as procedures or operations, sometimes combining the virtual and real worlds. For example, XR is a tremendous IT tool for anatomy training. Some training courses have been completely created using these tools, such as 3D Organon and Stanford Virtual Heart, which provide "tools for understanding both human anatomy, including organ anatomy, and their abnormalities in the artificially created virtual world" (p.6).

The authors also mention the ethical aspects of the Metaverse and XR, a subject hitherto relatively little covered by the scientific literature. The ethical balance should above all concern the respect for human and fundamental rights, freedoms, and dignity, while avoiding the pitfalls embodied by potential problems linked to gender, race, religion, or national affiliation. User privacy and digital identities should be the main ethical issues on which to base future considerations.

In conclusion, the Metaverse and XR are undeniably useful tools in education. Their ability to be customized to the individual needs of students and to represent sensory and embodied experiences makes them increasingly interesting for the education sector. They imply an improvement in students' problem-solving and critical thinking skills. However, the authors point out that "nothing can replace human contact" (p.7), and that for the time being, the use of these tools remains limited by their cost and carbon footprint.

Ethical hazards of health data governance in the metaverse | Nature Machine Intelligence s. f. www.nature.com/articles/s4225600658--023-w

"Metaverse technology is in constant development. It is essential to ensure a development that is compatible with the respect for human and fundamental rights, freedom, and human dignity of so-called ethical design."

"Education has been proclaimed one of the main foundations of the sustainable development of societies by UNESCO."

Applied research

How to improve supply chain workforce? A need for skill development and innovation

Adebayo, V. I., Paul, P. O., Jane Osareme, O., & Eyo-Udo, N. L. (2024). Skill development for the future supply chain workforce: Identifying key areas. International Journal of Applied Research in Social Sciences, 6(7), 1346- 1354.

The traditional paradigms of supply chain operations are being reshaped by factors such as automation, artificial intelligence, sustainability concerns, and changing consumer expectations. (Dagnaw, 2020; Muthuswamy & Ali, 2023) This article discusses the skill development needed for the future supply chain workforce by highlighting the role of various stakeholders, such as employers, educational institutions, and policymakers.

Adebayo and his colleagues observe that with the rapid advent of new technologies and the digital transformation of industry, the demand for super-skilled labor is becoming increasingly unavoidable. Firstly, the authors aim to demonstrate that the qualification of the workforce and the learning of in-demand skills are indispensable. Secondly, they explore ways to enhance talent strategies for organizations and stakeholders.

While the classic supply chain has long been defined by a linear model, advances in digital production and new technologies have required a rethink of a model that has been static for too long. Globalization (e.g., trade disputes, pandemics), evolving demand (e.g., e-commerce, personalized products), and geopolitical factors (e.g., tariffs, regional instability) all imply new dynamics. Among other things, automation technologies, artificial intelligence (AI), blockchain technology, and sustainability hold the key to rethinking the future of supply chain management.

As a result, the need to develop new skills is growing all the time. The needs of the supply chain are diversifying, and all have the same objective: to respond to incessant innovation with adapted and renewed skills and knowledge. Whether these skills are technical or soft, they need to be urgently prioritized if organizations are to keep pace with advances. The authors identify three types of skills that require constant renewal: 1) Technical skills, such as data analytics or automation proficiency (robotics, machine learning, etc.); 2) Soft skills, such as adaptability to an ever-changing sector or collaboration skills; 3) Domain-specific knowledge, which demands adopting more responsible strategies, especially due to the new demands in terms of carbon footprint, for instance.

Thus, the authors propose a skill development plan where stakeholders take direct responsibility for developing the skills of their employees. For example, in-house training programs, workshops, seminars, and the facilitation of certified courses are all ways to improve the skill chain. Traditional learning methods must give way to experiential learning, e-learning, and partnerships between private industry players and academic institutions. Last but not least, learning and improving skills must become a skill in itself, one that is always being improved. The authors urge stakeholders to prioritize investment in skill development activities to respond to the challenges and opportunities of the future.

AI-powered solutions, including machine learning algorithms and predictive analytics, are empowering supply chain professionals to make data-driven decisions, optimize demand forecasting, enhance inventory management, and mitigate risks.

Applied research

How to take better care of our students?

Jacob, R., Li, T. Y., Martin, Z., Burren, A., Watson, P., Kant, R., & Wood, D. F. (2020). Taking care of our future doctors: a service evaluation of a medical student mental health service. BMC Medical Education, 20, 1-11.

This research focuses on the well-being of medical students, based on a mixed methodology, including a cross-sectional analysis of 89 responses obtained from students, as well as observations of clinical effectiveness.

"Studies suggest the prevalence may be higher amongst medical students, particularly with respect to anxiety (25.7%), burnout (49.6%), and stress (31.2%)" (Dyrbye et al. 2008, Dahlin et al. 2005, Rotenstein et al. 2016).

It is common knowledge that the emotional and mental state of higher education students is a public health concern worldwide. Numerous studies have been carried out on this issue, highlighting the most widespread stress factors, such as difficulties in dealing with hierarchy, problems of humiliation and bullying, exposure to patient stress, sleep disorders, and pressure to succeed (p.2).

This article attempts to evaluate the effectiveness and lived experience of students attending the Clinical Student Mental Health Service (CSMHS) in Cambridge (UK), created in 2015 and aimed at providing "easy and rapid access to support from a consultant psychiatrist and clinical psychologists" (p.2). The authors evaluated the service provided, outcome measures, as well as students' involvement.

Service coverage, participant demographics, treatments offered, and student feedback are discussed by the authors, who are all affiliated with the Departments of Liaison Psychiatry at Cambridgeshire and Peterborough NHS Foundation Trust and Addenbrooke's Hospital, both based in Cambridge, UK.

One of the strengths of the study is that it covers both quantitative and qualitative data. In addition, the fact that the healthcare professionals involved did not have a superiority relationship with the students helped to reduce the potential concerns of students about confiding in their feedback. The authors also point out that students are not accustomed to seeking help for their mental health, for fear of being stigmatized or jeopardizing their career development. However, the study discussed here shows that a psychiatrically led assessment service, which then provides accurate treatment, is not only beneficial but also welcome.

In conclusion, studies such as these help envision how we can better support students, and thus underpin their future well-being, by improving their mental health, resilience, and indeed, the trajectory and success of their academic careers.

Brazeau CM, Shanafelt T, Durning SJ, et al. Distress among matriculating medical students relative to the general population. Acad Med. 2014;89:1520–5.

Dyrbye LN, Thomas MR, Shanafelt TD, Power DV, Eacker A, Harper W, et al. Burnout and suicidal ideation among U.S. medical students. Ann Intern Med. 2008;149(5):334341-. Available from: https://doi.org/10.732600008-200809020-5-149-4819-0003/.

Dahlin M, Joneborg N, Runeson B. Stress and depression among medical students: a cross-sectional study. Med Educ. 2005;39: 594604-. Available from: https://doi.org/10.1111/j.13652929.2005.02176-.x.

Rotenstein LS, Ramos MA, Torre M, Segal JB, Peluso MJ, Guille C, et al. Prevalence of depression, depressive symptoms, and suicidal ideation among medical students: a systematic review and meta-analysis. JAMA. 2016;316(21):2214-2236. Available from: https://doi.org/10.1001/jama.2016.17324.

"Studies suggest the prevalence may be higher amongst medical students, particularly with respect to anxiety (25.7%), burnout (49.6%) and stress (31.2%)."

"The nature of medical education in itself, may be a factor in students developing mental disorders." (Brazeau, 2014)

Applied research

Are chatbots the future of customer experience?

Lahouij, M. A., & Ferchakhi, W. (2024, March). L'Intelligence Artificielle (IA), accélérateur de l'expérience client? cas des chatbots dans le secteur des assurances et des banques. In Congrès National de la Recherche des IUT.

Who hasn't interacted with a chatbot in the last five years? These "virtual conversational agents," a pure product of the era of digital innovation in which we live, are increasingly present in our lives, whether we want to chat with our bank, keep track of our phone usage, or converse with an airline.
This article, written by two members of marketing technology departments affiliated respectively with the Institut Universitaire de Technologie (IUT) de Robert Schuman Illkirch and the IUT de Colmar (both in France), presents an exploratory qualitative research project designed to better understand the customer experience with chatbots, and the positive and negative points that emerge from it.

The authors base their study on a literature review focused on AI and its applications. For instance, they reference Volle, a professor at Université Paris Dauphine (France), who defines AI as 'a form of human-like intelligence that machines are capable of when performing cognitive functions such as understanding, learning, or problem solving' (in Frimousse & Peretti, 2019). Recent studies on chatbots, in particular, have highlighted the human-like behaviors attributed to these tools by marketing and psychology. Emotions, bodily characteristics, and virtual personalities are all features that companies are trying to integrate into chatbots to enhance the interaction between customers and these AI tools.
The research presented here, carried out with customers in the banking and insurance sectors, is intended to be qualitative and exploratory. The authors' initial aim was to understand the obstacles represented by the use of chatbots in the customer experience. Some forty semi-structured interviews were conducted with French customers. The aim of the research was to answer the question: "To what extent can chatbots improve the customer experience?" (p.2).
The results, analyzed thematically, concern the customer experience as a whole, categorized here into four elements: 1) the hedonic-sensory dimension; 2) the socio-cultural rhetorical dimension; 3) the temporal dimension; and 4) the praxeological dimension. According to these results, the chatbot's anthropomorphic dimension remains indispensable: the more human it seems, the better the customer experience. The bond between the customer and the chatbot is created with greater ease. However, there remains an area of limitation in that the customer is not always confident, particularly when it comes to entrusting personal data (banking data, for example) to a conversational agent.
To conclude, the authors mention "technological anxiety" (p.3) among customers, which is becoming more and more of an issue in a world that tends to be increasingly digitalized and dematerialized. While chatbots are becoming a tool for personalizing the customer experience in many cases, according to Lahouij and Ferchakhi, anthropomorphism could partly address this lack of trust by giving a more solid basis to the interaction between the technological tool and the human customer.

Frimousse, S., & Peretti, J. M. (2019). «Expérience collaborateur» et «Expérience client»: comment l'entreprise peut-elle utiliser l'Intelligence Artificielle pour progresser? Question(s) de management, (1), 135-156.

"The global chatbot market is expected to reach 1.25 billion USD by 2025, with an growth rate of 24.3%."

The chatbot's anthropomorphic dimension remains indispensable: the more human it seems, the better the customer experience.

Applied research

Artificial intelligence in 2024: a comprehensive report

Nestor Maslej, Loredana Fattorini, Raymond Perrault, Vanessa Parli, Anka Reuel, Erik Brynjolfsson, John Etchemendy, Katrina Ligett, Terah Lyons, James Manyika, Juan Carlos Niebles, Yoav Shoham, Russell Wald, and Jack Clark,

The Artificial Intelligence Index Report 2024, published by Stanford University's Human-Centered Artificial Intelligence, covers essential trends in AI such as technical advancements, public perceptions, and geopolitical dynamics around its increasing use.

The report, which is defined by an exceptional variety of topics, gives a particularly detailed picture of the current state of AI. Research and development, technical performance, issues of responsibility, economics and diversity, and the use of AI in medicine and education are all covered in the report.

The first chapter, dedicated to research and development, shows that the industrial sector dominates AI research and that the USA remains the leading source of the top AI models, with 61 models originating in US institutions, compared to 21 in Europe and 15 in China.

The study of patents, as well as research publications and conferences held in 2023, shows that AI research continues to grow, with, for example, 2.6 times more conference publications in 2022 than in 2015.

The next chapter, dedicated to technical performance, gives an overall picture of the technological progress that has taken place in the AI sector in 2023. One of the highlights of this section concerns performance: "AI beats humans on some tasks, but not on all," mention the authors (p.77), with visual commonsense reasoning and planning being examples of where humans are still outperforming technologies. This chapter also gives insights into the flexibility offered by LLMs (Large Language Models), which improve robotic capabilities as well as interactions.

Chapter 3, entitled "Responsible AI," is concerned with the responsible development and deployment of AI systems, aimed at mitigating the risks posed by the growing use of AI. Privacy and data governance, transparency and explainability, safety and security, and fairness are the four key areas of responsible AI analyzed in the report. While some of the highlights are rather pessimistic, such as the lack of standardization or the difficulty of detecting political deepfakes, the chapter provides a solid basis for rethinking a more responsible approach to AI.

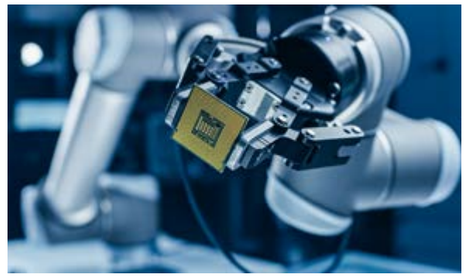
The chapter dedicated to the economy addresses the questions surrounding the growth of AI, especially in the industrial sector. The authors discuss the surge in investments in generative AI, as well as the increase in revenues implied by AI.

The fifth chapter focuses on science and medicine, exploring the scientific achievements in this sector, as well as the innovations it saw in 2023. The authors observe that the scientific sector has benefited greatly from AI, and so has medicine, with remarkable improvements such as the MedQA benchmark, a key test for assessing AI's clinical knowledge.

The chapter on education looks at learning dedicated to AI and computer sciences, as well as the very use of AI as a learning tool. Through data analysis, including the Computing Research Association's Taulbee Survey, the authors demonstrate that both Canadian and American students are interested in studying AI and CS.

"In 2023, industry produced 51 notable machine learning models, while academia contributed only 15."

A new McKinsey survey reveals that 42% of surveyed organizations report cost reductions from implementing AI (including generative AI), and 59% report revenue increases.



Applied research

Artificial intelligence in 2024: a comprehensive report

“The AI Index 2024 Annual Report,” AI Index Steering Committee, Institute for Human-Centered AI, Stanford University, Stanford, CA, April 2024.

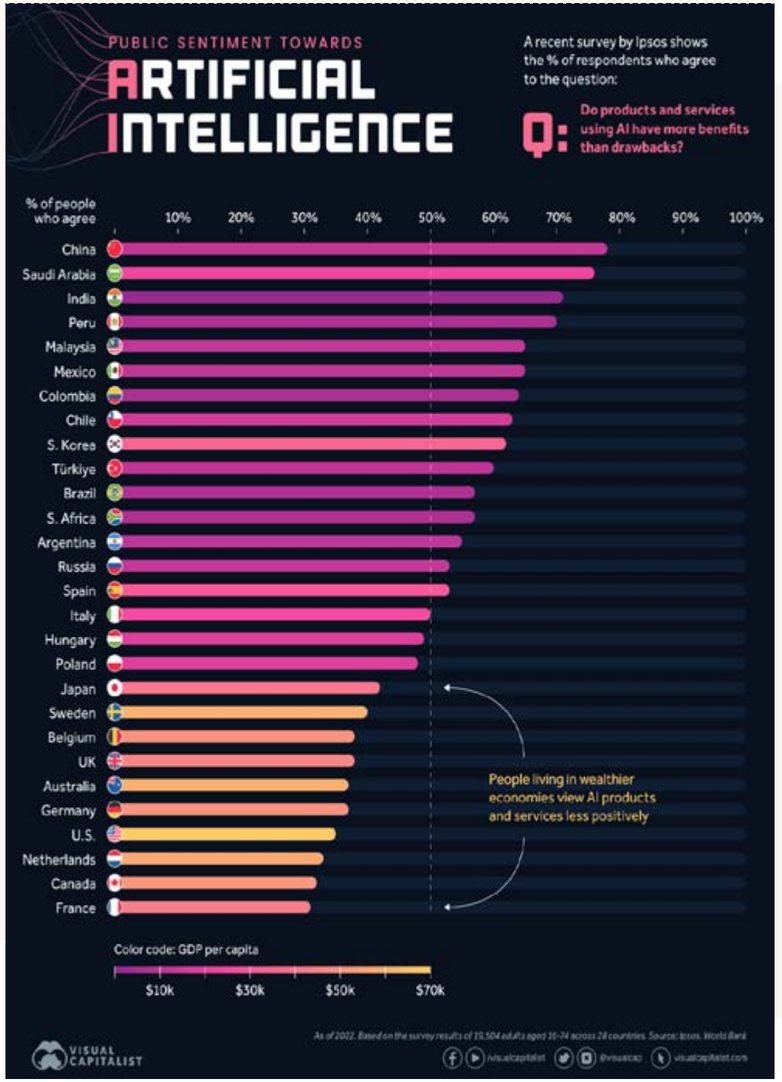
Chapter 7, which reflects on policy and governance issues, demonstrates that policymakers around the world are increasingly aware of the need to develop AI-related policies. In fact, the report states that "policymakers around the world can't stop talking about AI" (p. 369), and that more and more regulatory agencies are focusing on AI regulation, such as the US Department of Transportation, the Department of Energy, and the Occupational Safety and Health Administration. The next chapter focuses on the diversity issues raised by AI. The initial observation is rather alarming since it indicates that, as a considerable number of companies and datasets are based in Western countries, they reflect Western perspectives, thereby implying a lack of diversity that can lead to dangerous biases and inequalities. The report raises a warning to stakeholders to "intensify their endeavors to track diversity trends associated with AI" (p.413).

Finally, Chapter 9 on public opinion points out that it is essential to understand public opinion in order to better anticipate the impact of AI on society. Several data sources are called upon in this chapter, such as survey data from the University of Toronto, which explores the public perception of ChatGPT. The chapter highlights that people around the world have increasing anxiety toward AI, thinking "AI will dramatically affect their lives" (p.438).

The report, which is extremely comprehensive and well put together, gives a clear idea of what AI looks like in 2024. It provides an invaluable source of data on the subject, which can be used by policymakers, researchers, executives, and the general public alike.

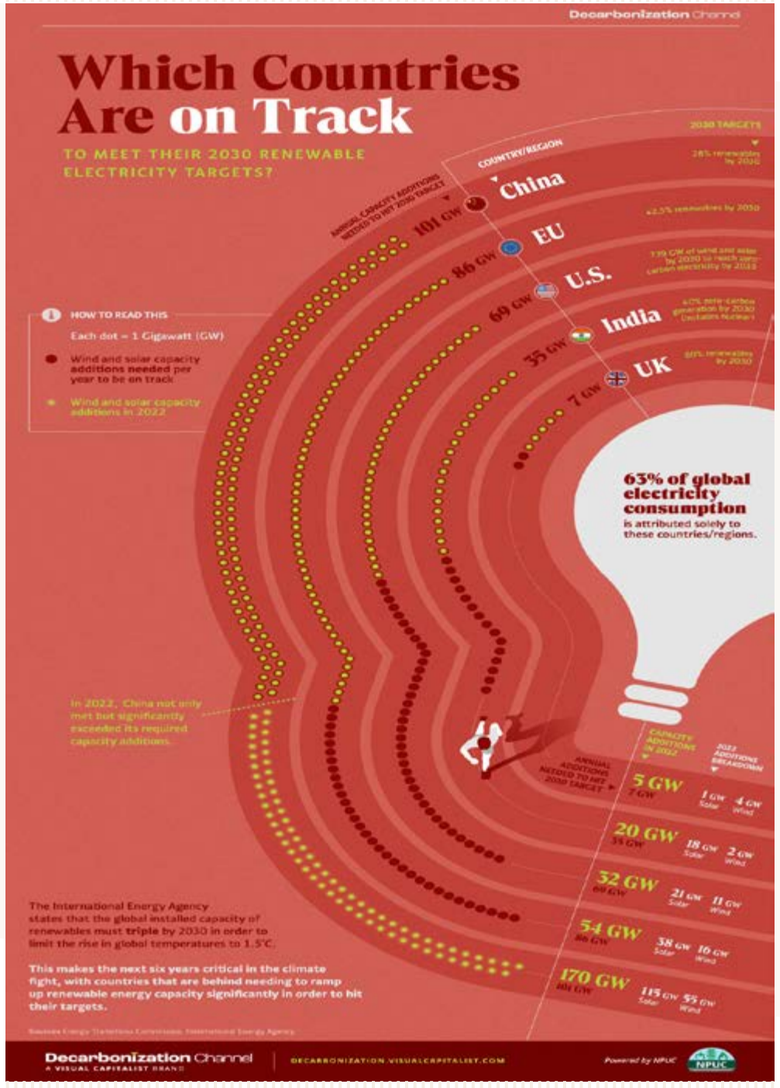
3- The future in numbers

Global Attitudes Towards AI



Marcus Lu, TechnologyVisualizing Global Attitudes Towards AI, Visual Capitalist, May 9, 2023, https://www.visualcapitalist.com/visualizing-global-attitudes-towards-ai/

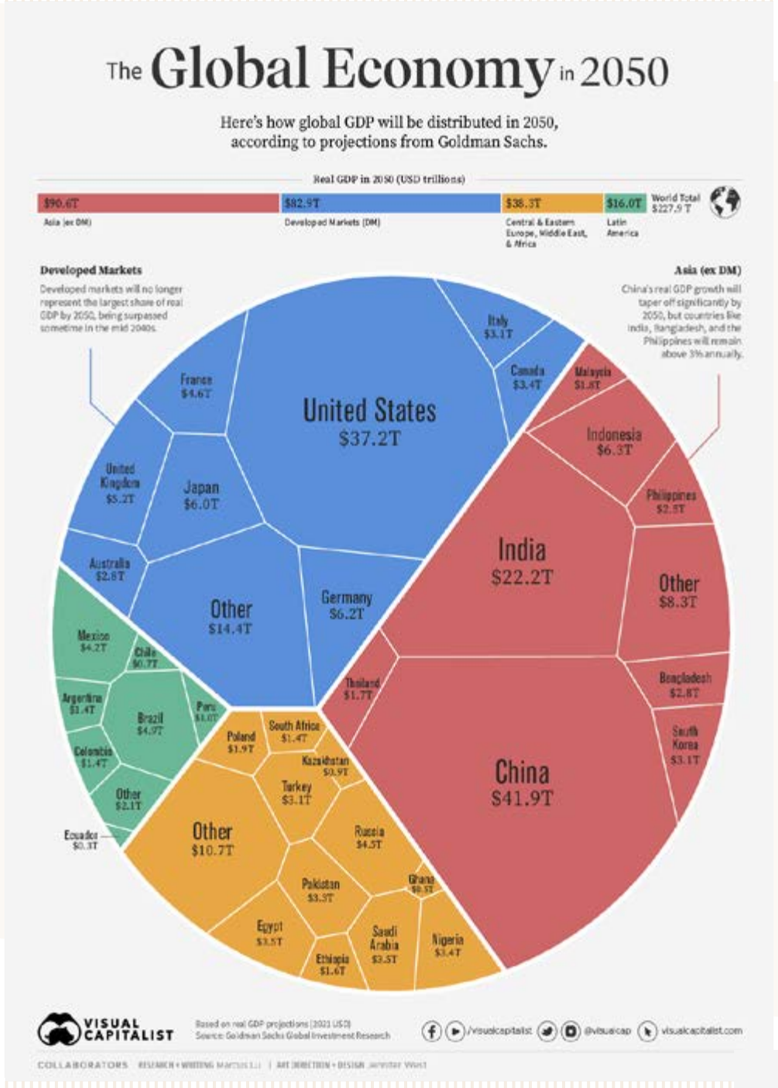
Progress on 2030 Renewable Energy Targets by Country



Selin Oğuz, Progress on 2030 Renewable Energy Targets by Country, Visual Capitalist, November 8, 2023 ,

https://www.visualcapitalist.com/progress-on-2030-renewable-energy-targets-by-country/

Visualizing the Future Global Economy by GDP in 2050



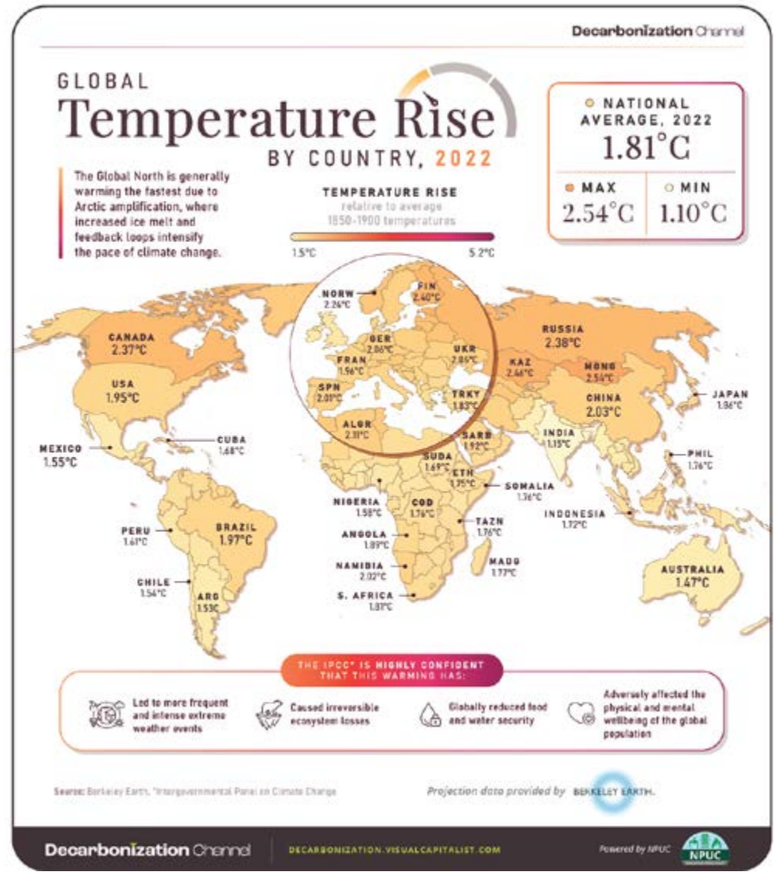
Marcus Lu, Visualizing the Future Global Economy by GDP in 2050, Visual Capitalist, August 22, 2023,

https://www.visualcapitalist.com/visualizing-the-future-global-economy-by-gdp-in-2050/

Ranked: The Top Economies in the World (1980–2075)

Marcus Lu, Ranked: The Top Economies in the World (1980–2075), Visual Capitalist, July 21, 2023,
https://www.visualcapitalist.com/top-economies-in-the-world-19802075-/

Mapped: Global Temperature Rise by Country (2022- 2100)



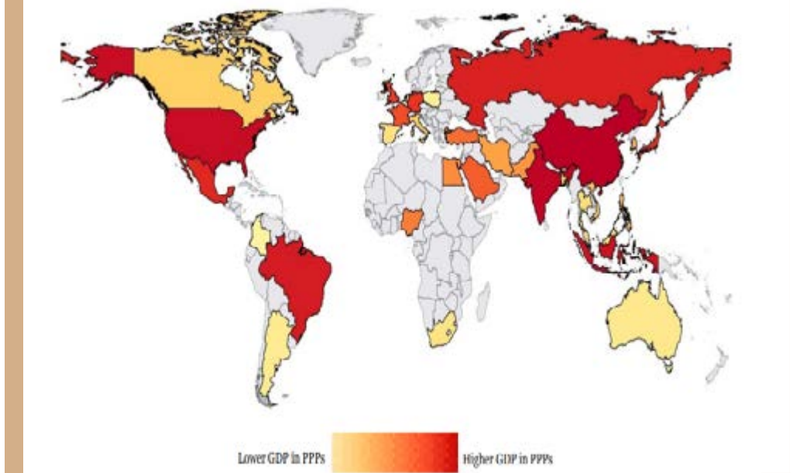
Selin Oğuz, Mapped: Global Temperature Rise by Country (20222100-P), Visual Capitalist, December 10, 2023,
https://www.visualcapitalist.com/mapped-global-temperature-rise-by-country/

Projected Rankings of Economies Based on GDP in PPP (in constant 2016 $bn)

GDP PPP rankings	2016 rankings		2030 rankings		2050 rankings	
	Country	GDP at PPP	Country	Projected GDP at PPP	Country	Projected GDP at PPP
1	China	21269	China	38008	China	58499
2	United States	18562	United States	23475	India	44128
3	India	8721	India	19511	United States	34102
4	Japan	4932	Japan	5606	Indonesia	10502
5	Germany	3979	Indonesia	5424	Brazil	7540
6	Russia	3745	Russia	4736	Russia	7131
7	Brazil	3135	Germany	4707	Mexico	6863
8	Indonesia	3028	Brazil	4439	Japan	6779
9	United Kingdom	2788	Mexico	3661	Germany	6138
10	France	2737	United Kingdom	3638	United Kingdom	5369
11	Mexico	2307	France	3377	Turkey	5184
12	Italy	2221	Turkey	2996	France	4705
13	South Korea	1929	Saudi Arabia	2755	Saudi Arabia	4694
14	Turkey	1906	South Korea	2651	Nigeria	4348
15	Saudi Arabia	1731	Italy	2541	Egypt	4333
16	Spain	1690	Iran	2354	Pakistan	4236
17	Canada	1674	Spain	2159	Iran	3900
18	Iran	1459	Canada	2141	South Korea	3539
19	Australia	1189	Egypt	2049	Philippines	3334
20	Thailand	1161	Pakistan	1868	Vietnam	3176
21	Egypt	1105	Nigeria	1794	Italy	3115
22	Nigeria	1089	Thailand	1732	Canada	3100
23	Poland	1052	Australia	1663	Bangladesh	3064
24	Pakistan	988	Philippines	1615	Malaysia	2815
25	Argentina	879	Malaysia	1506	Thailand	2782
26	Netherlands	866	Poland	1505	Spain	2732
27	Malaysia	864	Argentina	1342	South Africa	2570
28	Philippines	802	Bangladesh	1324	Australia	2564
29	South Africa	736	Vietnam	1303	Argentina	2365
30	Colombia	690	South Africa	1148	Poland	2103
31	Bangladesh	628	Colombia	1111	Colombia	2074
32	Vietnam	505	Netherlands	1080	Netherlands	1496

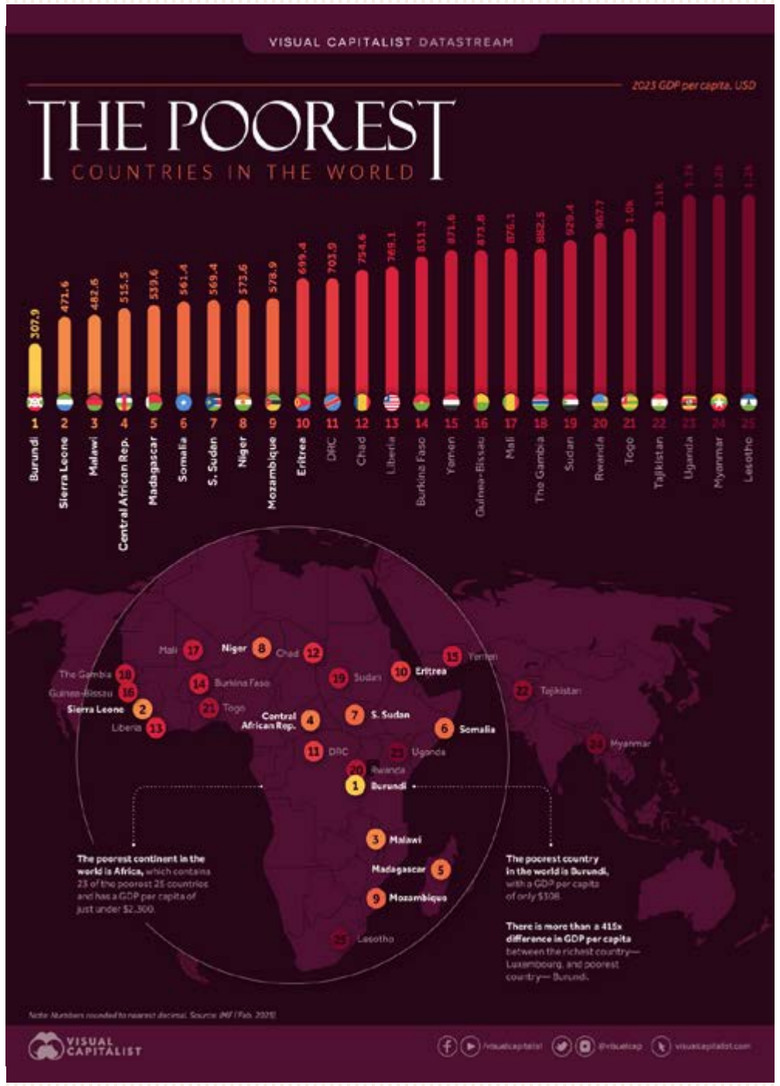
The World in 2050, The long view: how will the global economic order change by 2050?, PwC,
https://www.pwc.com/gx/en/research-insights/economy/the-world-in-2050.html#data

Projected GDP in PPP in 2050



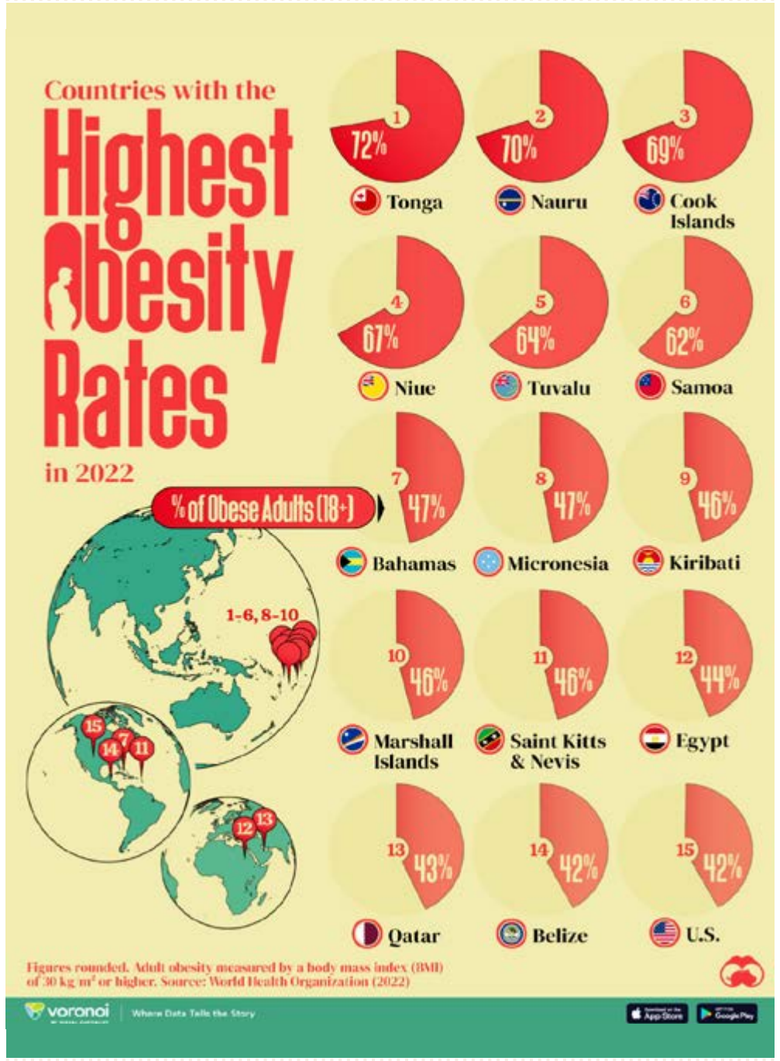
The World in 2050, The long view: how will the global economic order change by 2050?, PwC,
https://www.pwc.com/gx/en/research-insights/economy/the-world-in-2050.html#data

Ranked: The 25 Poorest Countries by GDP per Capita



Pallavi Rao, Ranked: The 25 Poorest Countries by GDP per Capita, Visual Capitalist, March 29, 2023, https://www.visualcapitalist.com/worlds-poorest-countries-2023-gdp-per-capita/

Mapped: Countries With the Highest Adult Obesity Rates



Mapped: Countries With the Highest Adult Obesity Rates, Visual Capitalist, July 20, 2024, https://www.visualcapitalist.com/mapped-countries-with-the-highest-adult-obesity-rates/

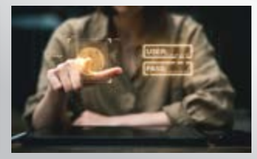
3

Issue No. 03

(October 2024)

FUTURE TRENDS
Report

Issue no. 3 - October 2024



Future Trends Report

Future Trends Report, published in English and Arabic by TRENDS Virtual Office in Montreal, stands out as a distinctive publication dedicated to highlighting:
1. the most important forward-looking studies that aim to identify future trends, analyze various variables that may influence these trends, and determine the best future scenarios.
2. the most important applied studies that explore the application of knowledge, scientific theories, and information to solve current problems and overcome future challenges.
3. the most important illustrative and graphic forms that visually summarize significant studies, helping readers understand the trends and challenges of the future world.

Editorial board

Contents

1 Prospective research

AI & warfare – the inevitable future?

Fatal equations – The lethal impact of algorithms in wars, Solveij Mailander, July 2024 - https://farsight.cifs.dk/fatal-equations/

The "disregard for thorough assessment and ethical consideration not only highlights the alarming dehumanization inherent in autonomous warfare, but also underscores the potential for – and exemplifies – the catastrophic consequences that can ensue when machines are entrusted with life-and-death decisions."

Solveij Mailänder, a research fellow at Oxford University's Future of Humanity Institute, explores the ethical and societal implications of using Artificial Intelligence (AI) in warfare. Her July 2024 article examines the moral concerns surrounding AI by referencing a case study on the everyday use of ChatGPT. She highlights the discomfort that can arise from relying on AI for daily decisions, as illustrated by Maxwell Strachan's experience in "I Asked ChatGPT to Control My Life, and It Immediately Fell Apart" (Vice, 2023).

Initially, outsourcing daily decisions to AI might seem harmless, but Mailänder delves into the more troubling ethical questions related to AI's role in warfare. She underscores the historical connection between the tech industry and the military, citing the example of companies like Anduril, which develop autonomous weapons systems. Anduril's AI-powered drones have led to significant contracts with the US military, highlighting the increasing use of AI in combat.

Mailänder points to disturbing instances, such as the Israeli military's use of the 'Lavender' autonomous system in Gaza. This system, operating with minimal human oversight, has facilitated airstrikes that sometimes target individuals with imprecise ammunition, often harming civilians and their families. Such developments provoke serious concerns about the moral implications of AI-driven decision-making in conflict zones.

The article questions who should make critical decisions in warfare and critiques the growing detachment associated with AI. Historically, new technologies have transformed warfare, as seen with the use of drones in the Vietnam War. Mailänder notes that AI lacks the moral and emotional capabilities inherent to human decision-making. Critics argue that remote warfare, facilitated by AI, involves an emotional detachment that undermines the ethical considerations crucial to conflict.

As AI technology advances, Mailänder urges caution. While AI systems may evolve and become more capable, their decisions could have profound life-and-death consequences. The integration of AI in warfare demands careful consideration of the human element, questioning whether such decisions should be left to machines or remain under human control.

The Vietnam War served as a pivotal testing ground for American drone technology, which in turn led to a transition toward surveillance-focused operations and a subsequent adoption of the "electronic battlefield" approach.

In the early 2000s, with the onset of the War on Terror, weaponised drones started populating the skies, engaging in what soon would become termed "joystick warfare."

Prospective research

A painless future

The painless future – August Leo Liljenberg, July 2024 - /https://farsight.cifs.dk/the-painless-future

In this article, the author reflects on our vision of pain, and its usefulness (or lack of it) in our lives. From the perseverance derived from it in the Christian religion to the four "noble truths" of Buddhism concerned with the repression of desire, suffering seems to be an integral part of our immutable realities. However, some believe that it is possible, and even necessary, to walk towards a new reality where suffering no longer exists.

The author refers to the work of philosopher David Pearce, in favor of an "abolitionist" project aimed at eliminating human suffering. The co-founder of the World Transhumanist Association (renamed Humanity+) is a fervent proponent of the idea of a "moral duty to eradicate all suffering via advanced biotechnology". Pearce asserts that the abolition of all suffering would result in "civilizing the pleasure-pain axis and eventually turning it into a pleasure-super pleasure axis".

Critics of that project explain their argument by the usefulness of feeling pain, and give as an example patients with Congenital Sensitivity to Pain (CIP), for whom daily life is difficult, being deprived of the body's mechanisms to protect itself from harm. As for Pearce, he blames "status-quo bias", the idea that we're stuck in a comfort zone rather than thinking about a future that's light-years away from what our bodies feel daily.

The issue here is biotechnological developments, and how they might maximize the human experience of life. But doubts about these uses of recent biotech discoveries cannot erase the idea that "altering a law of nature is fundamentally wrong". Other questions arise, such as the future of arts, if indeed it does sometimes depict suffering itself. Shall the abolitionist project see the light of day, will humanity find Shakespeare's tragedies incomprehensible? Similarly, will the privileged elite have easier access to this "life without suffering", thereby increasing inequality?

In fact, the author even ends up likening Pearce's theses to eugenics, which Pearce hastens to correct with a less negatively charged term: "genome reformist". The article's final question concerns death and the need for grievance when a loved one passes away. Should this become a hedonist experience?

"What does 'abolishing suffering' mean in practice?"

"500 or 5000 years from now, people will still be sitting around wondering why there is so much suffering in the world."
David Pearce, philosopher and transhumanist, suffering-abolitionist

Prospective research

A view of the economic future – what will 2050 look like?

The long view – How will the global economic order change by 2050? – February 2017 – PwC. https://www.pwc.com/gx/en/world-2050/assets/pwc-the-world-in-2050-full-report-feb-2017.pdf

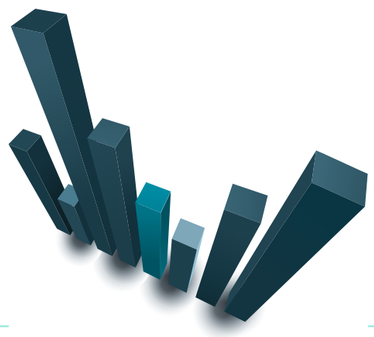
The report published by PwC in 2017 proposes to question the world's economic future between now and 2050, based on projections in terms of demographics, capital investment, education levels and technological progress. The report is aimed at a variety of audiences, from academics to policymakers, investors and economic commentators. Basing their projections in particular on the GDP estimates published in the International Monetary Fund's World Economic Outlook (October 2016), the authors attempt to sketch out the future trends of what the global economy will look like 25 years from now.

The GDP projections, for example, are based on the idea that global economic growth will be led primarily by the emerging market economies. The report predicts that economies like Mexico and Indonesia "are likely to be larger than the UK and France", while Nigeria could become the fastest growing African economy, if it diversifies its economy away from oil and strengthens its institutions and infrastructures.

While the authors predict that today's most advanced economies will remain in the lead in terms of average income, they also predict that emerging economies will make progress towards narrowing this gap between developed and emerging countries.

The value of this report also lies in the fact that it is aimed at policymakers, addressing certain challenges in maintaining sustainable growth. For example, the report details the major potential of certain economies, while laying down certain conditions, such as "sustained and effective investment in education, infrastructure and technology" (p.10). The authors also recommend that governments dedicate efforts to tackle climate change in order to maintain a long-term growth. Other challenges are described, such as demographic challenges like aging population. The example of Poland given on p.44 is particularly striking, since it presents the case of a population which, according to the report, will decrease approximately by 0.4% per annum over the period to 2050, which will weaken the growth tremendously. Again, efforts towards more sustainable growth are needed, moving from generous social policy to innovation-based economic growth, based on government-led industrial and scientific initiatives.

Finally, the report concludes with advice for companies operating in emerging markets, developing strategies around operational efficiency, innovation and go-to-market excellence. These tips illustrate the optimism of PwC's report, which places confidence in governments and businesses alike to meet the challenges of the future.



"By 2050 we project China will be the largest economy in the world by a significant margin, while India could have edged past the US into second place and Indonesia have risen to fourth place." (p.3)

"By 2050, the E7 economies could have increased their share of world GDP from around 35% to almost 50%" (p.5)

Note for the designers: please note there are many interesting graphs in the report itself

Prospective research

The combat against organized crime – a two-year prospect

Stratégie 20242026- – De nouvelles façons de penser et d'agir – Global initiative against organized crime, February 2024, https://globalinitiative.net/wp-content/uploads/202402//Strategie-2024%E2932026-%80%GI-TOC-Fevrier-2024.v1.pdf

The Global Initiative Against Transnational Organized Crime (GI-TOC) is an international network of 600 experts founded in 2013, aimed at fostering debate and developing innovative strategies to combat organized crime globally. The February 2024 report outlines GI-TOC's strategic plan for the next two years to tackle vulnerabilities created by organized crime and mitigate its impact on people, businesses, governments, and the environment.

The report introduces GI-TOC's "theory of change," which focuses on reducing organized crime and its detrimental effects. It proposes four key areas of action: 1) enhancing analytical work and data; 2) disrupting criminal markets; 3) building resilience; and 4) creating inclusive action networks.

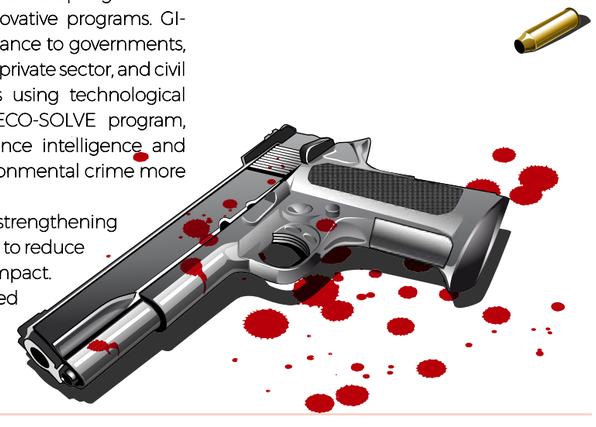
First, GI-TOC plans to improve analytical work by conducting research on illicit economies to better understand and respond to organized crime. This includes expanding publications based on the Global Organized Crime Index and addressing emerging crime types. Activities include raising awareness in regions like Central Asia and developing an online platform to share best practices in combating organized crime.

The second area involves disrupting criminal markets through innovative programs. GI-TOC will provide guidance to governments, law enforcement, the private sector, and civil society. This includes using technological tools, such as the ECO-SOLVE program, which aims to enhance intelligence and data to combat environmental crime more effectively.

The third focus is on strengthening community resilience to reduce organized crime's impact. GI-TOC has established a Resilience Fund supporting individuals and groups in over 50 countries and plans to increase funding and develop tools for sharing experiences and strategies to enhance community resilience.

Additionally, GI-TOC aims to build global action networks, exemplified by proposed collaborations with UNODC and INTERPOL. This includes forming annual partnerships with private sector entities to strengthen global efforts against organized crime.

Finally, the report emphasizes improving GI-TOC's operational efficiency through an Enterprise Resource Planning (ERP) system for better integration of functions and project audits to enhance performance, with a focus on staff well-being.



GI-TOC's theory of change focuses on four areas of action: 1) analytical work; 2) disrupting criminal markets; 3) building resilience; and 4) creating inclusive networks.

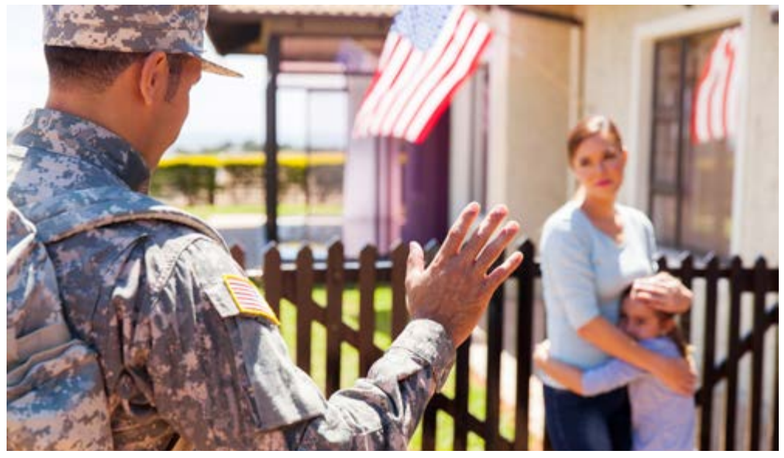
"Reducing organized crime and mitigating its negative impact on people, the environment, businesses and governments."

Prospective research

What do young people think about war?

Anne Muxel, Les jeunes et la guerre – Représentations et dispositions à l'engagement, Étude 116, IRSEM, April 2024 - https://www.irsem.fr/media/5-publications/etude-116-muxel-les-jeunes-et-la-guerre.pdf

In April 2024, ISERM (Institut de Recherche Stratégique de l'École Militaire, France) published a study examining young people's perceptions of war. ISERM, affiliated with the French Ministry of the Armed Forces, conducts research on war, defense, and security. This study, based on a quantitative online survey of 2,301 French individuals aged 18 to 25, explores young people's knowledge of war, their concerns, future visions, risk perceptions, and willingness to engage.



The findings reveal that 52% of young people have an interest in military issues, though only 15% express strong interest. Interest varies by gender, with young men showing more interest than young women (21% vs. 10%). The study suggests that ideological orientation affects interest in war, with right-leaning ideologies often linked to greater military interest. Factors such as family influence, media consumption, and exposure to films, video games, and conspiracy theories also play a role in shaping interest.

For instance, a related survey of Sciences Po students found that 14% of this educated group believed that the 911/ attacks were orchestrated by the CIA, not Osama Bin Laden. In contrast, 31% of the surveyed young people in the ISERM study supported this conspiracy theory, highlighting a significant portion of French youth still influenced by such beliefs over two decades after the events.

The study emphasizes that while young people are relatively informed about current conflicts, their views on war are shaped by various media and ideological influences. They recognize terrorism and biological weapons as major future threats but do not foresee new forms of warfare that deviate from traditional concepts.

Overall, the study sheds light on the complex ways in which young people understand and relate to war, influenced by ideological, familial, and media factors, and underscores the need for nuanced engagement with these issues.

To answer the initial research question, Muxel concludes that "young people are in a relationship of relative proximity with the military universe" (p.91), and that they would constitute a solid potential for resilience and support, in the event of a major conflict.

52% of young people have an interest in military issues, though only 15% express strong interest. Young men show more interest than young women (21% vs. 10%).

Young people would constitute a solid potential for resilience and support in the event of a major conflict.

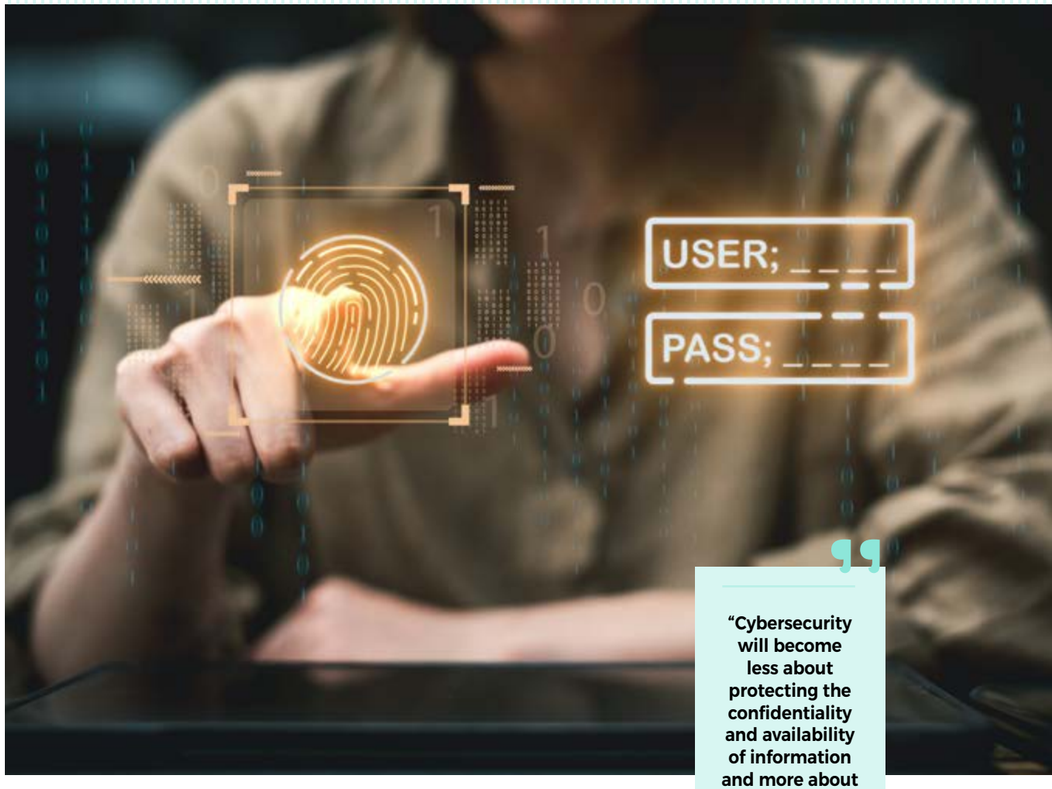
Note for the designers: please note there are many interesting graphs in the report itself

2 Applied research

The future of cybersecurity: findings and insights

Cybersecurity Futures 2030 – World Economic Forum, 2023, https://www3.weforum.org/docs/WEF_Cybersecurity_Futures_2030_New_Foundations_2023.pdf

The Cybersecurity Future 2030 was published by the UC Berkeley Center for Long-Term Cybersecurity (CLTC), the World Economic Forum Centre for Cybersecurity and CNA's Institute for Public Research. The report brings together findings and insights, observations and variances to lay the groundwork for thinking about the strengths, weaknesses and objectives of cybersecurity in the years ahead.



The first part is a collection of observations, based on the results of a series of in-depth workshops held in six international locations (Dubai, Washington DC, Kigali, New Dehli, Singapore and virtually in a few European countries), revealing the challenges, uncertainties and opportunities represented by today's cybersecurity landscape.
Innovations in the world of technology are accelerating daily, both in a licit and illicit way. The increase in mis- and disinformation, the risk of cyber-attacks, the lack of trusted and expert regulatory bodies in some regions are all challenges with which decision-makers have to contend
Therefore, according to the authors of this report, it is necessary to take advantage of the opportunities offered by the world of cybersecurity, such as the multiplication of public-private partnerships, the exchange of standard-setting processes between developing countries and those who have become 'trusted brands' in the field, or the strategic use of regulations designed to guard against the downsides of AI products.
The findings of this report will greatly help decision-makers (government, industry, academia and civil society) to understand the risks and challenges posed by cybersecurity and take initiative to mitigate the risks and securely harness the technological progress.

"Cybersecurity will become less about protecting the confidentiality and availability of information and more about protecting its integrity and provenance."

"Countries should form and strengthen trusted research institutions, particularly in less-developed economies, to support governments in addressing the most challenging social and technical cybersecurity problems of 2030."

Applied research

Topic models in applied settings: encoding knowledge through direct iterative refinement

Gao, Sally, Milda Norkute, and Abhinav Agrawal. "Evaluating Interactive Topic Models in Applied Settings." In Extended Abstracts of the CHI Conference on Human Factors

This paper, written by three members of the Thomson Reuters Labs, a content-driven technology company who curates and classifies data to support professionals, is a case study designed to "assess the impact of human refinement on model interpretability and predictive performance in collaboration with an analytics team" withing their organization. More specifically, the authors question the usefulness of an interactive topic model, a statistical modelling technique, which would enable non-expert users to "encode their knowledge (...) through direct iterative refinement." Human-in-the-loop topic modeling (HLTM) enables users to create their own topic models, thus ensuring a custom-built interface that is supposed to facilitate performance.

"Topic modeling is a text analysis technique for automatically discovering common themes in a collection of documents." (p.1)

The research is based on responses to an employee satisfaction survey, conducted between 2022 and 2024, among Thomson Reuters employees, with the main objective of understanding whether a custom-built HLTM solution would better serve the employees, by providing human feedback, identifying issues more rapidly, and creating an interactive setting. It should be noted here that, until this study, HLTM research had only been carried out in experimental environments, far from the "real-world applied settings" that this case study represents.

The study concludes on a positive note, since the users questioned were enthusiastic about the HLTM tool. However, the value of this research also lies in the fact that the authors recommend ways forward for improving topic modelling. Indeed, the project identified weaknesses and gaps that need to be addressed in order to improve the tool going forward.

For example, issues of performance (such as being able to "assign appropriate topics to future documents") or interpretability (i.e. making topics meaningful to end users) must be among the priorities in improving the HLTM tool. In addition, the authors suggest that, moving forward, we need to find ways to improve users' understanding of the tool and decisions around documents, and "help users validate that the model is behaving according to their intentions during refinement" (p.7).

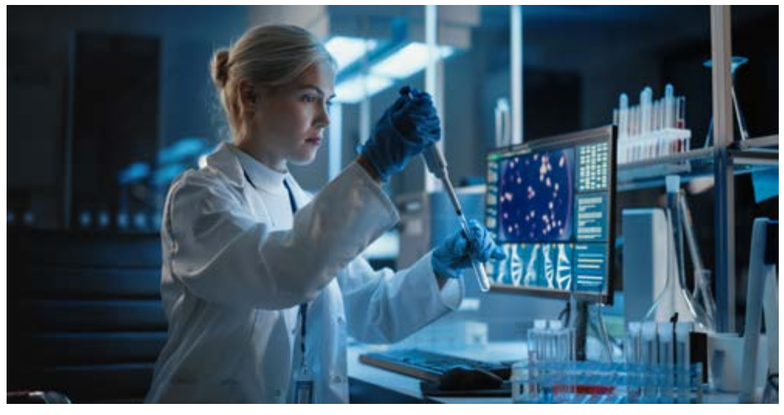
We need to improve users' understanding of the tool and decisions around documents, and help them validate that the model is behaving according to their intentions during refinement.

Applied research

Research and public health: a need for the future

McLaren, L., Braitstein, P., Buckeridge, D., Contandriopoulos, D., Creatore, M. I., Faulkner, G., & Smylie, J. (2019). Why public health matters today and tomorrow: the role of applied public health research. Canadian Journal of Public Health, 110, 317- 322.

The authors of this article published in 2019, all researchers at the Applied Public Health Chair (APHC), a "program designed to support innovation in population health research that improves health equity for citizens in Canada and around the world", reflect together on efforts that could be made to strengthen public health in Canada and globally.



The proposals made here are based on applied research, enabled by APHC's program focused on "interdisciplinary collaborations and mentoring of researchers and decision-makers in health and other sectors." Research themes include healthy public policy, supportive environments, diverse methodological approaches, global health and health equity (p.318).

For the authors, applied public health research rests on three fundamental principles that intertwine, support and reinforce each other: sustainability (in the approach of public health), equity (i.e. a "worldview concerned with the systemic drivers of unfair distributions of health-damaging experiences") and effectiveness (in the impacts for the populations' wellbeing). In order to ensure that these three pillars are solid, it is first necessary to ensure the researcher's complete autonomy. Defined as "the capacity to devote time and energy to activities that, at the researcher's discretion, facilitate research that embraces principles of sustainability, effectiveness and equity" (p.320), autonomy enables the researcher to navigate freely between institutions, governments, communities and any other actors and sectors that might have an impact on public health.

Furthermore, the authors argue that applied research can only succeed if funding is available to support cross-sectoral research programs. By increasing funding competitions, researchers could open their networks, and increase knowledge co-creation, as well as knowledge transfer. Partnerships should also be a key priority, as they enable researchers to gain skills and experience to navigate the contexts in which they intervene.

"A robust applied public health research community requires sustained funding to support foundations of a credible and internationally-competitive research program."

"Public health is critical to a healthy, fair, and sustainable society."

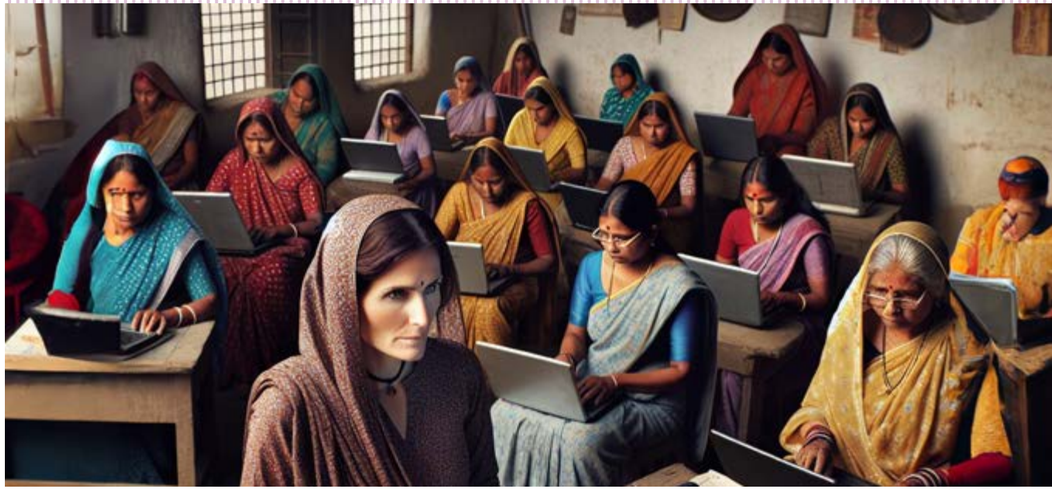
Autonomy enables the researcher to navigate freely between institutions, governments, communities and any other actors and sectors that might have an impact on public health

Applied research

Empowering women through education

Jaysawal, N., & Saha, S. (2023). Role of education in women empowerment. International Journal of Applied Research, 9(4), 0813-.

The authors of this paper, both professors in the Department of Social Work at Visva-Bharati (West Bengal, India), discuss the different ways in which education can increase women's empowerment today. Defined as "the process of enabling or authorizing individual to think, take action and control work in an autonomous way (Bhat, 2015; Kaur, 2018), empowerment implies liberation from oppression, as well as the reconfiguration of a variety of social and economic relationships.



Here, the authors present the results of a study based on a descriptive research design, through data collected from secondary sources, analyzed using meta-analyses, systematic reviews and literature reviews. Following a review of the evolution of women's education in India, the article focuses on the role of education in women's empowerment. The beneficial effects of education are described here as effectively empowering, at several levels: socio-cultural, economic, interpersonal, legal, political and psychological. Therefore, investing in education should be a priority, as it impacts not only individuals but also the nation.

The researchers present the various ways in which education can strengthen women, for example through their participation in public affairs. Acquiring knowledge will boost women's self-confidence and enable them to "resist all forms of exploitation" (p.10). As far as financial independence is concerned, empowering women will enable them to secure a better income, plan their finances and feel less dependent. Psychological empowerment must also be a priority, as it enables women to regain their sense of self, reduce isolation and feel more in control of their lives.

In conclusion, the authors point out that, despite their country's independence, it seems that women remain in a position of inequality on many levels. Education must eradicate gender stereotypes, and increase women's chances of achieving a more comfortable, less dependent and freer standard of living.

"If you educate a man, you educate an individual, however, if you educate a woman you educate a whole family." Nehru.

Education must eradicate gender stereotypes, and increase women's chances of achieving a more comfortable, less dependent and freer standard of living.

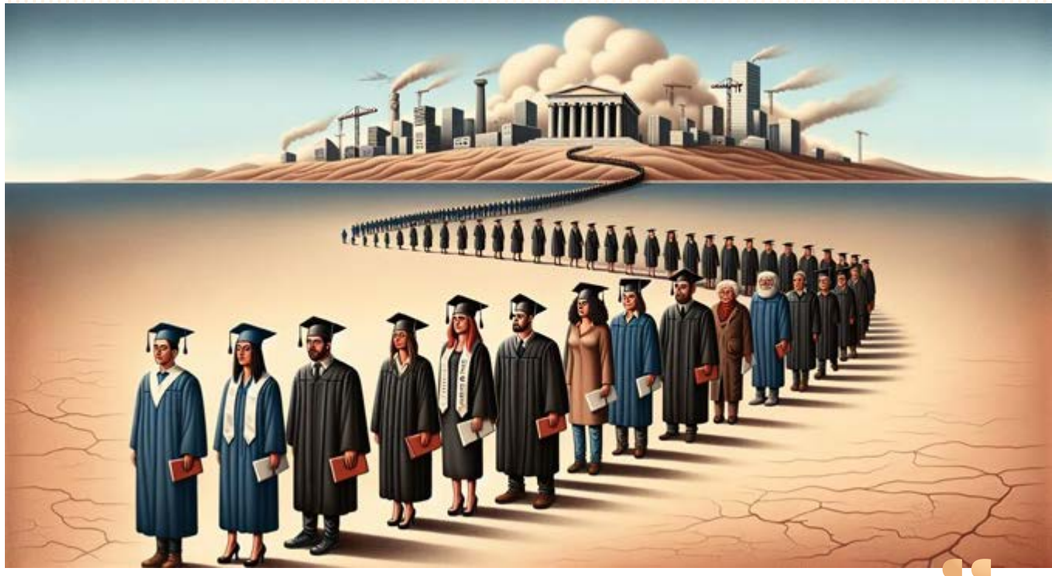
Bhat RA. Role of Education in the Empowerment of Women in India. Journal of Education and Practice. 2015;6(10):188192-
Kaur J. Role of Education in Women Empowerment in India. International Journal of Social Science and Economic Research. 2018;3(12):74667472-.

Applied research

Migration of skilled professionals: brain drain or brain gain?

Bhardwaj, B., & Sharma, D. (2023). Migration of skilled professionals across the border: Brain drain or brain gain? European Management Journal, 41(6), 1021- 1033.

This article reviews the literature on skilled migration, brain gain and brain drain. The 75 studies synthesized here respond to a lack of recent research on theorizing the causes as well as the outcomes of migration. Economic migration is not the only explanation for brain drain. "A national-level environment, adequate rules, strong property rights and research infrastructures may all play a role" (p.1022). The authors, members of HPKV Business School (Central University of Himachal Pradesh, India) attempt to answer here the enablers of migration for skilled professional, as well as the negative and positive outcomes of this drastic decision.



First, the authors explain how they have attempted to approach the cross-border migration of skilled professionals such as scientists, doctors and engineers from a behavioral perspective. To do this, they used Maslow's hierarchy of needs (1948) and Herzberg's theories (1968). Using key words and exclusion criteria, the authors selected articles from the Scopus database, focusing on studies dealing with the drivers of skilled migration and the consequences of migration (brain drain or brain gain).

While neoclassical macroeconomic theory (research of a higher income) and microeconomics (cost-benefit analysis) have been used, the theory of new economies challenges the presumptions suggested until now. According to this theory, the decision to migrate is based above all on "better prospects and opportunities for families". The most recent research stresses the "human resource aspects", and not just the economic aspect. Maslow's hierarchy helps the authors to identify that, while professionals used to migrate in search of a better source of income, they now migrate in order to meet their "higher-order motivational needs", namely self-actualization and self-esteem (Maslow, 1943). Other factors, such as "technological advancement, standard of living, and quality of work life" are presented here.

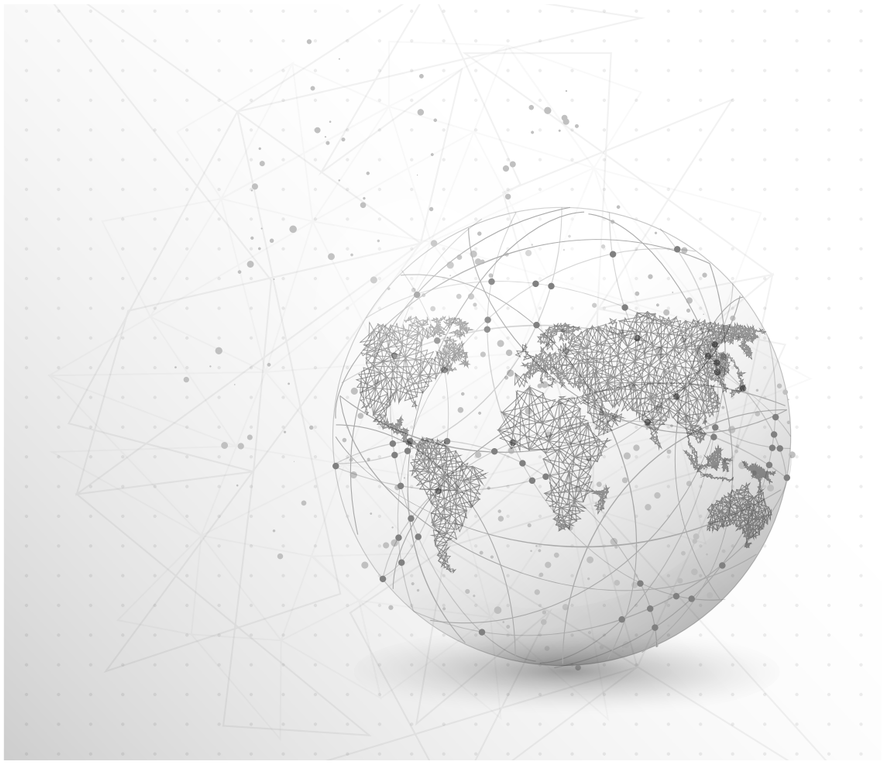
Finally, the authors conclude by questioning the theories that would suggest that skilled migration necessarily results in a brain drain for the country of emigration, and a brain gain for the country of immigration. According to Bhardwaj and Sharma, the impact of skilled migration is bidirectional, naming just a few of the paybacks it represents (investment and trade flows, technology transfer, remittances, charitable activities).

"A national-level environment, adequate rules, strong property rights and research infrastructures may all play a role."

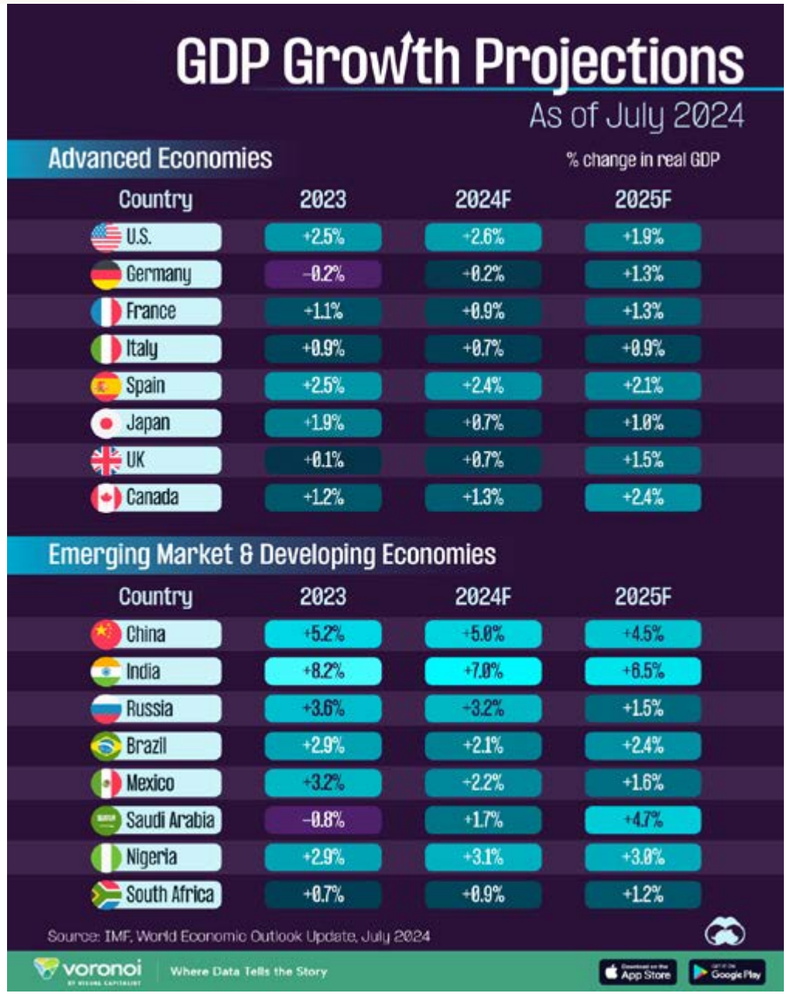
According to the UN, nearly 3.25 percent of people worldwide reside outside of their country of birth, and one of the primary reasons for this is employment (UN, 2016).

Herzberg, F. (1968). One more time: How do you motivate employees (Vol. 65). Boston, MA: Harvard Business Review.
Maslow, A. H. (1943). A theory of human motivation. Psychological Review google schola, 2, 2128-.

3 The future in numbers

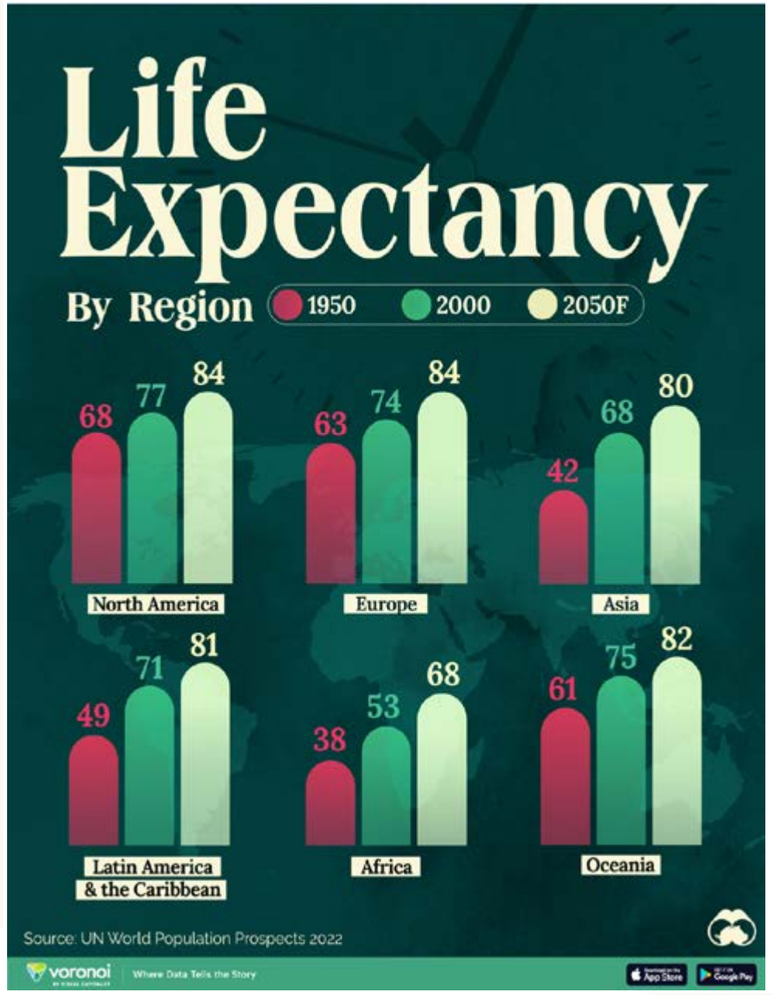


GDP Growth Projections for Key Economies (2024-2025)

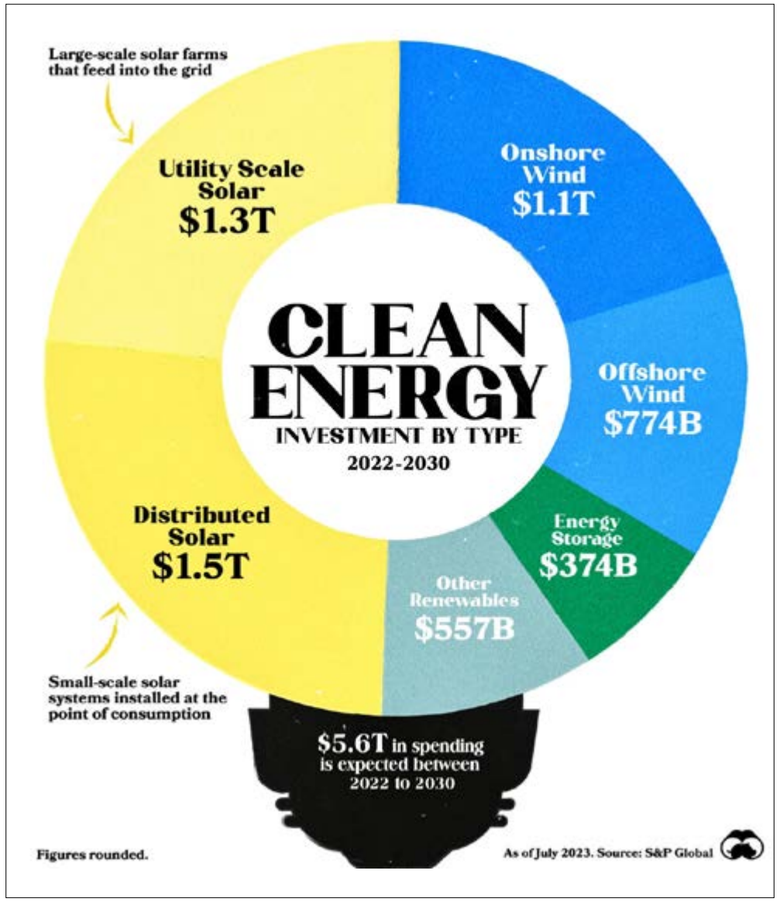


Population Growth by Region (1900–2050)

Life Expectancy by Region (1950–2050)

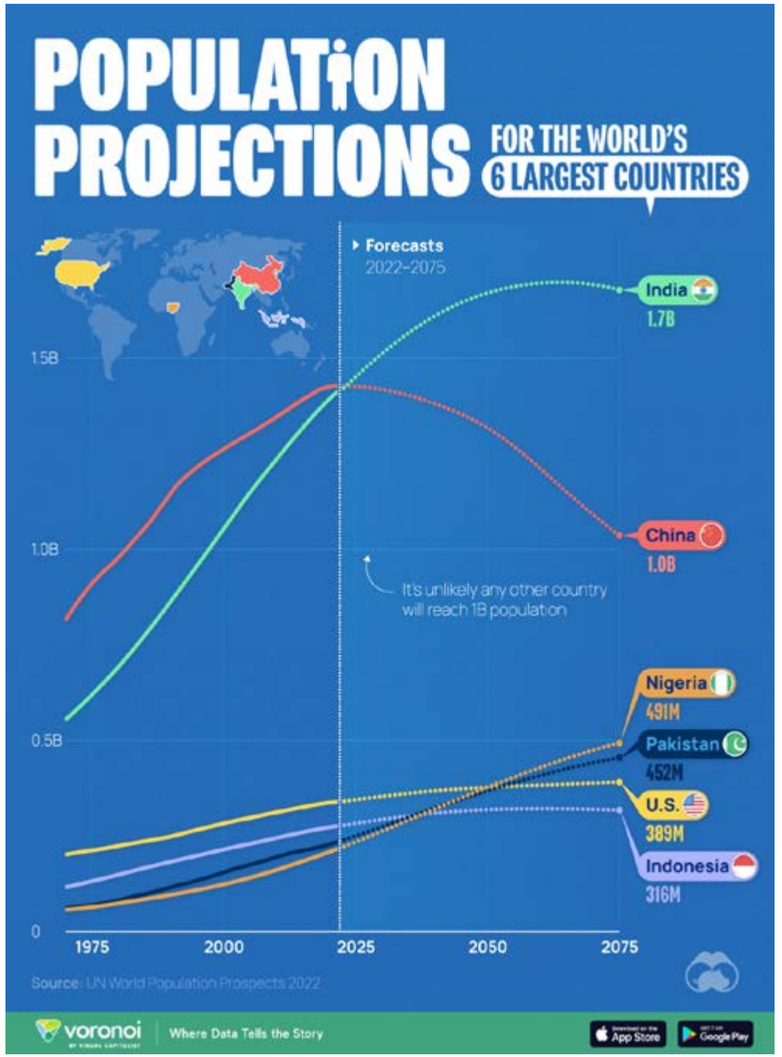


Global Clean Energy Spending Forecasts (2022-2030)



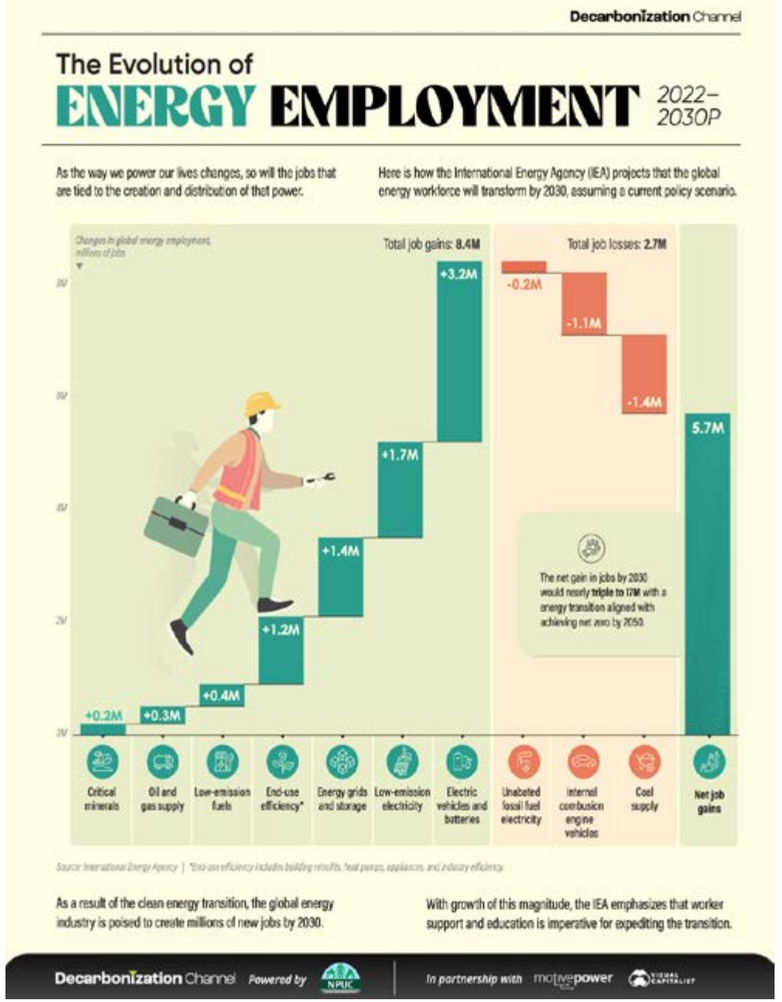
Pallavi Rao, Ranked: The 25 Poorest Countries by GDP per Capita, Visual Capitalist, March 29, 2023, https://www.visualcapitalist.com/worlds-poorest-countries-2023-gdp-per-capita/

The World's 6 Largest Countries in 2075



The Top Economies in the World (1980–2075)

The Evolution of Energy Employment (2022–2030)



4

Issue No. 04

(Novmber 2024)

FUTURE TRENDS

Report

Issue no. 4 - Novmber 2024

TRENDS RESEARCH & ADVISORY

Future Trends Report

Future Trends Report, published in English and Arabic by TRENDS Virtual Office in Montreal, stands out as a distinctive publication dedicated to highlighting:
1. the most important forward-looking studies that aim to identify future trends, analyze various variables that may influence these trends, and determine the best future scenarios.
2. the most important applied studies that explore the application of knowledge, scientific theories, and information to solve current problems and overcome future challenges.
3. the most important illustrative and graphic forms that visually summarize significant studies, helping readers understand the trends and challenges of the future world.

Editorial board

Contents

1 Prospective research

Transition 2050, choisir maintenant, agir pour le climat, rapport ADEME 2021

https://librairie.ademe.fr/ged/6531/transitions2050-rapport-compresse2.pdf

The report "Transition 2050, Choisir Maintenant, Agir pour le Climat" was published in 2021 by the Agence de la Transition écologique (ADEME), the French government agency responsible for guiding society's decisions towards a more ecological and sustainable future.

This report is the result of two years of forward-looking research, aimed providing solutions for France to become carbon-neutral by 2050. It brings together technical, economic and environmental knowledge, in order to envision sustainable transformations for society.

ADEME proposes scenarios inspired by the 2018 report published by the United Nations Intergovernmental Panel on Climate Change (IPCC), assessing the social, economic and environmental stakes of different paths toward carbon neutrality. The authors start from the premise that it is "essential to accelerate the debates now, given the time needed to make decisions in a democratic framework, as well as to implement them" (p.7). ADEME thus seeks to illustrate the possible options for the future, by highlighting the decisions that will soon become inevitable.

The four scenarios presented are: 1) Frugal generation; 2) Territorial cooperation; 3) Green technologies; 4) Restorative bet. They are all presented first from the point of view of lifestyle (society, food, housing and personal mobility), then from a technical, governance and territorial angle, to finally analyze the potential impacts on the economy, whether from a macro-economic or industrial perspective.

"Four coherent and contrasting 'typical' paths to lead France towards carbon neutrality."

The first scenario, "Génération frugale", imagines a chosen but also constrained frugality, with 50% organic food consumption, limited construction and reduced mobility. It also proposes to give pride of place to "low-tech", as well as "demetropolization", and a focus on medium-sized towns and rural areas. Industry would focus on needs, and prosperity indicators would be different (income disparities, quality of life, etc.).

Scenario 2, "Territorial cooperation", is based on a sharing economy and lifestyle changes, such as halving meat consumption. It also calls for shared governance and environmental taxation, supported by the "reindustrialization" of certain sectors, and dynamic local markets.

Scenario 3, "green technologies", proposes more new technologies, such as in the field of housing, with low-energy rebuilding, or in the field of mobility, by proposing new infrastructures that would manage car-sharing initiatives, for example. The scenario is based on "competitive technologies to decarbonize" (p.10), as well as on "green growth" that would drive international innovation.

Finally, scenario 4, the "restorative bet", is based on the near-stability of certain factors, such as mass consumption, the eternal quest for speed, and urbanization. It is based on the idea that the decarbonization of industry will occur via a carbon growth approach or targeted carbon taxation.

"If it is vital to keep the rise in average global temperatures below +2°C, or even +1.5°C, because beyond that, the scale and unpredictability of the impacts may be such that it will be difficult to define adaptation trajectories." (p.61)

"It is imperative to act quickly: the socio-technical transformations to be carried out are of such magnitude that they will take time to produce their effects."

Prospective research

Socioemotional wealth in family business: what are the impacts?

Smajić, H., Palalić, R., & Ahmad, N. (2023). Future perspective of socioemotional wealth (SEW) in family businesses. Journal of Family Business Management, .954-13(4), 923

The article examines the concept of socio-emotional wealth (SEW), which is essential for distinguishing family from non-family businesses. The three authors, from the College of Economics and Political Science, Sultan Qaboos University, Muscat, Oman (Management Department and Economics and Finance Department), and from the International University of Sarajevo, Bosnia and Herzegovina (Department of Economics), review the literature to demonstrate the importance of SEW in family business.

Despite its increasing prominence in family business literature since its introduction in 2007, research on SEW remains fragmented. The study aims to organize knowledge on SEW through a systematic literature review of 185 articles.

Four research questions guide the analysis: 1) The evolution of SEW literature shows a rising trend since 2007; 2) Citation analysis identifies influential journals and key authors in SEW research, guiding future scholars on collaboration and publication opportunities; 3) Thematic analysis reveals existing research themes and highlights overlooked areas; and 4) Examination of the top 25 most cited SEW articles provides insights into methodologies and future research directions.

Research on SEW and financial performance has produced mixed results. While some studies highlight that family firms often prioritize SEW over financial performance, other research suggests that SEW influences management and governance, impacting financial performance in various ways. For instance, while family employment may increase sales but reduce profitability in micro and small enterprises (Cruz et al., 2012), having a family CEO can improve financial performance in industrial districts but negatively impact publicly listed companies (Naldi et al., 2013).

The real value of this article lies in the advice it provides for future research. Whether on the methodological aspect, or on the conceptual aspect, the authors develop very clear advice on the path that research should take, with, for example, an improved understanding of the SEW concept itself, and its links with various dimensions. Performance issues also require further development, since "ownership preferences affect CEO succession, scapegoating, and organizational turnaround efforts" (p.946). The authors also advise that future research should look at the links between SEW and internationalization, as it seems to be very complex, between risk-willing and risk-averse.

The study concludes that SEW is a relatively underexplored concept, emphasizing its importance for future research in family business dynamics. It encourages further investigation into SEW's relationship with family firm performance and other critical areas.

Cruz, C., Justo, R. and De Castro, J.O. (2012), "Does family employment enhance MSEs performance?", Journal of Business Venturing, Vol. 27 No. 1, pp. 6276-, doi: 10.1016/j.jbusvent.2010.07.00.
Gomez-Mejia, L.R., Haynes, K.T., Nunez-Nickel, M., Jacobson, K.J.L. and Moyano-Fuentes, J. (2007), "Socioemotional wealth and business risks in family-controlled firms: evidence from Spanish olive oil mills", Administrative Science Quarterly, Vol. 52 No. 1, pp. 106137-, doi: 10.2189/asqu.52.1.106.
Naldi, L., Cennamo, C., Corbetta, G. and Gomez-Mejia, L. (2013), "Preserving socioemotional wealth in family firms: asset or liability? The moderating role of business context", Entrepreneurship Theory and Practice, Vol. 37 No. 6, pp. 13411360-, doi: 10.1111/etap.12069

"Socio-emotional wealth refers to the non-financial goals of the family business that satisfy the family's affective need(Gomez-Mejia et al., 2007)" (p.924).

"SEW (having a family CEO) is positively related to the financial performance of family firms in industrial districts but is negatively associated with the financial performance of publicly listed companies." (p.943)

Prospective research

Knowledge management: how to make the most out of it?

https://www.hbrfrance.fr/strategie/la-gestion-des-connaissances-retour-vers-le-futur-60479

"Given that knowledge resides mainly in the minds of employees, it is estimated that on average organizations lose 70% of their know-how every night when employees leave the company. In fact, only 30% of knowledge is documented in any way." (Knowledge Management Report, The Delphi Group, 1998).
The author of this article, Vincent Ribière, practitioner-researcher and lecturer at Bangkok University (Thailand), looks at knowledge management (KM). He begins by explaining why companies invest in KM, which enables them to gain considerable efficiency by reproducing certain scenarios with customers.

Ribière defines KM as "the process of capturing a company's collective expertise, knowledge and skills, wherever they may be - in people's heads, on paper or in data/information repositories - and distributing them where they can contribute to the greatest benefit". It is more a question of sharing knowledge than controlling or retaining it for no purpose.
The author begins with a brief history of KM. He recalls that the 90s saw a growing interest in technologies to improve the circulation of knowledge. However, without a clear strategic objective, many of these initiatives ultimately failed. Then, in the 2000s, it became clear that the focus should be on the people themselves. Communities of practice are an example of what began to be put in place to retain, share and improve knowledge. Technology became the "enabler, not the main driver."
The creation of an ISO standard (30401) in 2018 has continued to consolidate the importance of KM for organizations. This standard "sets requirements and provides guidelines for establishing, implementing, maintaining, reviewing and improving an effective management system for knowledge management in organizations."
The article refers to a recent survey (American Productivity Quality Consortium, 2024) which shows that knowledge management is perceived "as a tool for improving operational efficiency and process improvement within organizations." Another study conducted by the International Data Corporation (IDC) concludes that KM's benefits include improvements in several key areas: operational performance, customer service, satisfaction and engagement, and employee performance.
The importance of KM is now undeniable. In fact, international awards such as the Global Most Innovative Knowledge Enterprise Award and the APQC Excellence in Knowledge Management Award annually recognize organizations that excel in KM. Ribière concludes with the increasingly practical use of AI as a KM tool. He notes that "AI will help improve, perfect and automate some tedious knowledge management processes, such as content cleansing, content tagging and content restructuring."
"Becoming a learning organization, an organization that continuously and systematically manages knowledge at different organizational levels (individual, team, organization, ecosystem) is a key factor in organizational agility and productivity."

Note for the designers: please note there are many interesting graphs in the report itself

"In fact, only 30% of knowledge is documented in any way." (Knowledge Management Report, The Delphi Group, 1998).

"Becoming a learning organization, an organization that continuously and systematically manages knowledge at different organizational levels (individual, team, organization, ecosystem) is a key factor in organizational agility and productivity."

Prospective research

Importance of data anonymization: the current situation

https://www.obvia.ca/sites/obvia.ca/files/ressources/202408-OBV-Pub-Rapport_Symposium_Adesdonn%C3%A9es_0.pdf

The Data Anonymization Symposium Report was published in April 2024 by the International Observatory on the Societal Impacts of AI and Digital (OBVIA) and the Quebec Bar Foundation. It is based on perspectives presented at an interdisciplinary event held on April 29, 2024, at the Université de Montréal, in partnership with the L.R. Wilson Chair, the CRDP, OBVIA, the Fondation du Barreau du Québec, and GERAD. The presentations provided an overview of the state of anonymization techniques, the needs and challenges faced by stakeholders in the sector, and the legal and political issues surrounding data governance.

The authors begin by revisiting the concept of "data anonymization," emphasizing that it should not be seen as as "a concept that can be reduced to a binary representation, where data is either anonymized or not" (p.6). Several presentations linked anonymization to data identifiability, noting that there are various methods and thresholds that determine what constitutes an "acceptable risk of re-identification."

Several anonymization methods can be used to reduce risk: aggregation (combining several records into a single one), pseudonymization (replacing identifiers), k-anonymization (generalizing or deleting quasi-identifiers) and l-diversity. New tools are emerging to provide a framework for anonymization. Bill 25 in Quebec (Canada) is supposed to protect individuals' personal information. However, some researchers question its effectiveness, notably because it sees data anonymization only as an alternative to the destruction of personal information. Canada's National Standards are another tool that could help improve the quality of personal information protection. However, their limitations are also presented here, such as the fact that they are "non-binding" standards, meaning that organizations cannot be forced to comply with them. Moreover, while they provide a standard in the form of a certifying label, they are not free of charge, which can be an obstacle for many organizations.

In the third part of the report, the authors present data on governance. Mentioning first of all issues of legitimacy and social acceptance, the researchers criticize "governance by legislative delegation" (through official standards, for example), asserting their ineffectiveness. In their view, the fact that these standards are not binding makes them highly ineffective. For the researchers, the solution lies in "participative governance", where committees could represent interests by category, taking their inspiration from the institutions created by the European RGPD, and tailoring them to the cultural specificities of Canada.

The report concludes by examining the challenge of data anonymization for Fintechs, or companies that operate within the financial and banking technology sectors. For these companies, anonymization as just another obligation, but also recognize its limitations, such as the irreversibility of the process, or the consequences of potential lawsuits or sanctions. The point of view of consumers, who have little interest in the issue, indicates that one of the current challenges should be to find solutions to make consumers aware of their privacy rights.

"As there is no such thing as zero risk of re-identification, data can never be completely anonymized." (p.6)

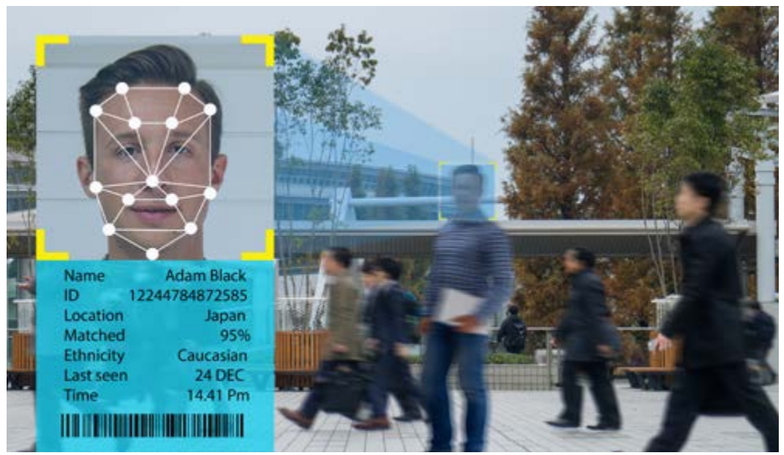
One of the current challenges should be to find solutions to make consumers aware of their privacy rights

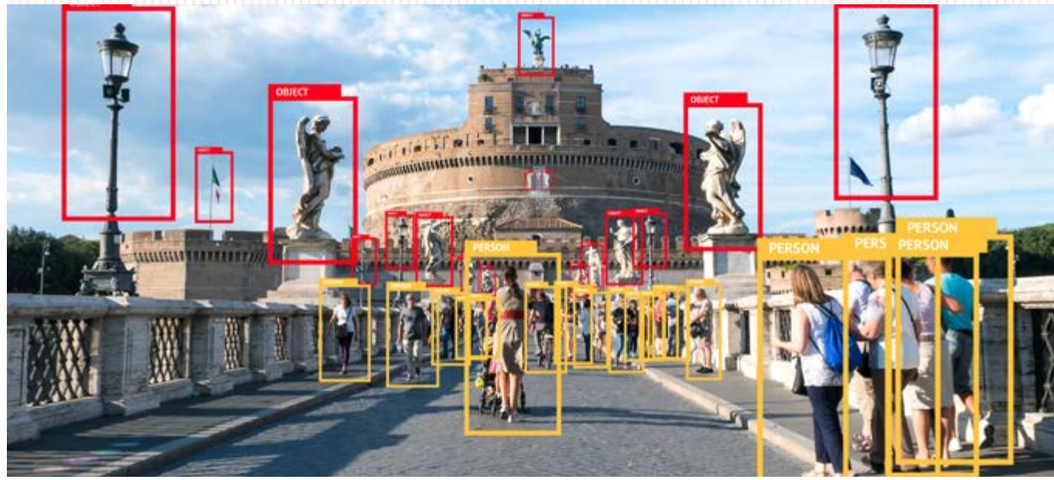
Prospective research

Do algorithms shape us?

https://podcast.ausha.co/la-jungle-des-miroirs/episode-4-algorithme

This podcast, which aims to raise awareness, understanding and critical thinking skills, attempts to decipher what is meant by the term "algorithm." This episode, the third in a series of 20, aims to understand how algorithms shape perceptions of the contemporary world.





The speakers start from the observation of what a company can put in place to manipulate information, taking the example of Cambridge Analytica and the outcry it created at the time of Donald Trump's election in the United States.
The question here is: when you open your networks and access content instantly, how is that content chosen? Content that seems random but is in fact skillfully decided by an algorithm. In fact, the sites' creators analyze your likes, shares and all your online actions in order to understand who you are, your values, beliefs, political opinions, tastes and so on.
Here, the guest mentions the striking example of a book published in 2022, Toxic Data, by David Chavalarias, which aims to reflect on digital manipulation via social networks as a threat to democracy. The author, a mathematician and director of research at the Centre d'analyse et de mathématique sociales (CNRS) and the Institut des systèmes complexes de Paris Ile-de-France, is dedicated to the analysis of social networks and online political activism. His book suggests ways of resisting the intoxication of opinion at individual level, and of collectively protecting democracy by adapting it to the new digital order. One of the examples taken from the book and mentioned in La Jungle des Miroirs is that of an author who decides to "like" all possible publications and links on Facebook related to extremist postures. He notices that after just 48 hours, his News Feed offers him only extremist suggestions.
Every social network implements this kind of tool. The algorithms play on three psychological concepts: 1) reinforcement or confirmation bias: opinion is reinforced when we are exposed to things we already believe; 2) the filter bubble: it's impossible to be exposed to contradictory information, so we don't see opposing thoughts; and 3) negativity bias: on representations of your fears, indignation generates much more engagement than other ways. These are all addictive mechanisms, generating a maximum of emotions, and playing on the dopamine release phenomena they imply.
The podcast concludes that the social networking system is based on a "vicious model", and that we need to be aware that data is now worth its weight in gold. The guests, despite the anxiety-inducing discussion they publish here, offer some hope for the future, mentioning that the solution lies in knowledge: we need to train, read and learn, so as to sharpen a critical mind that "is our only possible shield."

"The 19th century was the century of the gold rush, the 20th century was the century of the oil rush, the 21st century is and will be the century of the rush for the world's personal data."

"The solution lies in knowledge: we need to train, read and learn, so as to sharpen a critical mind that "is our only possible shield."

Note for the designers: please note there are many interesting graphs in the report itself

2 Applied research

Out-of-distribution detection in multi-label classification: a crucial theoretical framework

Zhang, Dell, and Bilyana Taneva-Popova. “A Theoretical Analysis of Out-of-Distribution Detection in Multi-Label Classification.” ACM, 2023. https://doi.org/10.11453578337.3605116/.

The article "A Theoretical Analysis of Out-of-Distribution Detection (ODD) in Multi-Label Classification" by Dell Zhang and Bilyana Taneva-Popova explores the theoretical foundations of detecting out-of-distribution (OOD) inputs specifically within multi-label classification contexts. The need for effective OOD detection is critical for the safe deployment of machine learning models, especially in real-world applications like medical diagnostics and financial fraud detection, where encountering inputs significantly different from training data can lead to severe consequences.

Traditionally, OOD detection research has concentrated on multi-class classification problems, where each input belongs to only one class. In contrast, multi-label classification involves scenarios where a single input can belong to multiple classes simultaneously, complicating the OOD detection process. This paper aims to bridge this gap by analyzing existing methods and providing a deeper understanding of their mechanisms.

The authors systematically review various OOD detection methods such as Maximum Softmax Probability (MSP), Maximum Logit, and JointEnergy. They classify these methods based on two dimensions: label-wise scoring functions (e.g., softmax probabilities, logistic probabilities) and aggregation functions (e.g., maximum, sum, average). Interestingly, they find that some methods yield equivalent results under appropriate conditions, such as MaxProb and MaxLogit, indicating that multiple approaches can achieve similar performance outcomes.

A significant contribution of the paper is the proof that JointEnergy is the optimal probabilistic solution for OOD detection in scenarios where class labels are conditionally independent. This insight offers a more rigorous interpretation of JointEnergy's effectiveness compared to its original joint-likelihood interpretation, emphasizing that its performance relies more on the independence of labels than on their interrelationships.

The paper discusses practical implications for deploying OOD detection methods in multi-label classification tasks, especially in fields where inputs can be ambiguous or multifaceted. The findings suggest that understanding the underlying assumptions and relationships of various methods can lead to better model designs and improved detection accuracy.

The authors highlight potential future research areas, including the exploration of label relationships in OOD detection and the development of new models that can effectively leverage these relationships. They call for further empirical studies to validate the theoretical findings and enhance the practical applicability of OOD detection techniques in multi-label settings.

In summary, this paper provides a crucial theoretical framework for understanding OOD detection in multi-label classification. By analyzing existing methods and establishing the optimality of JointEnergy under specific conditions, the authors contribute valuable insights that could lead to advancements in machine learning practices, particularly in safety-critical domains. The exploration of label relationships and the proposed future research avenues underscore the importance of ongoing inquiry into this complex area of machine learning.

> **Effective OOD detection is critical for the safe deployment of machine learning models, especially in real-world applications like medical diagnostics and financial fraud detection.**

> **Understanding the underlying assumptions and relationships of various methods can lead to better model designs and improved detection accuracy.**

Applied research

The Migration Experience: A Conceptual Framework

Kreienkamp, J., Bringmann, L. F., Engler, R. F., de Jonge, P., & Epstude, K. (2024). The Migration Experience: A Conceptual Framework and Systematic Scoping Review of Psychological Acculturation.. 28(1), 81- 116.

The authors, all based in the Netherlands, address a challenge in psychological acculturation research: the multitude of theories and their heterogeneity. This diversity in the literature represents a challenge for "researchers, practitioners, and policymakers in the field". To tackle this, the authors propose to categorize psychological acculturation into four distinct aspects of human experience: wanting, feeling, thinking and doing. This conceptual framework not only simplifies the process of organizing research but also allows for more effective examination and comparison of the various conceptualizations involved.

The adoption of such a framework, beyond facilitating the categorization and understanding of research and its results, will enable all concerned to make better-informed decisions for the future. For example, policy development and intervention design can greatly benefit from such a tool.

The authors discover that the more intimate, internal aspects of acculturation, such as emotions and motivations, have been little covered in the literature.

The framework targets three key areas related to psychological acculturation: theoretical literature, psychometric literature, and empirical studies. First, it examines broad theoretical works to uncover underlying assumptions. Second, it evaluates validated acculturation measures to create a database that categorizes scales by their focus on various psychological aspects. Finally, it analyzes empirical literature to explore operationalizations of psychological acculturation, facilitating comparisons across different fields and research subjects.

Building on recent advancements in the field, the authors demonstrate the framework's organizational and comparative value by conducting a systematic scoping review of existing theoretical, psychometric, and empirical literature. Their findings indicate that the framework effectively organizes previous research, revealing that very few articles fall outside the ABCD model (Affect, Behavior, Cognition and Desire). Additionally, it highlights significant gaps in the literature, such as a critical disconnect between theoretical insights and empirical application. This framework also aids in future theoretical developments and practical applications by facilitating novel predictions and interventions. Overall, it serves as a solid foundation and a valuable resource for both researchers and practitioners seeking to deepen their understanding of psychological acculturation.

"Culture consists of explicit and implicit patterns of historically derived and selected ideas and their embodiment in institutions, practices, and artifacts; cultural patterns may, on one hand, be considered as products of action, and on the other as conditioning elements of further action." (based on Kroeber & Kluckhohn, 1952, p. 181)

Kroeber, A. L., & Kluckhohn, C. (1952). Culture: A critical review of concepts and definitions. Peabody Museum Press. https:// iiif.lib.harvard.edu/manifests/view/drs:42769295515i

"Psychological acculturation experience can be understood in terms of affects, behaviors, cognitions, and desires."

"Culture consists of explicit and implicit patterns of historically derived and selected ideas and their embodiment in institutions, practices, and artifacts; cultural patterns. (based on Kroeber & Kluckhohn, 1952, p. 181)

Applied research

Refugee mothers in Canada: unique challenges

Omar, L. (2023). Foreclosed futures and entangled timelines: conceptualization of the 'future' among Syrian newcomer mothers in Canada. Journal of Ethnic and Migration Studies, 49(5), 12101228-.

The article examines how Syrian refugee mothers resettled in Canada conceptualize the future, focusing on how their past experiences, cultural contexts, and current challenges shape their perceptions. The authors differentiate between dreams, hopes, and concrete plans, noting that many mothers express broad aspirations—like their children achieving stability—without specifying detailed personal plans.

Hadeel, for instance, embodies a sense of agency by connecting relating her dreams to her current situation, while others, like Heba, voice deep concerns about an uncertain future marked by instability and lack of permanent employment. The psychological burden of securing their children's futures in a new context contributes significantly to the stress these mothers experience.

The concept of "foreclosed futures" is central to understanding these mothers' experiences. Many explicitly state that their futures are intertwined with those of their children, prioritizing their children's well-being over their own aspirations. This contrasts with the individualistic mindset prevalent in North American society. Alia, a mother who feels more respected in Canada than in Syria, reflects this by asserting that her life is "over" but her children's futures remain her primary concern. Similarly, Samia expresses that her opportunities have passed, choosing to focus on her children's potential instead. Despite their self-sacrifice, some mothers do find optimism in their new lives. They appreciate the safety and opportunities available in Canada compared to the hardships they endured in their home country and during their transitions. The narrative reveals that while some mothers delay their personal goals, they still express hope for their children's education and future success.

The article also discusses the idea of "entangled timelines," where mothers' perceptions of the future are intricately linked to their past traumas and present struggles. This entanglement complicates their ability to envision a separate future, as their narratives often reflect a longing for the stability of the past alongside aspirations for their children's success.

The article concludes that understanding the temporal aspects of refugee mothers' experiences is essential for comprehending their integration challenges. It suggests that their futures cannot be viewed in isolation but must be understood through the lens of their pasts and present circumstances. This highlights the complexity of migration and resettlement and calls for further research on how different variables—such as individual backgrounds and trauma—impact these mothers' future projections. Overall, the findings highlight the unique challenges faced by refugee mothers, their prioritization of their children's futures, and how cultural, temporal, and psychological factors intersect to shape their experiences after resettlement. The article advocates for deeper exploration of these themes, recognizing the diverse experiences among mothers and the implications for their integration into Canadian society.

Many mothers explicitly state that their futures are intertwined with those of their children, leading them to prioritize their children's well-being over their own aspirations.

Refugee mothers grapple with feelings of inadequacy and dislocation in a new society that challenges their cultural values and parenting practices

Applied research

AI in education: impacts

Nguyen, N. D. (2023). Exploring the role of AI in education. London Journal of Social Sciences, (6), 84- 95.

In this paper, Nguyen explores the role of Artificial Intelligence (AI) in education. Published in 2024 in the London Journal of Social Sciences, this paper reflects on AI applications in education, focusing on the approaches adopted up to the 2020s, in order to better plan their use in the future. The impacts of AI in education are categorized into three aspects: "guidance", "teacher" and "student".

The "Guidance" AI approaches refer to programs that support students and teachers in making decisions. These applications can, for example, facilitate academic choices for students with certain learning disabilities. The author gives the example of a study published in 2021, where "AI was used to predict students at risk of failing to provide intervention" (Hlosta et al., 2021). Here, AI helps to fill certain gaps in education, and to promote a more accessible and adapted education for all.

The "Student" AI approaches refer to technological and educational tools that improve the quality of education, such as 'learning AI', which implements innovative learning tools, such as game-based learning or learning analytics. "According to the Entertainment Software Association, 65% of Americans, or 212.6 million, play at least 1 hour of video games a week" (Pierre-Louis, 2023). Therefore, it's easy to see why using the appeal of video games in education can help make the learning experience more adapted, efficient, and engaging.

The "Teacher" AI approaches are all technologies that help teachers to teach. AI tools become true partners for the teaching staff, who see their preparation time reduced, and can therefore devote more of their time to the teaching itself. For example, "automated essay scorers", which use machine learning and natural language processing to score essays, enable teachers to spend less time grading papers by hand, and more time interacting with their students.

Nguyen demonstrates the importance of categorizing the impacts of AI in education.

The paper does, however, put the results into perspective with some of the drawbacks that the use of AI in education could represent, notably in relation to questions of lack of human interaction, costs, or even ethics in relation to privacy and data security.

The author concludes that the rapid development of AI call for careful examination of its applications and regulations in education, as AI could become integral to the sector in the coming decades. The categorization of AI applications can help developers in creating targeted solutions while leveraging existing principles. However, it is essential to address ethical concerns, technical limitations, and costs to ensure the safe and effective implementation of AI in education.

The impacts of AI in education are categorized into three aspects: "guidance", "teacher" and "student".

"65% of Americans, or 212.6 million, play at least 1 hour of video games a week, highlighting the appeal of video games in making the learning experience more adapted, efficient, and engaging."

Pierre-Louis, S. (2023, July 6). Essential Facts -Entertainment Software Association. Retrieved from https://www.theesa.com/2023-essential-facts/.

Applied research

The Olympic Games and the theory of spectacle in modern societies

MacAloon, J. J. (2023). Olympic Games and the theory of spectacle in modern societies. In The Olympics (pp. 80107-). Routledge.

John J. MacAloon, an anthropologist and Professor Emeritus at the University of Chicago, focuses on cultural performance theory, particularly in relation to the modern Olympic Movement and Games. In his paper, MacAloon categorizes the Olympic experience into four genres: spectacle, festival, ritual, and game, arguing that these genres are central to understanding Olympic ideology.

He begins by defining "spectacle," a less understood genre of cultural performance. Spectacles prioritize visual sensory experiences and require both actors and spectators. Unlike rituals, which may not necessitate an audience, spectacles demand public displays of grandeur. MacAloon emphasizes that while outsiders might confuse rituals with spectacles, it is crucial to maintain a clear distinction for analytical purposes. The Olympic Games exemplify spectacle through their blend of visual grandeur and audience engagement, highlighting the importance of spectators in both performance and organization.

Next, MacAloon contrasts "festival" with spectacle. The term "festival" comes from Latin roots meaning joy and celebration, and is marked by planned observances that evoke a festive mood. Festivals emphasize participation, whereas spectacles elicit a broader range of emotions, often focusing on visual awe. Festivals are typically regular and joyous, while spectacles can be spontaneous and prone to moral ambiguity. The Olympic Games incorporate both elements, with organizers aiming to foster a celebratory atmosphere despite the complexities and controversies that arise. Ultimately, both genres serve as frameworks for various cultural performances.

MacAloon then explores the "ritual" aspect of the Olympics. Pierre de Coubertin, the founder of the modern Olympic Games, highlighted the importance of rituals in distinguishing the Olympics from mere athletic competitions. He believed rituals invoke sacred forces and facilitate social transformation. The Olympic ritual's foundation is human kindness, representing shared humanity among diverse national identities. Coubertin advocated for "true internationalism," celebrating cultural diversity rather than erasing it. Olympic ceremonies, structured around rites of passage, incorporate national symbols while promoting a transnational identity, aiming to unite participants and spectators emotionally.

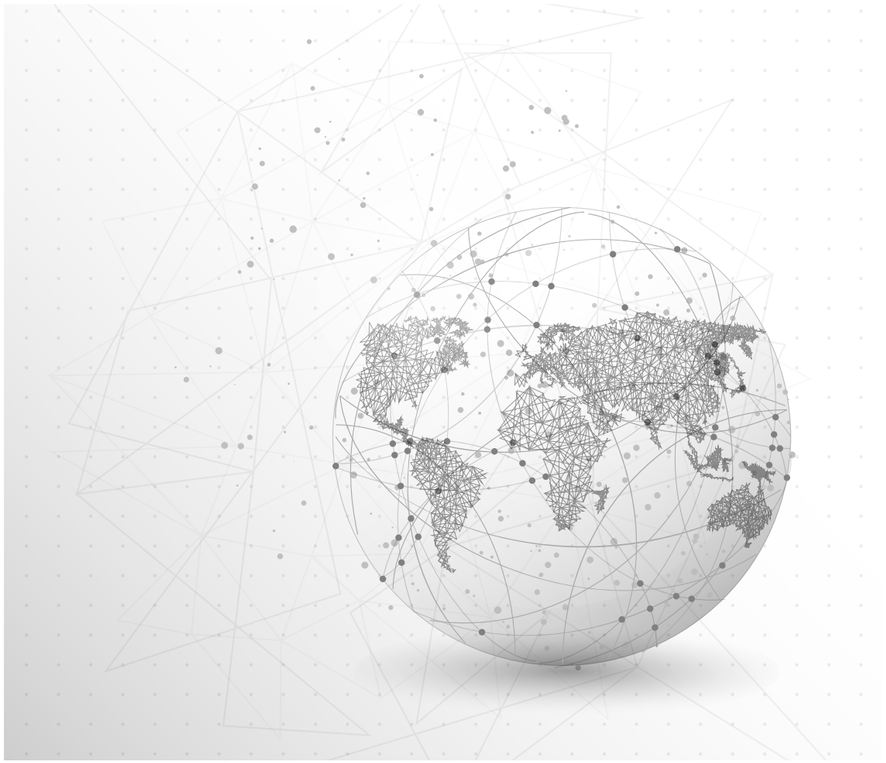
"In merely eighty years, the Olympic Games have grown into a cultural performance of global proportion." (p.80)

MacAloon categorizes the Olympic experience into four genres: spectacle, festival, ritual, and game.

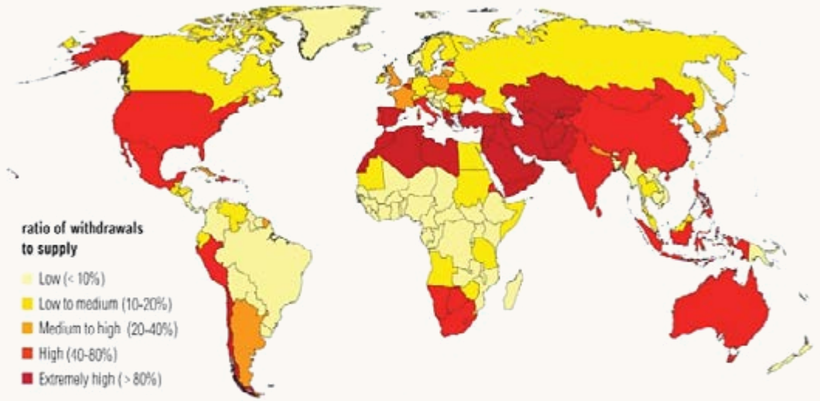
Lastly, MacAloon addresses the "games" genre. Anthropologists are increasingly acknowledging the importance of games and sports in modern society, a realization that has lagged behind psychological insights. Historically focused on "primitive" societies, anthropology has often overlooked organized sports' evolving role. Games embody paradoxes: they have fixed rules but allow individual autonomy, providing structured competition alongside moments of sincerity. Coubertin viewed the Olympics as a means to transcend materialism, promoting education and cultural exchange. He believed games could unite diverse peoples, serving as a universal language that celebrates both differences and shared humanity.

In conclusion, MacAloon's paper examines why the Olympic Games are framed as spectacle rather than merely as a festival. He argues that the spectacle allows for emotional distance and passive observation, aligning with modern values of individual choice and skepticism. Drawing on cultural critiques from Daniel Boorstin and Guy Debord, MacAloon highlights the prevalence of manufactured imagery in contemporary life. Ultimately, the Olympic Games illustrate a complex interplay of illusion and reality, prompting critical reflections on identity, morality, and societal values, revealing how spectacles can both alienate and stimulate genuine engagement.

3 The future in numbers



Water stress of 2040

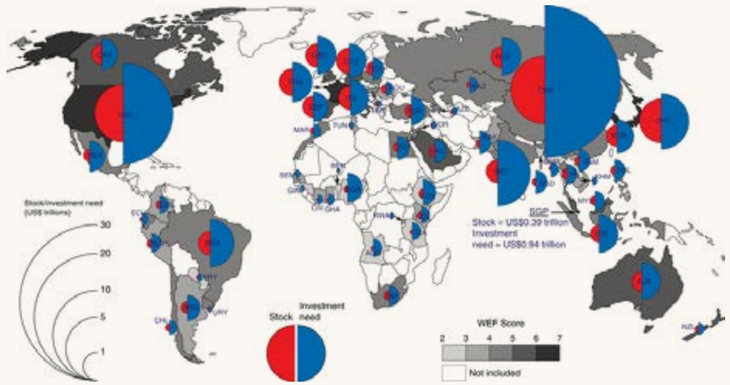


NOTE: Projections are based on a business-as-usual scenario using SSP2 and RCP8.5.

For more: ow.ly/R9Wop

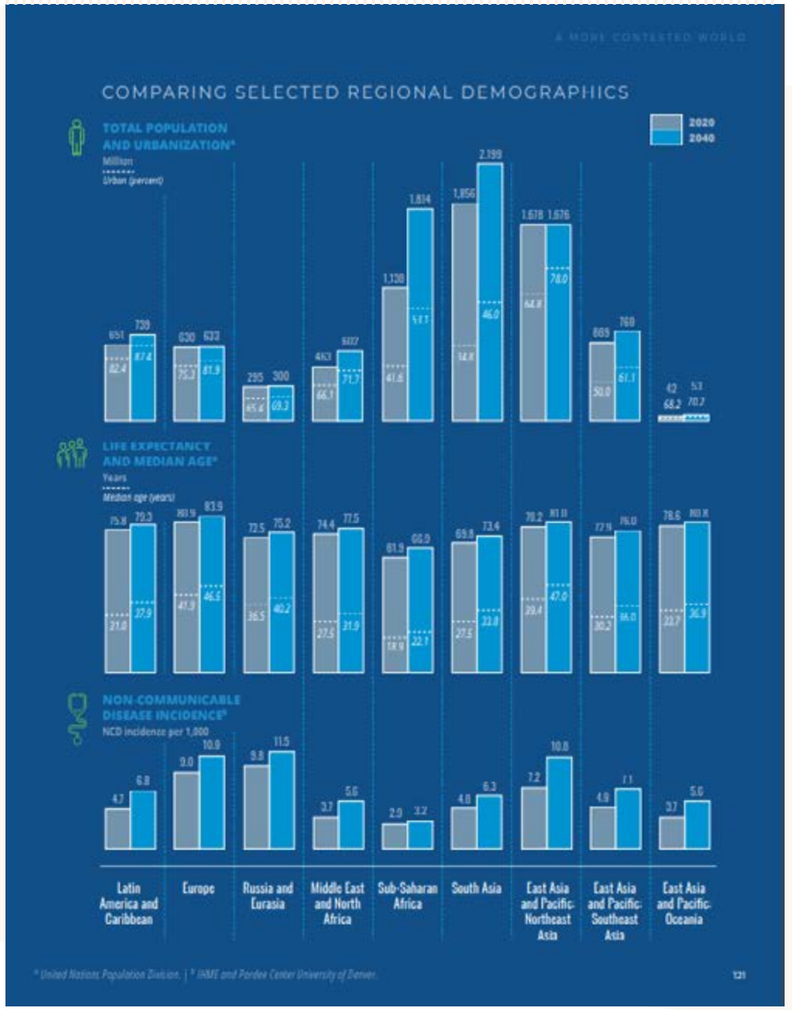
WORLD RESOURCES INSTITUTE

Current infrastructure stock and forecast future needs to 2040



Nature Sustainability

Comparison of regional demographics (2020- 2040)



Ending plastic pollution by the end of 2040

Economic Activities Forecast (2020- 2040)

5

Issue No. 05

(December 2024)

FUTURE TRENDS
Report
Issue no. 5 - December 2024

Future Trends Report

Future Trends Report, published in English and Arabic by TRENDS Virtual Office in Montreal, stands out as a distinctive publication dedicated to highlighting:
1. the most important forward-looking studies that aim to identify future trends, analyze various variables that may influence these trends, and determine the best future scenarios.
2. the most important applied studies that explore the application of knowledge, scientific theories, and information to solve current problems and overcome future challenges.
3. the most important illustrative and graphic forms that visually summarize significant studies, helping readers understand the trends and challenges of the future world.

Editorial board

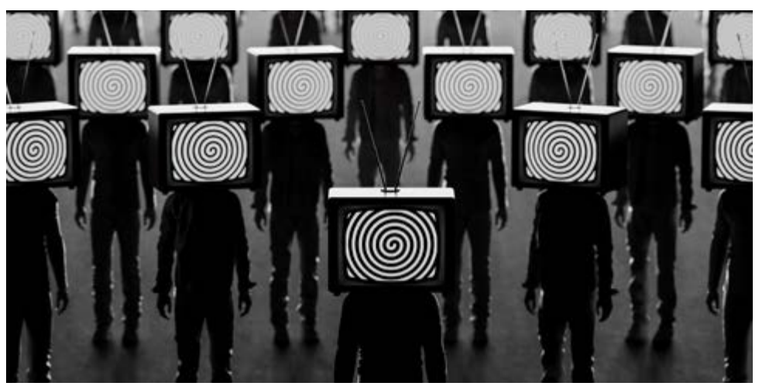
Contents

1 Prospective research

What will the world of information look like in 2050?

Le monde de l'information en 2050: des scénarios possibles, Institut National de l'Audiovisuel (INA), 2024 - https://larevuedesmedias.ina.fr/sites/default/files/202409-/EGI_RAPPORT_DE_PROSPECTIVE_INA.pdf

This report from the Institut National de l'Audiovisuel (INA), a public body that has catalogued and preserved all audiovisual archives of French radio and television since 1975, explores the future of information up to 2050 through a forward-looking approach, drawing on consultations with around forty experts from various fields. The aim is to understand the major transformations the information sector could undergo, while highlighting the challenges ahead, such as information manipulation, the economic fragility of the media, and risks to democracy. The authors emphasize that, although difficult to predict, the future of information remains uncertain, and media literacy will be essential to address the challenges of this rapid evolution.



The report is based on an impact matrix developed at the Information General Assembly (2024), which analyzes the effects of technological, economic, political, and societal transformations on information. Among the hypotheses formulated, the impact of cognitive sciences on the media ecosystem is considered, with technologies such as neural implants capable of delivering information directly to the brain. This analysis leads to three main scenarios for 2050: an optimistic one, a pessimistic one, and a median one.

The optimistic scenario imagines a "golden age" of information. After a major crisis in 2032, trust in the media would be restored, and information would become a common good, financed by citizens through donations, subscriptions, and royalties. Public regulation would guarantee the independence and quality of information, and generative AI would facilitate content production, making information more diverse and accessible. In this future, a global democracy would enhance citizen involvement in the production and financing of information.

The pessimistic scenario describes a "death of information," dominated by technology giants, where information would become volatile, unstable, and manipulable. Independent media would have disappeared, replaced by information flows controlled by technology companies. Fact-checking would become nearly impossible, and society would be fragmented, with neural implants enabling personalized access to information, creating informed elites and a population disconnected from shared realities.

The middle scenario, or "chiaroscuro," envisions a world of fragmented, saturated information. AI would increase information production, but the resulting content would become increasingly unreliable, generating a "collective immunity" to manipulation. Large traditional media would disappear in favor of niche outlets, while citizens would seek "comfortable information" aligned with their personal beliefs. A portion of the population would be excluded from direct access to information, and the fragmentation of the media landscape would weaken democracy, posing new challenges, such as the establishment of "neuro-rights" to protect individuals' mental integrity.

While these scenarios are unlikely to unfold exactly as described, the report encourages reflection on the future risks and opportunities for information and the proactive steps needed to address these developments. This forward-looking approach aims to open up perspectives and prepare society for a complex future, where information will play a central but uncertain role in sustaining democratic and social balance.

The future of information remains uncertain, and media literacy will be essential to address the challenges of this rapid evolution.

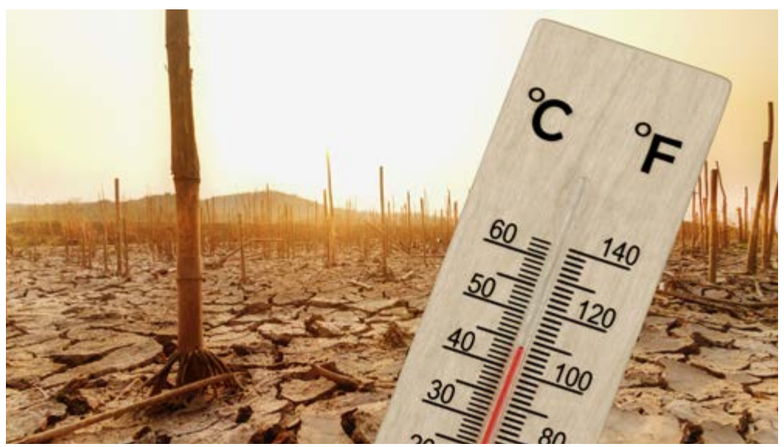
Society must be prepared for a future where information is uncertain, and where media literacy will be essential to address the challenges of this rapid evolution.

Prospective research

The world in 2050: how will our society have changed?

Le monde en 2050 : quels changements notre société aura-t-elle connu? (March 2024), Groupe Les Temps Nouveaux https://www.groupelestempsnouveaux.fr/articles/le-monde-en-2050-quels-changements-notre-societe-aura-t-elle-connus

This article explores the issues and prospects that will shape the future between now and 2050, with a focus on Generation Z, technological advances, and the societal challenges ahead. It suggests that, while the exercise of speculating on the future may seem bold, it is also necessary, due to an intergenerational responsibility, to ensure that future generations inherit an environment conducive to human flourishing and progress.



One of the main areas of focus is gene editing, particularly technologies such as CRISPR, which could soon make it possible to eliminate certain genetic diseases, treat cancers, and even resurrect extinct species. Genetics expert Samuel H. Sternberg sees colossal potential in these technologies to transform medicine over the next 10 to 15 years.

However, this technological advance raises profound questions about the job market. As robots, artificial intelligence, and algorithms increasingly replace repetitive tasks, concerns are emerging about the future of employment. AI, a fast-growing field, could revolutionize certain sectors, but the emergence of general AI, comparable to human intelligence, still seems a long way off, according to Robin Hanson, a researcher at Oxford University. While automation can lighten the burden of work, it also raises major economic and social issues, particularly regarding the distribution of the benefits of this evolution.

The most urgent threat to humanity remains climate change. The resulting disconnection from nature and lack of empathy complicate efforts to reduce greenhouse gases. Although limiting these effects is possible, political and economic obstacles hinder coordinated global action. This is where Gen Z, growing up with a keen awareness of environmental and social issues, could play a key role in implementing innovative solutions.

Young people of this digitally savvy generation are aware of the dangers of hyperconnection and place greater value on protecting their privacy. They are also open to diversity and inclusiveness, with strong awareness of gender issues and environmental advocacy. This group is particularly marked by its independence and ability to combine various disciplines of study to address social and ecological challenges. They favor collaborative approaches and use their technical and social skills to solve complex problems.

The future, according to this analysis, is being built today. For this future to be better than the present, it is imperative to think ahead, anticipating the consequences of technological advances and integrating them into political, economic, and social decision-making. Gen Z, with its values of diversity, sustainability, and innovation, seems ready to take up these challenges, offering a vision of tomorrow's solutions.

In conclusion, to shape a sustainable future, it is crucial to adopt a collaborative, responsible, and ethical approach, where technology and innovation are placed at the service of collective well-being, while preserving our planet.

The most urgent threat to humanity is climate change.

The future is being built today. Gen Z, with its values of diversity, sustainability, and innovation, seems ready to take up exiting challenges.

acronym for Clustered Regularly Interspaced Short Palindromic repeats, a technology that can precisely modify a piece of DNA or its chemistry (so-called epigenetics) in the human body.

Prospective research

Setting energy futures to music: scenarios

“Les scenarios mondiaux de l’énergie à l’horizon 2050 - Mise en musique des futurs de l’énergie», Conseil Français de l’Énergie, 2013 https://www.worldenergy.org/assets/downloads/Les-sc%C3%A9narios-mondiaux-de-lenergie-a-lhorizon-2050.pdf

The World Energy Council (WEC) has developed energy scenarios for 2050 to explore the world’s energy future. Unlike normative scenarios, which aim to achieve a precise objective (such as CO_2 reduction), the exploratory scenarios, inspired by the musical themes “Jazz” and “Symphony,” enable decision-makers to assess the impact of their choices. These scenarios were developed over a three-year period, with contributions from more than 60 experts from 28 countries.

The key messages of the scenarios highlight that the complexity of the energy system will increase, energy efficiency will be crucial, and fossil fuels will remain dominant, even if renewable energy sources grow. The “Jazz” scenario focuses on energy access and economic growth, while “Symphony” emphasizes environmental issues and international cooperation.

By 2050, energy demand will be strongly influenced by population growth (reaching between 8.7 and 9.4 billion inhabitants depending on the scenario) and a sharp rise in global GDP, especially in Asia. The energy system will have to manage an increased supply of primary energy, estimated to rise by 61% in the Jazz scenario and 27% in Symphony. Energy efficiency should halve energy intensity in relation to GDP by 2050.

“Global electricity production will increase from 123% to 150% by 2050.” In 2010, it stood at 21.5 billion MWh. In the Jazz scenario, it is set to increase by 150%, to 53.6 billion MWh, while in the Symphony scenario, the increase will be 123%, to 47.9 billion MWh. This increase will require major changes in the power generation mix to meet future demand.

Fossil energy sources will still dominate in 2050 (77% in Jazz, 59% in Symphony), but renewable energy will grow significantly (from 15% in 2010 to 20% in Jazz and 30% in Symphony). Nuclear power will remain marginal, representing around 4% of global supply in Jazz. Electricity generation will increase sharply, by 150% in Jazz and 123% in Symphony.

The scenarios also show that Asia will become a major economic driver, accounting for almost half of global growth and increasing its share of global energy consumption. In contrast, Europe and North America's shares will decline.

With regard to climate, both scenarios anticipate global action to reduce emissions but take different approaches: Jazz favors adaptation, while Symphony focuses on climate change mitigation. Reducing CO_2 emissions and setting up emissions trading markets will be crucial to limiting climate impact.

In summary, the WEC scenarios indicate that achieving a balance between energy security, energy equity, and environmental protection (the “energy trilemma”) will require tough choices, massive investment in energy efficiency, and coordinated global policies.

By 2050, energy demand will be strongly influenced by population growth, reaching up to 9.4 billion, and a sharp rise in global GDP.

Between $19,000 and $26,000 billion in investment will be required for the world's power generation by 2050.

Prospective research

Prospects for Africa in 2050

“Enquête Afrique 2050 – l’Afrique de demain vue par celles et ceux qui la feront », 2024, Insitut Choiseul.https://www.choiseul-africa.com/wp-content/uploads/202403//Enquete-Afrique-2050_FR.pdf

This report, published in February 2024 by the Institut Choiseul, an independent think tank for international politics and geoeconomics based in Paris, France, aims to identify and connect the 200 most talented African economic leaders. The report, titled “Afrique 2050 - l'Afrique de demain vue par celles et ceux qui la feront” (Africa 2050 survey - tomorrow's Africa as seen by those who will make it), examines the outlook of African economic players, attempting to understand their views on economic, digital, energy, and trade dynamics with the rest of the world.

The first part presents what the authors describe as “An Afro-optimistic Africa.” African decision-makers adopt a global and pan-African vision, with a strong focus on a continental scale. Over 80% of leaders express confidence in Africa's socio-economic future, particularly between now and 2050. The concept of an African free-trade zone is widely supported, seen as beneficial for economic development. Agribusiness, energy, digitalization, and manufacturing are identified as primary growth drivers.

"The most important economic driver in the years to come could be regional integration and increased intra-African trade, thanks to projects such as the African Continental Free Trade Zone," says Stone ATWINE, Founder and Managing Director of Eversend, Uganda.

The second part tempers this optimism by identifying structural weaknesses. Major obstacles remain, mainly related to insecurity, political risks, and lack of investment. The quality and availability of infrastructure are perceived as insufficient, particularly in the energy, transport, and digital sectors. In addition, a shortage of skilled labor and gaps in education, especially in higher education, are holding back entrepreneurship and reducing the continent's competitiveness. The following section addresses the key challenges of this century. Issues of sustainable development and digitization are at the forefront. Climate change poses a major threat, particularly for agriculture, but also presents opportunities due to Africa's abundant natural resources. Ecological transition is seen as a long-term challenge that requires regional cooperation. At the same time, digitization, though still in its early stages, is viewed as essential for boosting competitiveness, with productivity gains anticipated by 2050.

In part four, the report emphasizes the importance of foreign direct investment (FDI) for Africa's development but highlights shortcomings in the current business climate and legal framework. Only 19% of executives consider the legislation satisfactory. Europe is viewed as the preferred trading partner, particularly in French-speaking Africa, while China and the U.S. are also seen as significant partners in certain regions. The European Global Gateway project, which aims to invest 150 billion euros in Africa, is positively regarded. Russia, on the other hand, is not considered a key partner and generates little interest.

In conclusion, African leaders are generally optimistic but cognizant of the challenges that must be addressed, particularly regarding infrastructure, education, and ecological transition. The continent's future success depends on advancements in these areas and the integration of new technologies.

Over 80% of leaders express confidence in Africa's socio-economic future, particularly between now and 2050.

The most important economic driver in the years to come could be regional integration and increased intra-African trade.

Prospective research

What will Asia look like in 2050?

Asia 2050 – Realizing the Asian Century (2011) – The Asian Development Bank https://www.adb.org/sites/default/files/publication/28608/asia2050-executive-summary.pdf

This report, published in 2011 by the Asian Development Bank, is aimed at policymakers, business leaders, and opinion makers within Asia to help forge a consensus on a vision and strategy for Asia by 2050.
Asia is in the midst of a historic transformation, with the prospect that, by 2050, its per capita income could increase sixfold in purchasing power parity (PPP) terms, reaching Europe's current level. This growth would enable around 3 billion more people to become affluent by today's standards. Asia could also see its share of global GDP double to 52% by 2050, regaining the dominant position it held before the Industrial Revolution 300 years ago. However, this ascent is not guaranteed, and many challenges must be overcome to make this "Asian Century" a reality.

The main challenges, according to the authors, are: 1) Growing inequalities within countries, threatening social cohesion; 2) The middle-income trap, where some countries risk failing to transition from middle-income to high-income status; 3) Intense competition for natural resources in the face of an increasingly affluent Asian population; 4) Growing income disparities between countries, which could lead to instability; 5) Climate change, threatening agriculture, coastal populations, and large cities; and 6) Weak governance and institutional capacity, a recurring problem in many Asian countries.
These challenges are interconnected and could reinforce each other, threatening the region's growth, stability, and security.
The report presents two scenarios for Asia's future. The first is the "Asian Century Scenario." This optimistic scenario assumes that Asian economies will sustain their growth momentum over the next 40 years, enabling Asia to become a major economic player, with GDP reaching $174 trillion by 2050—half of the world's GDP.
The second scenario is the "Middle Income Trap." This pessimistic scenario envisions the region's fast-growing economies stagnating, falling into a trap where they fail to diversify and increase their competitiveness. In this case, Asia's GDP in 2050 would be reduced to $65 trillion, less than half of what is projected in the optimistic scenario, and per capita income would not exceed $20,600 (PPP).
To achieve the best-case scenario, reforms are required at multiple levels:
1. National: Promote inclusive growth, innovation, sustainable urbanization, and financial stability. Shift to a greener economy and improve governance.
2. Regional: Strengthen Asia's economic integration and cooperation, fostering openness and free movement of goods and investment.
3. Global: Asia should actively shape global economic rules, contributing to shared prosperity and global stability. These efforts will help secure long-term prosperity for the region.
Thus, Asian leaders will need to demonstrate visionary leadership to navigate these challenges and seize the opportunities ahead. If these reforms are successfully implemented, Asia could witness an unprecedented transformation by 2050, with billions lifted out of poverty and a central role in the global economy. However, failure to meet these challenges could limit economic and social gains and leave Asia in a less favorable position on the world stage.

Asia could see its share of global GDP double to 52% by 2050, regaining the dominant position it held 300 years ago.

Asian leaders will need to demonstrate visionary leadership to navigate challenges and seize opportunities ahead.

2 Applied research

Global challenges & the importance of applied research

Green, P.F. Ameliorating global challenges: Globalization, geopolitics, basic & applied research, and research security. MRS Bulletin 48, 964–967 (2023). https://doi.org/10.1557/s4357700600--023-w

This article by Peter F. Green, former president of the Materials Research Society (MRS), examines the global challenges we face and emphasizes the crucial importance of scientific research and international collaboration in addressing them. He highlights growing environmental, economic, and social issues, such as climate change, food shortages, water insecurity, and over-reliance on fossil fuels that generate greenhouse gas emissions. The author emphasizes that preserving our standard of living and tackling these challenges will require significant advances in both fundamental and applied research, particularly in fields like engineering, materials, resilient infrastructures, renewable energies, energy storage, and supply chains.

However, Green points to rising tensions between globalization, geopolitics, and scientific advancement. While globalization has significantly accelerated collaboration among researchers worldwide, geopolitical forces can disrupt these partnerships by imposing restrictions on investment, controlling exports, and increasing economic uncertainty. Such tensions create obstacles to implementing technical solutions for global crises, such as the energy transition and food security.

One of the main arguments in the article is the need to reassess the rules governing international collaboration. The current era is marked by increasingly rapid scientific discoveries and global partnerships, making traditional boundaries less relevant. The author notes that once-dominant countries, such as the U.S. and China, are now sharing scientific output with other nations, reflecting a shift toward a more diverse scientific leadership. For example, the COVID-19 pandemic illustrated how researchers worldwide collaborated to understand and treat the disease.

Green advocates a collaborative approach that includes researchers from all regions and disciplines, emphasizing that diversity, equity, and inclusion (DEI) are essential to this process. Adopting these principles fosters innovation and encourages participation by all, especially by historically underrepresented groups. He suggests that scientific societies, such as the MRS, should address specific global challenges and promote interdisciplinary and international research.

Another key point the author addresses is the future of energy systems and associated technologies. Green cites several promising research areas, such as artificial intelligence/machine learning (AI/ML) and quantum information science, which are poised to play major roles in the discovery of new materials and the development of autonomous, resilient energy infrastructures. At the same time, he highlights the importance of electrifying the energy and industrial sectors to meet global climate targets, while emphasizing that innovations in energy storage and greenhouse gas emissions reduction are also crucial.

Finally, Green calls for a review of current mechanisms for sharing scientific knowledge to balance the necessary openness for collaboration with security concerns. In his view, a coherent and inclusive approach to global challenges will be essential to ensure a secure and prosperous future for all, not just the most developed nations.

In conclusion, the article calls for collective action and strengthened international collaboration to tackle global challenges, while integrating the values of diversity, equity, and inclusion.

> **Preserving our standard of living and tackling global challenges will require significant advances in both fundamental and applied research.**

> **We need a collaborative approach, which includes researchers from all regions and disciplines, emphasizing diversity, equity, and inclusion (DEI).**

Applied research

“Big tech wants to privatize the future”

https://www.philonomist.com/en/interview/big-tech-wants-privatise-future “Technopolitique”, Asma Mhalla (2024), Paris, Seuil Editions. Interview by Apolline Guillot

In her book Technopolitics, political analyst Asma Mhalla argues that we have unwittingly become soldiers in a war led by technology giants, or "Big Tech." In her view, these companies, such as Meta, Microsoft, and OpenAI, represent a new form of geopolitical power that goes far beyond mere technological issues. Their ambition is to control not only technologies but also minds, thereby redefining politics, society, and even the future of democracy.

Mhalla introduces the concept of "total technology," a form of technology which, she argues, carries an ideological and political agenda, seeking to impose total control over all aspects of human life. Contrary to the conventional view of technology as a simple tool, these companies use their innovations to reshape public space, influence discourse, and, most worryingly, militarize their inventions.

One of the greatest dangers of Big Tech is its ability to manipulate information and collect massive amounts of data, creating a form of "hyperknowledge" that can be used for surveillance and control purposes. For example, technologies such as Neuralink, although presented as therapeutic advances, pose major risks of militarization and privatization of the human body, opening the way to profound vulnerabilities, notably through brain hacking.

Mhalla warns against the simplistic approach in current debates on technology: the question is not whether technology is good or bad, but how the giants of the sector are shaping our future without any real democratic oversight. She criticizes the way AI and surveillance are often approached from the binary perspective of "security versus freedom," which limits truly nuanced reflection on these issues.

Another fundamental aspect of this analysis is the idea of the "hyper-personalization" of modern societies, notably through social media and recommendation algorithms. These tools fragment societies, making them more atomized and vulnerable to authoritarian forms of governance. Mhalla also discusses Big Tech's role in creating an ideological vacuum, in which figures like Elon Musk or Sam Altman assume pre-eminent roles, filling the gap left by the absence of a genuine political project from states.

Finally, Mhalla questions the future of Europe in the face of Big Tech's rising power. In her view, Europe must reclaim its industrial and technological sovereignty if it is not to become a mere consumer in a world dominated by Big Tech. The future of democracy and society itself depends on it. In short, Technopolitics calls for collective awareness of the geopolitical and social stakes involved in technological advances and argues for a reorientation of political priorities to better regulate these technological giants before it's too late.

We have unwittingly become soldiers in a war led by Big Tech.

The question is not whether technology is good or bad, but how Big Tech is shaping our future without any real democratic oversight.

Kroeber, A. L., & Kluckhohn, C. (1952). Culture: A critical review of concepts and definitions. Peabody Museum Press. https:// iiif.lib.harvard.edu/manifests/view/drs:4276929551$i

Applied research

What is the future of the planet?

“Time to focus research on past, present and future climate change, say Earth Scientists” – Nature Research Custom Media, 2024. https://www.nature.com/articles/d424732-00095-024-

A recent survey of over 1,100 geoscience experts highlights research priorities for the future of the planet, with a particular focus on past, present, and future climate change. According to the results, these issues are crucial for understanding and anticipating the impact of human activity and natural phenomena. The researchers emphasized the importance of studying climate change throughout history, as this could provide models for understanding the evolution of today's climate.

The survey revealed that, in addition to climate change, topics such as carbon capture and storage, as well as energy resources, are also considered essential for controlling greenhouse gas emissions. The researchers stress the need for solid data to inform future policy choices, noting that information on the Earth's climatic past could be vital in addressing future climate upheavals.

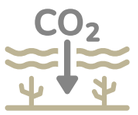
One key aspect of current research is the analysis of deep geological data, dating back millions of years, to better understand the evolution of the Earth, life, climate, and tectonic movements. This data, often scattered and difficult to compare, needs to be standardized, as the Deep-time Digital Earth (DDE) initiative is striving to achieve. This platform aims to consolidate geoscientific data and make it accessible to better understand the planet's evolution and predict future changes.

An important outcome of the survey was the growing importance of technologies such as machine learning and “big data” analysis, which are helping to bridge gaps in current knowledge, particularly in the study of fossils and ancient geological processes. Recent projects, such as one that reconstructed the history of carbon dioxide levels over the past 66 million years, are providing a more accurate picture of past climate variations and lessons for the future.

Finally, geoscientists emphasize the importance of understanding the evolution of minerals, which played a central role in the origin of life. According to Carnegie Science researcher Robert Hazen, it is crucial to continue studying the interactions between minerals and life to better understand past ecological processes and their impact on today's climate.

This survey shows that geoscience must focus on a global and interconnected vision of the Earth's evolution to better address the climate challenges of the present and the future.

Studying climate change throughout history could provide models for understanding the evolution of today's climate.



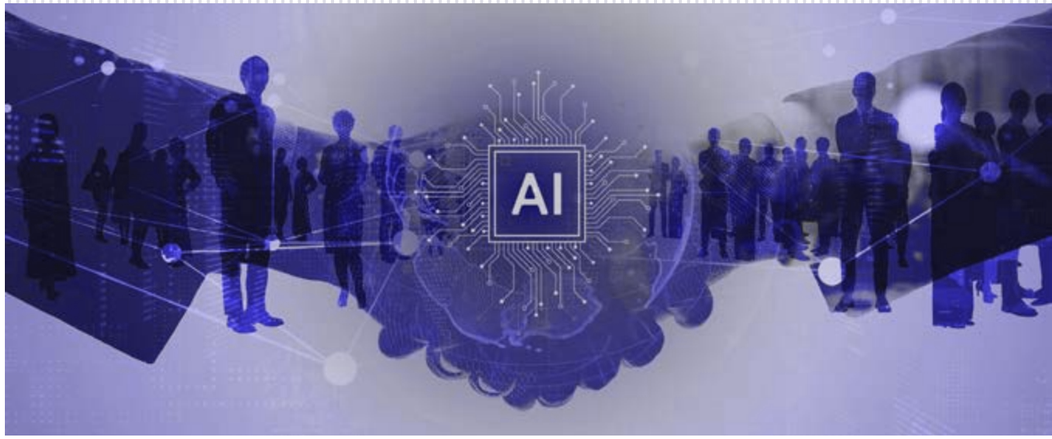
“There is no other way to understand evolving geography without understanding the evolving solid Earth,” says Hazen.

Applied research

AI & diplomacy – tools and opportunities

“Harnessing artificial intelligence in diplomacy: examples of opportunities, applications, and challenges”, 2024, Warin T, HEC Montreal.https://www.linkedin.com/pulse/harnessing-artificial-intelligence-diplomacy-examples-thierry-warin-9p5ze/

Artificial intelligence (AI) is gradually transforming the field of diplomacy, offering new opportunities and tools for diplomats while raising ethical and practical challenges. This article explores how AI, particularly through massive data analysis and scenario modeling, can improve decision-making, diplomatic influence, and conflict resolution.



What are the potential strategic applications of AI in diplomacy?

1. Influence diplomacy: AI enables diplomats to better understand international relations by analyzing voting behavior, geopolitical trends, and diplomatic relations. It helps predict countries' positions on crucial issues, facilitating the formation of strategic alliances. It also supports economic and commercial diplomacy by identifying market opportunities and aiding in the adoption of international standards.

2. Cultural and reputational diplomacy: AI helps countries promote their values on a global scale, enhancing their image through culture and favorable policies. It also assists in building coalitions based on common goals, an essential aspect of the “soft power” described by Joseph Nye.

3. Scientific diplomacy: In global crises, such as the COVID-19 pandemic, AI has enabled faster scientific collaboration by analyzing large volumes of data to identify potential partners. It also plays a significant role in promoting a country's scientific achievements, enhancing its international reputation.

4. Economic diplomacy: AI enables diplomats to analyze complex economic data, identify investment opportunities, assess risks, and understand the geopolitical implications of economic policies. By analyzing trade flows and global supply chains, AI helps formulate more effective strategies, particularly in trade negotiations.

5.Conflictresolution:AIfacilitates real-time monitoring of conflict zones, enabling diplomats to adjust their strategies based on local developments. It also helps analyze the root causes of conflicts, such as economic inequalities, and aids in predicting negotiation outcomes, thereby increasing the chances of achieving lasting peace.

Despite its advantages, AI poses several ethical challenges:

6. Disinformation and bias: AI can be used to spread disinformation on a large scale, posing a risk to public trust and international relations. Furthermore, if the data used to train AI systems is biased, it can lead to unjust decisions, particularly concerning human rights or international law.

7. Lack of transparency: The opacity of AI algorithms, often referred to as the “black box” problem, can create mistrust and compromise diplomatic efforts, especially when crucial decisions are made without a clear explanation.

8. Ethical dilemmas: AI, by making automated decisions without regard for human empathy, can overlook important moral considerations, raising questions about the role of humans in AI-powered diplomacy.

AI has the potential to transform diplomacy by increasing diplomats' ability to manage the complexities of international affairs. However, its integration requires caution, balancing its benefits with ethical considerations. AI should be viewed as a tool to enhance human capabilities, not replace them, allowing diplomats to navigate global issues with a blend of human wisdom and technological support.

Applied research

The myth of rationality: how neuroscience challenges centuries of western philosophy on human nature

"The myth of rationality: How neuroscience challenges centuries of western philosophy on human nature and why it matters to leader", Noll, Douglas, October 2024 https://www.linkedin.com/pulse/myth-rationality-how-neuroscience-challenges-centuries

The Myth of Rationality explores the evolution of the concept of human rationality, challenging the longstanding assumption in Western philosophy that humans are fundamentally rational beings. Historically, thinkers such as Plato, Aristotle, Descartes, and Kant upheld the idea that reason should guide human morality and actions, with emotions seen as disturbances to be controlled. However, recent advances in neuroscience reveal a different reality: emotions, far from being obstacles to rationality, are actually essential to it.

Neuroscience and Human Decision-Making

Research in neuroscience, notably by Antonio Damasio, shows that emotions play a crucial role in decision-making. According to Damasio's "somatic marker hypothesis," emotions act as markers that guide choices. For example, without these emotional cues, a person may struggle to make a decision, even in a rational context. Findings on the role of the amygdala and prefrontal cortex also show that emotions activate the brain's response more quickly than logical thinking. This hierarchy of responses suggests that in emotional situations, our reactions often precede our capacity for logical reasoning. Furthermore, cognitive biases, such as confirmation bias or the availability heuristic, demonstrate that our decisions are frequently influenced by unconscious emotions, challenging the idea that humans act purely rationally. Jonathan Haidt's research also indicates that moral judgments are often based on emotional intuitions rather than objective reasoning.

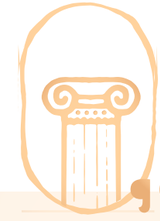
Neuroscience shows that rationality, far from being the primary driver of our behavior, often serves as a tool to justify our emotional decisions. Philosopher David Hume anticipated this concept, declaring that "reason is, and ought only to be, the slave of the passions." Recent neuroscientific discoveries support this view, demonstrating that emotions guide decision-making and that rationality often follows to justify choices made on an emotional level.

The implications of this understanding of human nature are profound for leadership and ethical practices. Recognizing that emotions shape our decisions, leaders should adopt emotional intelligence skills to manage conflict, make informed decisions, and build strong relationships. Techniques such as "emotional labeling" (identifying and acknowledging emotions) enable leaders to defuse tense situations and encourage more rational, collaborative decision-making.

Effective leaders today understand emotional dynamics, regulate their own emotions, and know how to manage conflict by engaging with the emotions of others. Ignoring emotions not only reduces decision-making effectiveness but can also be counterproductive. In contrast, recognizing and addressing emotions leads to more thoughtful and positive outcomes.

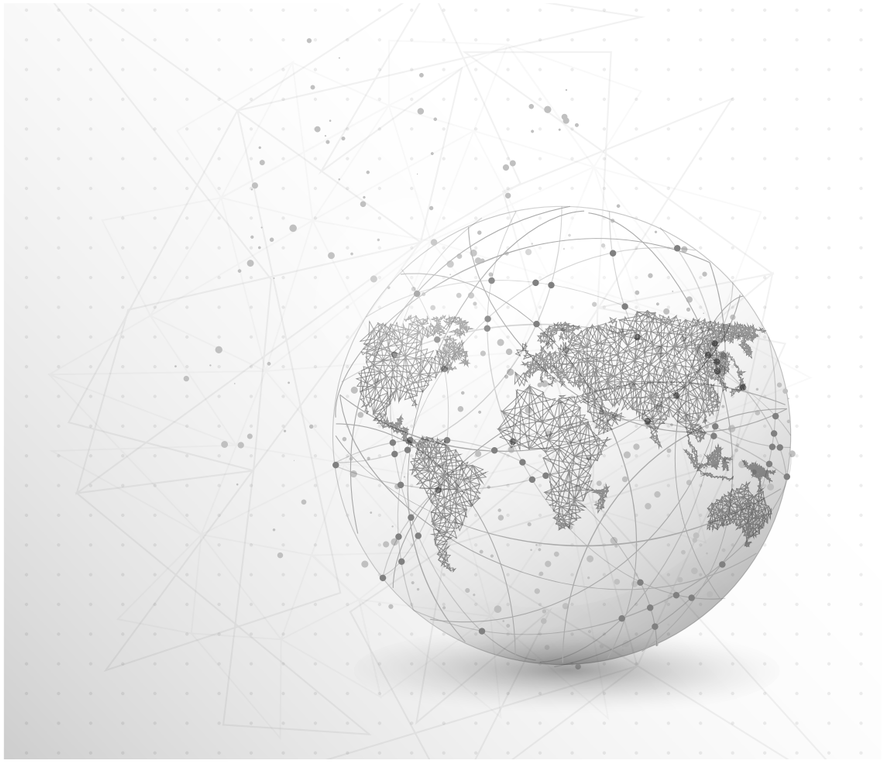
In conclusion, the Western philosophical assumption that humans are primarily rational beings is challenged by modern neuroscience. Emotions, far from being mere distractions, play a central role in our decisions and actions. Leaders today need to reevaluate the balance between rationality and emotion, understanding that emotional intelligence is essential for navigating complex human interactions and strategic decisions. Emotional skills such as empathy and emotional labeling are not just trends but fundamental tools for informed decision-making and effective human relations.

Recent advances in neuroscience reveal a different reality: emotions, far from being obstacles to rationality, are actually essential to it.

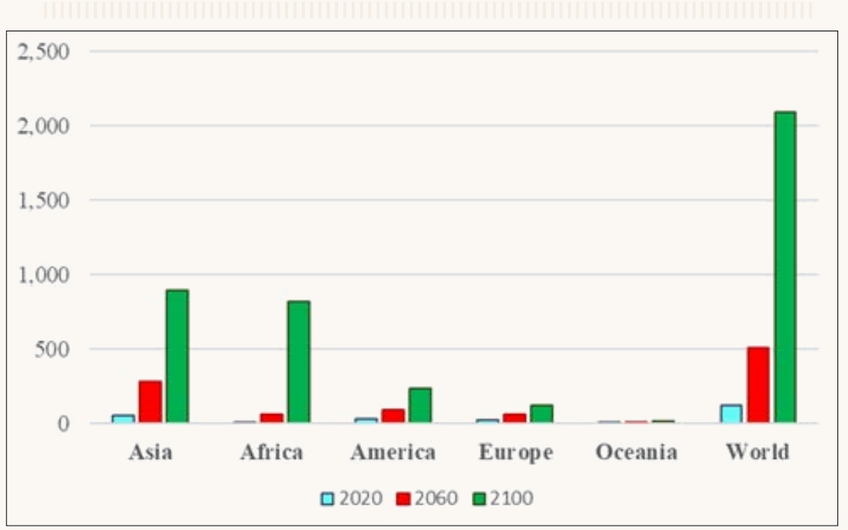


Recognizing that emotions shape our decisions, leaders should adopt emotional intelligence skills to manage conflict, make informed decisions, and build strong relationships.

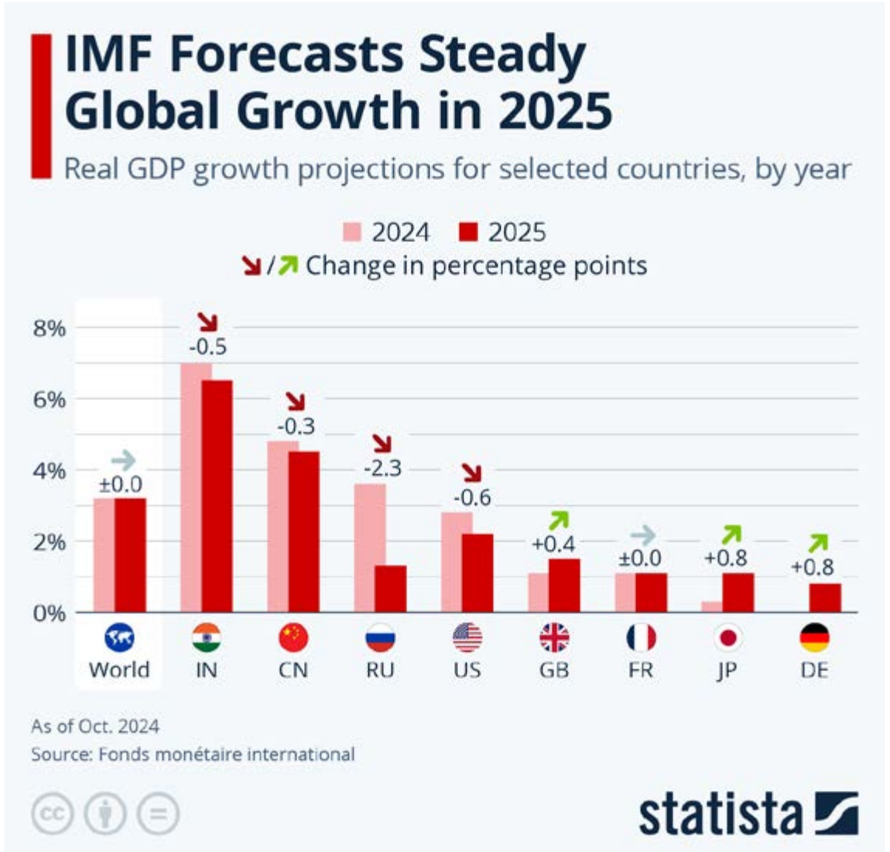
3 The future in numbers



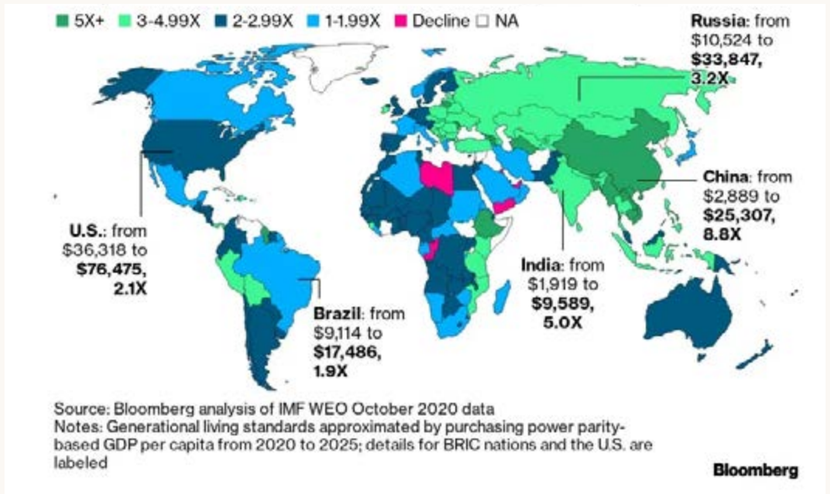
GDP of major regions and the world, 2020-2100



IMF Forecasts Steady Global Growth in 2025



Living standards will at least doubled in many nations by 2025



6

Issue No. 06

(January 2025)

FUTURE TRENDS

Report

Issue no. 6 - January 2025

Future Trends Report

Future Trends Report, published in English and Arabic by TRENDS Virtual Office in Montreal, stands out as a distinctive publication dedicated to highlighting:
1. the most important forward-looking studies that aim to identify future trends, analyze various variables that may influence these trends, and determine the best future scenarios.
2. the most important applied studies that explore the application of knowledge, scientific theories, and information to solve current problems and overcome future challenges.
3. the most important illustrative and graphic forms that visually summarize significant studies, helping readers understand the trends and challenges of the future world.

Editorial board

Contents

1 Prospective research

The future of higher education

« Penser hors des sentiers battus – Perspectives sur les futurs de l'enseignement supérieur à l'horizon 2050 » - May 2021, UNESCO International Institute for Higher Education in Latin America and the Caribbean

This UNESCO prospective report states that higher education in 2050 will evolve in a transformative and progressive way to promote the well-being of the planet and contribute to social and economic development. It will have to assume responsibility for protecting the planet, promoting sustainability, diversity and security, and fostering a shift in development paradigms. According to the authors, higher education must also respond to global challenges and support inclusive economic and social development, notably by reducing global inequalities and supporting less developed regions.

The financing of higher education will remain a major challenge, particularly with the intensification of climate-related costs and the proliferation of global debt. To support an accessible and inclusive higher education system, considerable public funding is essential, along with innovative financing models such as a "Global Fund for Learning."

The higher education of tomorrow will also need to be more interconnected. Institutions will need to collaborate with other social and economic institutions, integrating flexible, inclusive pathways tailored to learners' needs. This includes a multidisciplinary approach that better links the humanities and social sciences with technology and innovation. The inclusion of vulnerable groups, the elimination of financial barriers and the quality of education must be priorities to guarantee access to higher education as a universal right.

Finally, education must support learners' individual development, preparing them for autonomous life projects and global civic engagement, while strengthening their autonomy and fostering practical and critical skills for the future.

The report stresses that higher education, guided by values of solidarity and collective well-being, must become an essential tool for tackling global challenges, particularly those related to social justice, sustainability and peace. Higher education must promote human rights, protect minorities and the environment, and focus on international cooperation in the face of global crises such as COVID-19. The pandemic has revealed the need for greater global cooperation, particularly in research and innovation. Higher education, as a global player, must position itself to guide this cooperation, while being sensitive to ethical issues in the application of technologies such as artificial intelligence.

Higher education institutions must be at the forefront of the fight against climate change, integrating education for sustainable development and developing "green growth" skills. They must also foster inclusive internationalization, challenge models of elitism and inequality in student mobility, and promote equitable partnerships between institutions worldwide.

Higher education must become a "global commons," supporting sustainable development goals and fostering greater interconnection between cultures, societies and generations. However, it must also overcome internal challenges, such as institutional competition and unequal access. Finally, a reassessment of past values, including colonialism and its legacies, is needed to imagine a more equitable and sustainable future for higher education.

"Higher education in 2050 will change in ways that are both transformative and incremental, disruptive and smooth."

"Higher education needs to not only welcome but be responsive to diversity."

Prospective research

How can we act in the face of crisis? A philosopher's point of view

Deneault, Alain. Faire que!: L'engagement politique à l'ère de l'inouï. Lux Éditeur, 2024. https://luxediteur.com/catalogue/faire-que/

Faire que! L'engagement politique à l'ère de l'inouï by Alain Deneault is an essay that questions how we can act in the face of the current ecological and social crisis. Deneault, a Quebec philosopher and essayist, analyzes the tensions of our times, marked by unprecedented climatic disturbances, extreme phenomena such as fires, hurricanes and heatwaves, but also by a rise in collective anxiety about an uncertain future. Written against a backdrop of crisis, the book reflects on the political action needed to overcome the state of global decline.

The essay begins with an alarming observation: the planet is undergoing unprecedented upheavals. Climatic phenomena are becoming increasingly violent and uncontrollable, and the resulting threats—famines, mass migrations, wars, epidemics seem to be looming on the horizon. Yet, in the face of such urgency, inaction seems to dominate. The philosopher criticizes the political class, which pretends to ignore these challenges, and deplores the powerlessness of scientists, overwhelmed by the scale of the crisis and lacking an adequate response. In his view, this situation creates a climate of "mediocracy," where important issues are drowned out by populist rhetoric and superficial solutions, such as "sustainable development" or "green capitalism," which are, in his view, nothing but decoys.

In this context, the author calls for collective action, a radical transformation of mentalities and power structures. He questions the notion of "crisis," which he considers too weak to describe the current reality. The term "crisis" implies a possible way out, whereas Deneault views the situation as far more serious and lasting. In his analysis, the environmental crisis is inextricably linked to the capitalist organization of the world, which benefits a small elite at the expense of the majority. The author underscores the fragility of a system that seems to be leading the world to its doom, while exacerbating inequalities.

Deneault proposes a rethinking of political commitment outside the classic structures of institutional politics. He calls for a mobilization that transcends mere opposition to current drifts, to imagine a future based on principles of solidarity, cooperation and equity. One of the solutions he suggests is the concept of the bioregion, an idea born in the 1960s, which involves thinking of territories not in terms of political boundaries but according to ecological and social limits. In a bioregion, human communities and ecosystems are interdependent and need to relearn how to work together sustainably. This means returning to local structures, strengthening social ties, and redefining work and social values.

Deneault also calls for a collective awakening: anxiety about the future is legitimate, but it must not be passively endured. The essayist sees anxiety as a sign of mental health, as long as it is assumed and used as a driving force for change. He criticizes substitute solutions that divert attention from the real emergency, such as symbolic gestures (cardboard straws, electric cars, etc.), which are not enough to solve the system's structural problems.

Finally, in this book, Deneault revisits the classic question of political engagement: what to do? For him, the answer does not lie in violent revolution or passive expectation of a miracle solution. On the contrary, it requires a reinvention of politics, based on a new way of thinking collectively and democratically. Faire que! is therefore a call to action, a manifesto for radical change, a collective project to confront contemporary crises, far from false hopes and cosmetic solutions.

"80% of terrestrial species are threatened by industrial activity. We haven't seen anything like this since the disappearance of the dinosaurs".

Anxiety about the future is legitimate, but it must not be suffered.

Prospective research

What impact will AI have on geopolitics?

"Géopolitique de l'intelligence artificielle – comment la révolution numérique va bouleverser nos sociétés," February 2021, IRIS (Institut de Relations Internationales et Stratégiques) https://www.youtube.com/watch?v=bHINSVhX_Ss

A videoconference was organized by IRIS, an independent French research institute, in February 2021, on the occasion of the publication of the book "Géopolitique de l'intelligence artificielle: comment la révolution numérique va bouleverser nos sociétés" (Eyrolles) by Pascal Boniface, Director of IRIS. The discussion, moderated by Sylvie Matelly, Deputy Director of IRIS, focuses on the geopolitical issues surrounding AI, drawing on the expertise of author Pascal Boniface, as well as Gilles Babinet, advisor to the Institut Montaigne on digital issues (France), and Rahaf Harfoush, digital anthropologist and lecturer at Sciences Po Paris.

The panelists attempt to address the impact of AI from a global perspective, discussing from the outset issues such as the replacement of certain jobs by technological innovations. The speakers refer in particular to Marx on the development of productive forces. While certain jobs may diminish or disappear due to AI, the speakers note that a kind of "cornucopia" could soon emerge. For example, research could evolve through collaboration between intellectuals and algorithms. As Boniface observes, "someone could be a bricklayer in the morning, and an architect in the evening." AI would also drive certain developments in creative industries, such as design projects.

These perspectives highlight why companies need to prepare for these challenges, notably by rethinking their value systems, and adapting to the changes brought by AI. Harfoush, an anthropologist specializing in digital issues, explains the reasons behind the lack of discussion around these challenges. In her view, thinking is often blocked by an overly binary vision of the digital future where there seem to be only two possible scenarios: utopia or dystopia. Yet, in her perspective, the scenario towards which the world is moving is rather a duality between these two extremes. AI will be both formidable and terrible, and the role of states will be to manage the balance between these opposing outcomes.

In particular, the book discusses cybersecurity issues, since AI can also be seen as creating new threats, such as situations where algorithms give greater visibility to certain political agendas, encouraging high-risk geopolitical situations. Data sharing is also discussed, as it could pose significant dangers to populations.

Speakers discuss at length the role of GAFAMs, and ask: Will they kill off states or will they become vectors of democracy? An example is given of the rivalry between the U.S. and China, and the role of multinationals in these geopolitical issues. Will a digital giant necessarily follow the priorities set by the state in which it was created? According to Boniface, "companies think market, not flag." Governments were too slow to react, and didn't realize the power that technological innovation— and the giants leading it would eventually hold. These corporations are now providing essential services to the public, notably during the COVID-19 health crisis. However, as Babinet says, "the important thing is that they continue to be our servants, and that they don't become our masters."

In conclusion, the priority should be to answer the question: How can innovation continue without breaking the social contract of our societies? How can we maintain equitable growth and drive innovation without compromising the well-being of our societies?

AI will be both formidable and terrible, and the role of states will be to manage the balance between these opposing outcomes.

how can innovation continue without breaking the social contract of our societies?

Prospective research

The no-harm rule and sovereignty in the advisory opinions on climate change

Foster, C. E. (2024). Due Regard for Future Generations? The No Harm Rule and Sovereignty in the Advisory Opinions on Climate Change. Transnational Environmental Law, 1–22.

The article explores the obligation of states not to allow their territory to be used for acts harmful to others, particularly in the context of climate change. It examines how the principles of the no harm rule which include the prohibition of irreversible damage to the environment, and the importance of international cooperation, aim to prevent devastating climatic effects.

International law recognizes the legal interests of future generations, notably through the principle of sustainable development and the theory of intergenerational equity. These principles underline the need for states to respect the needs of future generations, particularly in the management of natural resources and environmental impacts. The Rio Declaration and the International Court of Justice have argued that economic development must be balanced with environmental protection, considering the effects on future generations, although sustainable development often remains a soft-law norm.
The article examines the application of the principle of "sic utere tuo" and the obligation not to harm future generations, focusing on the notion of "due regard." This principle is emerging as a global norm in international law, obliging states to respect the interests of others, including those of future generations. It is linked to obligations such as due diligence and environmental impact assessment. "Due regard" could become a standard for harmonizing sovereignty with the preservation of the rights of others, particularly in environmental and intergenerational matters.
The principle of "due regard" (due consideration) is already applied in various international legal cases, particularly in relation to territorial sovereignty and environmental obligations. It emphasizes that the sovereignty of states must be exercised in a reasonable manner, without excessively prejudicing the rights of others, including future generations. This principle is reflected in decisions by the ICJ and arbitral tribunals, as well as in requests for advisory opinions, notably on climate change, where states must consider the impacts on future generations.
Researchers and practitioners recognize humanity's responsibility towards the future. International law might give concrete expression to this responsibility, particularly through the notion of "due regard." Although already used in various international legal contexts, this concept could play a key role in protecting the interests of future generations. The article also examines how contemporary moral philosophy on climate stresses the importance of taking future generations into account.

Economic development must be balanced with environmental protection.

The principle of "due regard" emphasizes that the sovereignty of states must be exercised without excessively prejudicing the rights of others, including future generations.

Prospective research

A vision of global drivers that will shape the future

Global Strategy Trends – Out to 2055, Bite-size, Ministry of Defence, UK, 2024 https://assets.publishing.service.gov.uk/media/669923bda3c2a28abb50d236/GST_7_Bite_size_web.pdf

Today's world is hyperconnected, constantly changing and often chaotic. The pace of technological and social change, against a backdrop of interconnected crises, makes the future increasingly uncertain. Preparing for multiple scenarios with limited resources and shifting global power is becoming difficult. The Global Strategic Trends (GST) program aims to provide a long-term strategic context for the UK Ministry of Defence (MOD), government decision-makers, and the UK's allies. It provides analysis to minimize bias, reduce surprises and improve preparedness for alternative futures.

The GST program identifies six global drivers of change that will shape the future. These drivers are: competition for global power, demographic pressures, climate change, technological advances and connectivity, economic transformation and the energy transition, as well as inequality and pressure on governance. These factors often interact in complex ways, influencing and accelerating global dynamics in unexpected ways. At the same time, five key contradictions such as cooperation versus confrontation—are redefining international relations and societies. Uncertainty surrounds the impact of these drivers, particularly with regard to the evolution of technologies, climate change and competition for natural resources. Major issues ahead include the future of global governance, geopolitical tensions, and the adaptation of societies to ecological and technological challenges.

The future world order will be shaped by a variety of players, including states, international organizations and non-state actors. The United States, although powerful, will probably see its relative influence diminish in the face of the rise of China and other emerging powers such as India. Russia, for its part, will depend on the outcome of its war in Ukraine. Medium-sized powers such as the UK and Japan will use their diplomatic, economic and military influence. This world could evolve towards a multipolar order, but with significant uncertainties, including possible fragmentation or increased cooperation depending on responses to global challenges.

The report goes on to present forecasts for each region of the world. For example, it states that Russia's future is uncertain, depending on the outcome of the war in Ukraine and its economic, social and political repercussions. An aging population, environmental challenges and government pressures could weaken Russia, pushing it to focus on its domestic priorities, despite tensions with China.

Finally, the report discusses thematic areas: society, economy, environment, information and technology and conflict and security. On the subject of information and technology, the report mentions in particular that in the coming decades, the amount of data and the use of technology could grow considerably. Access to data will become crucial for government and business decisions. Technological advances, such as artificial intelligence and quantum computing, will transform various sectors, but will also pose regulatory challenges.

To conclude, the six drivers of global change identified in GST show that global competition for power will persist, but the balance of power will shift. Population growth, climate change, technological advances, energy transitions and growing inequality will transform societies and economies, with varying impacts.

The future world order will be shaped by a variety of players, including states, international organizations and non-state actors.

Population growth, climate change, technological advances, energy transitions and growing inequality will transform societies and economies.

2 Applied research

Inequality and immigration in the UK

Christian Dustmann, Yannis Kastis, Ian Preston, Inequality and immigration, Oxford Open Economics, Volume 3, Issue Supplement_1, 2024, Pages i453–i473, https://doi.org/10.1093/ooec/odad052

This article examines the impact of immigration on inequality, particularly in the UK. Immigration can affect income inequality by altering the wages of native-born workers, increasing competition for certain jobs, or changing the composition of the labor market. Immigrants, who are often better educated but occupy low-paid jobs, can reduce the wages of low-skilled workers while increasing those of skilled workers. The article analyzes the effects of immigration on wage distribution in the UK, and shows that the impact on inequality is small but noticeable.

Immigration to the UK has increased considerably over the last 45 years, particularly since the 2000s. The share of immigrants in the population climbed to 13.4% in 2015, with a high concentration among 1860- year-olds. The origin of immigrants has changed, with a notable rise in arrivals from EU countries after 2004.

In addition, the definition of an immigrant varies depending on whether one considers birth or nationality. Immigration to the UK includes a significant proportion of temporary migrants, with a high rate of departures, particularly among EU nationals.

Immigrants to the UK, although educated, often experience a "devaluation" of their skills on arrival, as these are not always transferable, not least because of language barriers. This leads them to take up lower-paid jobs than their level of education would suggest. Over time, however, they "move up the ladder," acquiring skills suited to the local job market. The economic integration of immigrants depends on their intention to stay in the country, and their investment in specific skills. Investment in human capital is influenced by the length of their intended stay.

Immigration can influence native wages by altering the labor supply. If immigrants compete with natives in the labor market, wages may fall, especially for groups with similar skills. However, immigration can also increase the productivity of complementary factors, such as capital or other groups of workers. Economic adjustments can occur, for example, via trade or technology, allowing the additional labor supply to be absorbed without changing wages significantly. Empirical research shows that immigration tends to widen the wage distribution of native-born workers.

Immigration can affect wage inequality in the host country in two ways: by altering the wage distribution of residents, or by changing the composition of the population. For example, the arrival of low-skilled workers can reduce the wages of low-skilled native workers, thereby increasing inequality among them. However, immigration also introduces a new category of workers, lowering the overall average wage, while increasing inequality between all workers, native and immigrant.

The authors conclude on the relationship between immigration and inequality in the UK over the last 40 years. Immigration has led to a slight increase in wage inequality, but the overall effects remain small. Well-educated immigrants often start out in lower-paid jobs, but their wages rise over time. What's more, wage inequality fell after 2000, thanks in particular to the rise in the national minimum wage. Finally, immigration has had no significant impact on the wage distribution of native-born workers, and its fiscal effects are positive.

"The share of foreign-born in the UK population increased from 5.3% in 1975 to 13.4% in 2015."

Immigration can also increase the productivity of complementary factors, such as capital.

Applied research

Radicalization to violence among the youth

Audet, G., Fleury, R., Miconi, D., Santavicca, T., Rousseau, C. & Plante Thibodeau, S. (2024). Understanding to Better Respond. Radicalization to Violence Among the Youth. Guide for School Staff. RAPS, CREDEF and SHERPA.

This guide, published in 2024, jointly by the RAPS (Research and Action on Social Polarizations) team, CREDEF (Chaire de Recherche sur les Enjeux de la Diversité en Éducation et en Formation), and the SHERPA Research Institute, all three based in Montreal, analyzes the issues surrounding radicalization and violence among young people. The researchers suggest courses of action for all those involved in education, to better respond to this increasingly present challenge.

The world is rapidly changing, demanding constant updates to our knowledge and practices. This acceleration often challenges traditional methods, making them outdated or even harmful. One area of concern is the rise of violence among youth, especially in schools. In 2023, media coverage highlighted growing aggressive behaviors, including hate crimes, gun violence, and bullying. This guide aims to spark reflection and collective action on these issues. It presents recent data, tools, and practices to assist educators, acknowledging that it is not exhaustive and should be enhanced with field-based insights.

The 20152018- Government Action Plan on Radicalization in Quebec emphasized the role of education in preventing violence and promoting social cohesion. It called for schools to adopt anti-bullying and anti-violence plans with prevention and reporting measures. In 2016, a training course on violent radicalization was developed, and this updated guide reflects new research, including the impact of the pandemic and the Internet on social polarization. It outlines tools for promoting "living together," provides action steps, and offers resources for further support, incorporating recent initiatives from the RAPS team.

Radicalization is not inherently problematic, as it can bring about necessary social change. Being radical generally implies a shift from moderate to extreme views, but not necessarily violent ones. History shows examples of non-violent radicalism contributing to women's rights, minority rights and environmental protection. However, radicalization can also lead to violence, often fueled by online culture. Young people in search of an identity are particularly vulnerable, and social isolation, frustration and exclusion can increase this risk. Supporting protective factors such as a stable social network and good education is essential to counter these risks.

The role of schools and school staff in preventing violent radicalization is crucial. Schools must avoid stigmatizing students and their families, and instead promote social cohesion. Preventing radicalization involves fostering "living together," reducing vulnerability factors and strengthening protective factors. Various tools exist, such as the Educational Project, the School Code of Conduct and anti-violence plans. School integration, intercultural policy and ongoing teacher training are also essential in the fight against radicalization and its consequences.

Schools need to adopt anti-bullying and anti-violence plans with prevention and reporting measures.

The role of schools and school staff in preventing violent radicalization is crucial.

Applied research

Applied educational research and thematic analysis

Peel, Karen L. (2020) "A Beginner's Guide to Applied Educational Research Using Thematic Analysis," Practical Assessment, Research, and Evaluation: Vol. 25 , Article 2. DOI: https://doi.org/10.7275/ryr5-k983

Karen L. Peel, from the University of Southern Queensland (Australia), addresses the lack of literature on the theory and application of conducting case studies in educational settings. This article first presents the theoretical and philosophical foundations behind research design suitable for educational settings, and then sets out a roadmap, or "inquiry framework," that provides the keys to effective, functional research.

The author points out that philosophical assumptions (ontology and epistemology) influence the researcher's position on ethical research. According to Peel, researchers who restrict themselves to qualitative research, particularly case studies, must understand that reality is multiple and contextual. Thematic analysis allows meanings to be constructed from participants' experiences, but the researcher, as interpreter, plays a key role in data collection and analysis. Critical reflection and consideration of personal biases are essential to guarantee the transparency and rigor of the study.

This article describes a research framework adapted to the case study approach, used to explore specific educational issues. Case study is a qualitative method that enables in-depth examination of delimited systems through diversified data collection. Peel describes a rigorous six-step process for data collection and thematic analysis, influenced by renowned researchers such as Butler (2011) and Yin (2014). The six steps are: 1) identify the issue; 2) collect the data; 3) prepare and engage with the data; 4) analyze thematically; 5) interpret the data analysis; 6) compose the research paper. Each step is duly described by the author, giving the reader the keys to applying the framework effectively. For example, Peel explains the codification stage, a tool for identifying significant extracts in transcripts by means of codes. These codes, created inductively, are used to identify patterns of meaning in the data. The researcher assigns codes based on the words and behaviors of the participants and revises them iteratively. As the analysis proceeds, new codes emerge, while old ones are refined.

This flexible, structured approach is designed to guide novice researchers in the analysis of qualitative data, emphasizing reflection and rigor in the interpretation of results for transparent, ethical empirical research. Indeed, qualitative research involves a close relationship between the researcher and the participants, requiring respect and ethics, which the author highlights. Research ethics include protecting participants and minimizing risks. Research rigor and credibility are reinforced by transparent methodology, rigorous data analysis and traceability of decisions.

In conclusion, although case study research is limited by its scale, it enables in-depth exploration of issues. This approach is suited to complex questions and must respect the researcher's philosophical principles, while generating transferable knowledge.

Philosophical assumptions (ontology and epistemology) influence the researcher's position on ethical research.

Qualitative research involves a close relationship between the researcher and the participants, requiring respect and ethics.

Applied research

The future of education: a philosopher's point of view

De Koninck, T. (2010). Philosophie de l'éducation pour l'avenir. Presses de l'Université Laval.

De Koninck, a philosopher from Québec, Canada, proposes in his book "Philosophie de l'éducation pour l'avenir" to "rethink education from the bottom up." With this book, which is almost like a class, built around thirteen parts, the philosopher addresses everyone, very directly, in an attempt to respond to the challenges facing educators today.

After a section on philosophy and its role in education, the author returns to the true raison d'être of education, namely "happiness itself." In his view, the purpose of education is to give meaning to life, to elevate each individual towards a fully human existence, with affectivity as its essential priority. Children begin their emotional development in a state of great indeterminacy, and the love they receive from early childhood is crucial to their self-esteem. Lack of affection is detrimental to development, as shown by the criticism of the character Thomas Gradgrind in Dickens' Hard Times, a symbol of the neglect of emotions and sensitivity in education. Love and recognition, based on human relationships, are vital.

In the fourth part, de Koninck discusses the importance of the educational approach in relation to children. The education of children, approached as a whole, is of paramount importance from early childhood onwards. Moral and intellectual education rests on three pillars: nature, reason and habit. This vision, inherited from the ancients, was developed by thinkers such as Plutarch, Aristotle and Locke. The plasticity of the developing human brain underlines the importance of early sensory impressions in cognitive development. In particular, touch, from the embryonic stage, plays an essential role in brain development, linked to understanding and self-perception. Thus, according to the author, education, by enriching sensory experience, shapes a child's intelligence.

De Koninck also discusses the challenges of teaching. As Paul Valéry and Simone Weil emphasize, teaching must arouse the desire to learn, because intelligence only develops in joy. The aim is to prevent ideas from becoming inert, and to stimulate active, creative thinking. The challenge is to help students connect subjects and understand their usefulness in the present. Teaching must encourage active listening and personal engagement, valuing interaction and wonder in the face of ignorance, as in the sciences.

Humanist education needs to be redefined to meet contemporary needs. In the words of Antoine de Saint-Exupéry, we need to "fill" the word "humanism" by giving it a deeper meaning. This challenge involves promoting diversity, not only in biology, but also in human talents and cultures. Biology shows that diversity is essential to survival and evolution. Finally, culture and the diversity of cultures are precious resources, in danger of being standardized by technology. Preserving this richness is vital to a full understanding of humanity. Technology, though utilitarian, must be put at the service of human beings. Education must encourage critical reflection, the awakening of the mind and the capacity for discernment, in order to prevent illusions and ensure genuine, humane progress.

The purpose of education is to give meaning to life, to elevate each individual towards a fully human existence, with affectivity as its essential priority.

Education, by enriching sensory experience, shapes a child's intelligence.

Applied research

How can geopolitics affect scientific research? The example of Russia

Zhang, L., Cao, Z., Sivertsen, G. et al. The influence of geopolitics on research activity and international collaboration in science: the case of Russia. Scientometrics (2024). https://doi.org/10.1007/s1119204984--024-

In recent years, the tension between open science policies and those focused on competition and security has highlighted a paradox: global scientific collaboration is not keeping pace with defense alliances. Despite political tensions, the United States collaborates massively with China and Russia. The Russia-Ukraine war has led to sanctions affecting scientific collaboration, but scientific communities are resisting, favoring individual exchanges.

This phenomenon reflects the idea that science should be above political boundaries, although the geopolitical situation is gradually influencing these relationships.

To test the hypothesis of the relative stability of Russia's collaboration and publication patterns, we used a long-term perspective, with annual and monthly analyses. The data come from the Web of Science™ and InCites, covering 461,366 international publications from January 2022 to April 2023. Two indicators were developed: relative intensity of collaboration (RIC), measuring bilateral activity, and balance in collaboration (BIC), measuring the balance of a country's collaboration profile. These indicators make it possible to analyze the impact of geopolitics on Russia's scientific collaborations.

The results of this study show a complex evolution in Russia's scientific contribution to international journals. Between 2000 and 2014, the share of Russian publications declined, as it did for other countries, due to the increase in contributions from other regions, notably China and India. However, after 2014, Russia managed to reverse this trend for a while thanks to scientific policies, such as the 5top100 project, aimed at improving academic mobility and international cooperation. But since 2022, this dynamic has declined sharply, partly due to sanctions and geopolitical difficulties linked to the war in Ukraine.

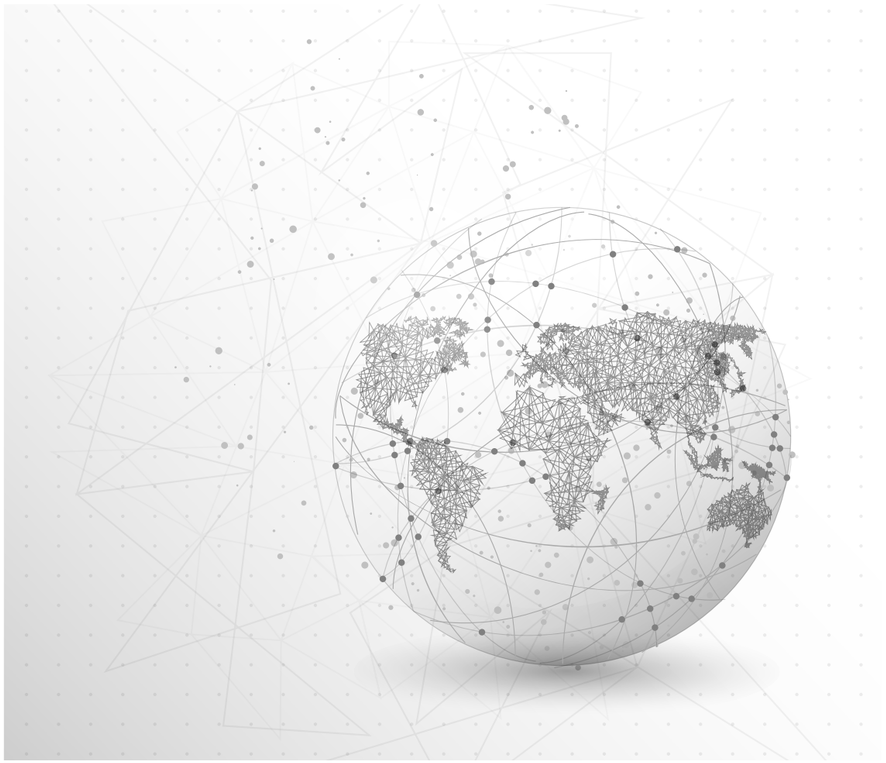
Analysis of international collaboration, measured by the rate of foreign co-authors, shows a relative stability in scientific cooperation despite a decline in Russian scientific output. However, collaboration with countries such as Germany and the U.S. has decreased, while with China and India it has increased. In addition, the study reveals significant variations in certain domains such as particles and fields, where Russia has seen a significant reduction in its partnerships, in contrast to fields such as astronomy, where collaborations have been maintained. These results suggest that geopolitical decisions influence scientific fields differently.

The results confirm the hypothesis that geopolitical conflicts marginally affect long-term trends in international scientific collaboration. Russian science is well integrated into global science, and the intensity of bilateral collaboration remains stable, particularly with the U.S. and China. However, collaboration with Germany is declining, while it is increasing with China and India. The decline in Russian contributions to scientific journals seems to be due to internal factors, such as the repression of academic freedom.

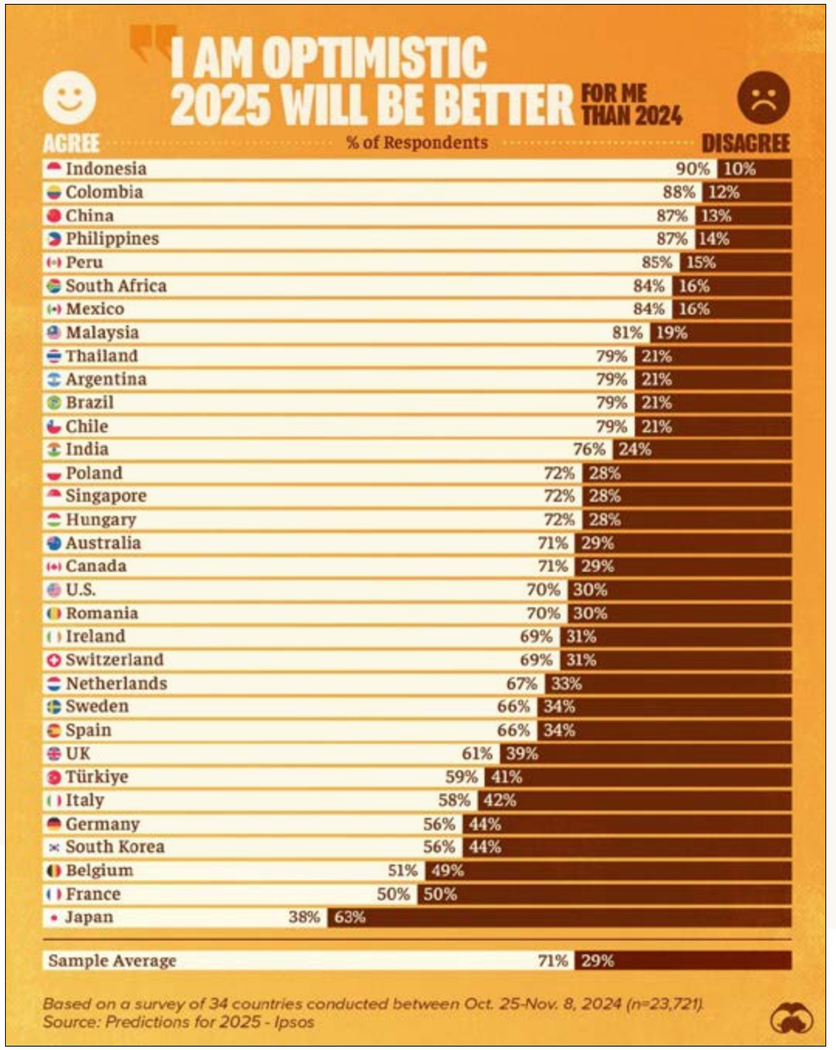
Science should be above political boundaries.

Geopolitical conflicts marginally affect long-term trends in international scientific collaboration.

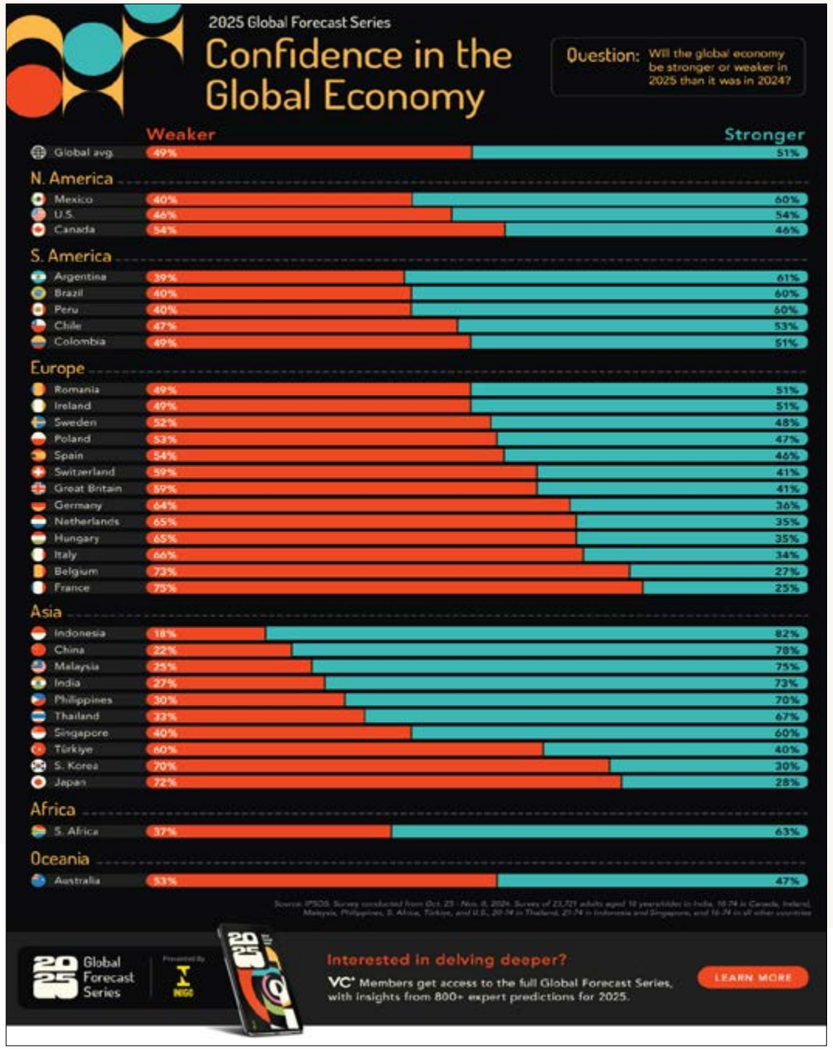
3 The future in numbers



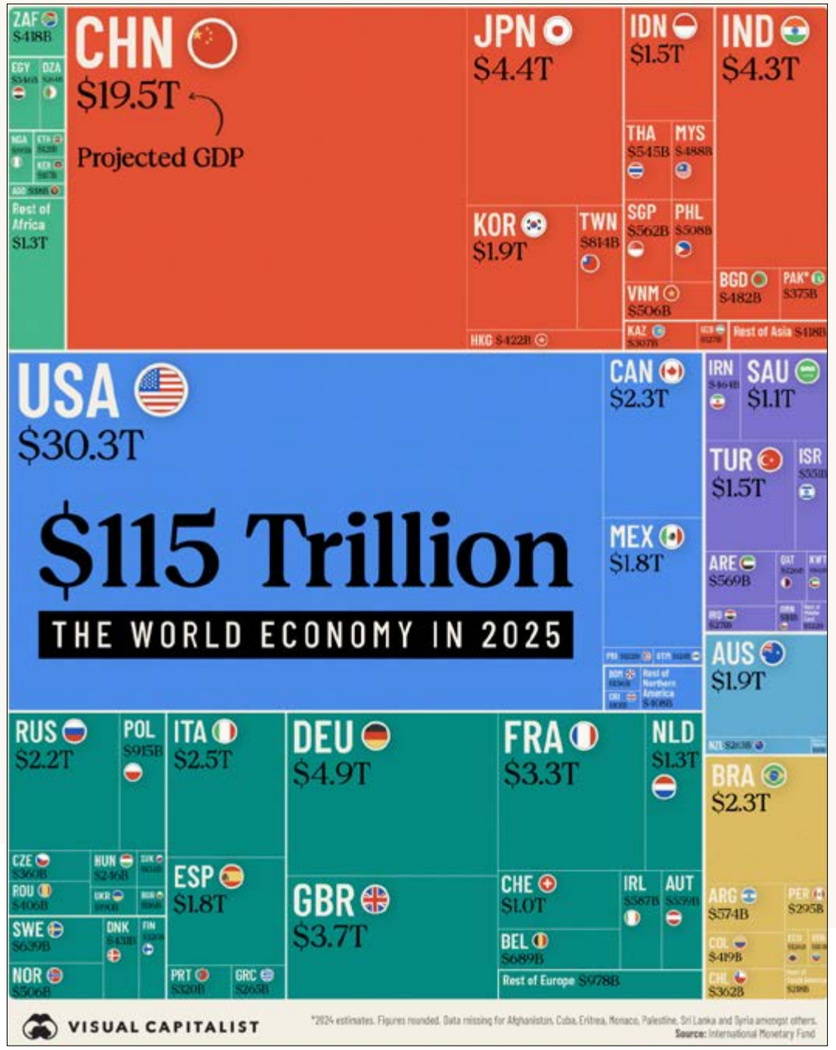
I Am optimistic 2025 Will Be Better For Me Than 2024



2025 Global Forecast Series confidence in the Global Economy

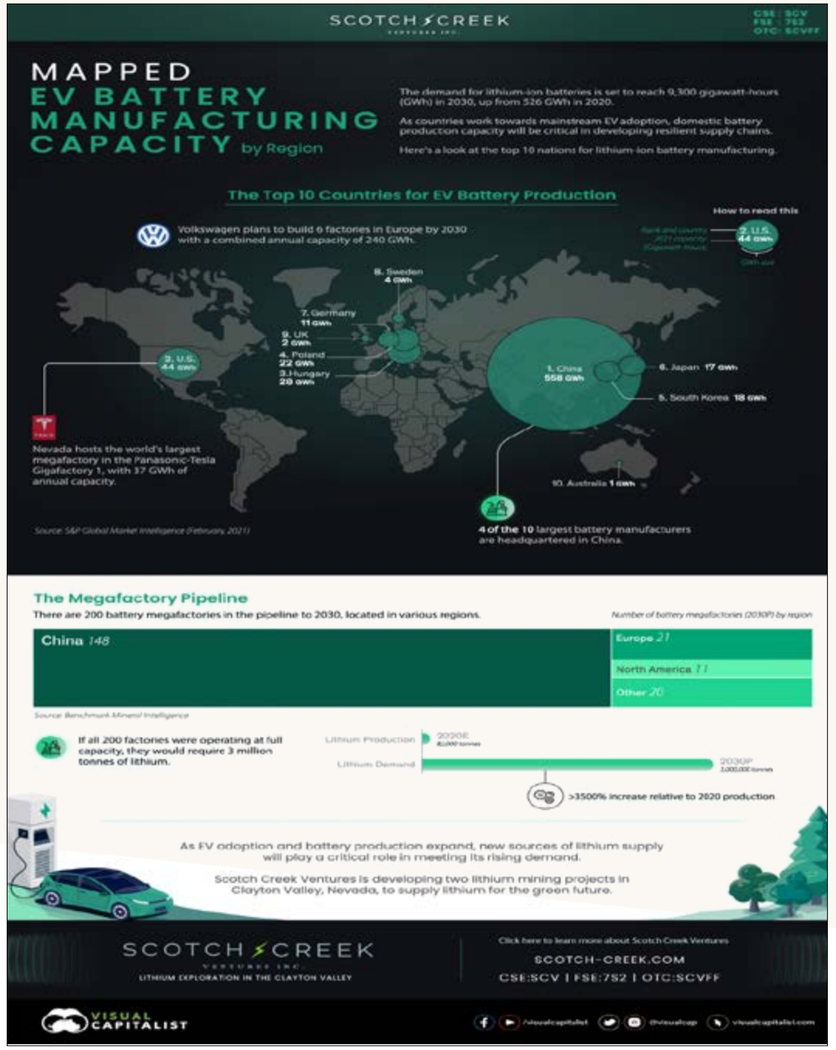


$115 trillion The World Economy In 2025



Top Grossing movies of 2024

Mapped Ev battery manufacturing Capacity by region



7

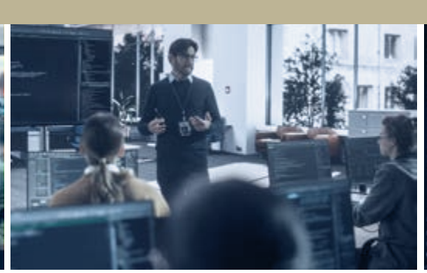
Issue No. 07

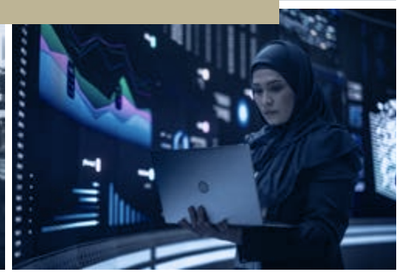
(February 2025)

FUTURE TRENDS

Report

Issue no. 7 - February 2025





Future Trends Report

Future Trends Report, published in English and Arabic by TRENDS Virtual Office in Montreal, stands out as a distinctive publication dedicated to highlighting:
1. the most important forward-looking studies that aim to identify future trends, analyze various variables that may influence these trends, and determine the best future scenarios.
2. the most important applied studies that explore the application of knowledge, scientific theories, and information to solve current problems and overcome future challenges.
3. the most important illustrative and graphic forms that visually summarize significant studies, helping readers understand the trends and challenges of the future world.

Editorial board

Contents

1 Prospective research

Knowledge management: how to make the most out of it?

https://www.hbrfrance.fr/strategie/la-gestion-des-connaissances-retour-vers-le-futur-60479

The author of this article, Vincent Ribière, practitioner-researcher and lecturer at Bangkok University (Thailand), looks at knowledge management (KM). He begins by explaining why companies invest in KM, which enables them to gain considerable efficiency by reproducing certain scenarios with customers.

Ribière defines KM as "the process of capturing a company's collective expertise, knowledge and skills, wherever they may be - in people's heads, on paper or in data/information repositories - and distributing them where they can contribute to the greatest benefit". It is more a question of sharing knowledge than controlling or retaining it for no purpose.

The author begins with a brief history of KM. He recalls that the 90s saw a growing interest in technologies to improve the circulation of knowledge. However, without a clear strategic objective, many of these initiatives ultimately failed. Then, in the 2000s, it became clear that the focus should be on the people themselves. Communities of practice are an example of what began to be put in place to retain, share and improve knowledge. Technology became the "enabler, not the main driver."

The creation of an ISO standard (30401) in 2018 has continued to consolidate the importance of KM for organizations. This standard "sets requirements and provides guidelines for establishing, implementing, maintaining, reviewing and improving an effective management system for knowledge management in organizations."

The article refers to a recent survey (American Productivity Quality Consortium, 2024) which shows that knowledge management is perceived "as a tool for improving operational efficiency and process improvement within organizations." Another study conducted by the International Data Corporation (IDC) concludes that KM's benefits include improvements in several key areas: operational performance, customer service, satisfaction and engagement, and employee performance.

The importance of KM is now undeniable. In fact, international awards such as the Global Most Innovative Knowledge Enterprise Award and the APQC Excellence in Knowledge Management Award annually recognize organizations that excel in KM.

Ribière concludes with the increasingly practical use of AI as a KM tool. He notes that "AI will help improve, perfect and automate some tedious knowledge management processes, such as content cleansing, content tagging and content restructuring."

"Becoming a learning organization, an organization that continuously and systematically manages knowledge at different organizational levels (individual, team, organization, ecosystem) is a key factor in organizational agility and productivity."

ISO 30401:2018, ISO/AWI 30401 - Knowledge management systems — Requirements.

"Given that knowledge resides mainly in the minds of employees, it is estimated that on average organizations lose 70% of their know-how every night when employees leave the company. In fact, only 30% of knowledge is documented in any way." (Knowledge Management Report, The Delphi Group, 1998).

Prospective research

Do algorithms shape us?

https://podcast.ausha.co/la-jungle-des-miroirs/episode-4-algorithme

This podcast, which aims to raise awareness, understanding and critical thinking skills, attempts to decipher what is meant by the term "algorithm." This episode, the third in a series of 20, aims to understand how algorithms shape perceptions of the contemporary world.

The speakers start from the observation of what a company can put in place to manipulate information, taking the example of Cambridge Analytica and the outcry, it created at the time of Donald Trump's election in the United States.
The question here is: when you open your networks and access content instantly, how is that content chosen? Content that seems random but is in fact skillfully decided by an algorithm. In fact, the sites' creators analyze your likes, shares and all your online actions in order to understand who you are, your values, beliefs, political opinions, tastes and so on.
Here, the guest mentions the striking example of a book published in 2022, Toxic Data, by David Chavalarias, which aims to reflect on digital manipulation via social networks as a threat to democracy. The author, a mathematician and director of research at the Centre d'analyse et de mathématique sociales (CNRS) and the Institut des systèmes complexes de Paris Ile-de-France, is dedicated to the analysis of social networks and online political activism. His book suggests ways of resisting the intoxication of opinion at individual level, and of collectively protecting democracy by adapting it to the new digital order. One of the examples taken from the book and mentioned in La Jungle des Miroirs is that of an author who decides to "like" all possible publications and links on Facebook related to extremist postures. He notices that after just 48 hours, his News Feed offers him only extremist suggestions.
Every social network implements this kind of tool. The algorithms play on three psychological concepts: 1) reinforcement or confirmation bias: opinion is reinforced when we are exposed to things we already believe; 2) the filter bubble: it's impossible to be exposed to contradictory information, so we don't see opposing thoughts; and 3) negativity bias: on representations of your fears, indignation generates much more engagement than other ways. These are all addictive mechanisms, generating a maximum of emotions, and playing on the dopamine release phenomena they imply.
The podcast concludes that the social networking system is based on a "vicious model", and that we need to be aware that data is now worth its weight in gold. The guests, despite the anxiety-inducing discussion they publish here, offer some hope for the future, mentioning that the solution lies in knowledge: we need to train, read and learn, so as to sharpen a critical mind that "is our only possible shield."

"The 19th century was the century of the gold rush, the 20th century was the century of the oil rush, the 21st century is and will be the century of the rush for the world's personal data."

"The solution lies in knowledge: we need to train, read and learn, so as to sharpen a critical mind that "is our only possible shield."

Prospective research

What impact will AI have on geopolitics?

"Géopolitique de l'intelligence artificielle – comment la révolution numérique va bouleverser nos sociétés," February 2021, IRIS (Institut de Relations Internationales et Stratégiques) https://www.youtube.com/watch?v=bHINSVhX_Ss

A videoconference was organized by IRIS, an independent French research institute, in February 2021, on the occasion of the publication of the book "Géopolitique de l'intelligence artificielle: comment la révolution numérique va bouleverser nos sociétés" (Eyrolles) by Pascal Boniface, Director of IRIS. The discussion, moderated by Sylvie Matelly, Deputy Director of IRIS, focuses on the geopolitical issues surrounding AI, drawing on the expertise of author Pascal Boniface, as well as Gilles Babinet, advisor to the Institut Montaigne on digital issues (France), and Rahaf Harfoush, digital anthropologist and lecturer at Sciences Po Paris.

The panelists attempt to address the impact of AI from a global perspective, discussing from the outset issues such as the replacement of certain jobs by technological innovations. The speakers refer in particular to Marx on the development of productive forces. While certain jobs may diminish or disappear due to AI, the speakers note that a kind of "cornucopia" could soon emerge. For example, research could evolve through collaboration between intellectuals and algorithms. As Boniface observes, "someone could be a bricklayer in the morning, and an architect in the evening." AI would also drive certain developments in creative industries, such as design projects.

These perspectives highlight why companies need to prepare for these challenges, notably by rethinking their value systems, and adapting to the changes brought by AI. Harfoush, an anthropologist specializing in digital issues, explains the reasons behind the lack of discussion around these challenges. In her view, thinking is often blocked by an overly binary vision of the digital future where there seem to be only two possible scenarios: utopia or dystopia. Yet, in her perspective, the scenario towards which the world is moving is rather a duality between these two extremes. AI will be both formidable and terrible, and the role of states will be to manage the balance between these opposing outcomes.

In particular, the book discusses cybersecurity issues, since AI can also be seen as creating new threats, such as situations where algorithms give greater visibility to certain political agendas, encouraging high-risk geopolitical situations. Data sharing is also discussed, as it could pose significant dangers to populations.

Speakers discuss at length the role of GAFAMs, and ask: Will they kill off states or will they become vectors of democracy? An example is given of the rivalry between the U.S. and China, and the role of multinationals in these geopolitical issues. Will a digital giant necessarily follow the priorities set by the state in which it was created? According to Boniface, "companies think market, not flag."

Governments were too slow to react, and didn't realize the power that technological innovation— and the giants leading it would eventually hold. These corporations are now providing essential services to the public, notably during the COVID-19 health crisis. However, as Babinet says, "the important thing is that they continue to be our servants, and that they don't become our masters."

AI will be both formidable and terrible, and the role of states will be to manage the balance between these opposing outcomes.

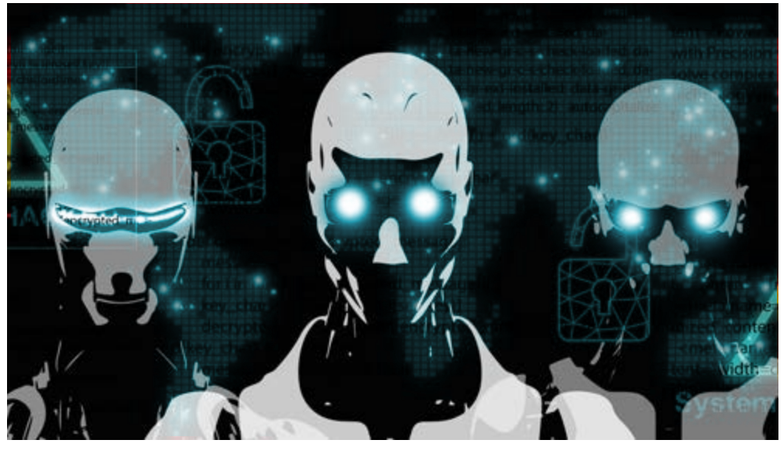
In conclusion, the priority should be to answer the question: How can innovation continue without breaking the social contract of our societies? How can we maintain equitable growth and drive innovation without compromising the well-being of our societies?

Prospective research

AI & warfare – the inevitable future?

Fatal equations – The lethal impact of algorithms in wars, Solveij Mailander, July 2024 - https://farsight.cifs.dk/fatal-equations/

The "disregard for thorough assessment and ethical consideration not only highlights the alarming dehumanization inherent in autonomous warfare, but also underscores the potential for – and exemplifies – the catastrophic consequences that can ensue when machines are entrusted with life-and-death decisions."



Solveij Mailänder, a research fellow at Oxford University's Future of Humanity Institute, explores the ethical and societal implications of using Artificial Intelligence (AI) in warfare. Her July 2024 article examines the moral concerns surrounding AI by referencing a case study on the everyday use of ChatGPT. She highlights the discomfort that can arise from relying on AI for daily decisions, as illustrated by Maxwell Strachan's experience in "I Asked ChatGPT to Control My Life, and It Immediately Fell Apart" (Vice, 2023).

Initially, outsourcing daily decisions to AI might seem harmless, but Mailänder delves into the more troubling ethical questions related to AI's role in warfare. She underscores the historical connection between the tech industry and the military, citing the example of companies like Anduril, which develop autonomous weapons systems. Anduril's AI-powered drones have led to significant contracts with the US military, highlighting the increasing use of AI in combat.

Mailänder points to disturbing instances, such as the Israeli military's use of the 'Lavender' autonomous system in Gaza. This system, operating with minimal human oversight, has facilitated airstrikes that sometimes target individuals with imprecise ammunition, often harming civilians and their families. Such developments provoke serious concerns about the moral implications of AI-driven decision-making in conflict zones.

The article questions who should make critical decisions in warfare and critiques the growing detachment associated with AI. Historically, new technologies have transformed warfare, as seen with the use of drones in the Vietnam War. Mailänder notes that AI lacks the moral and emotional capabilities inherent to human decision-making. Critics argue that remote warfare, facilitated by AI, involves an emotional detachment that undermines the ethical considerations crucial to conflict.

As AI technology advances, Mailänder urges caution. While AI systems may evolve and become more capable, their decisions could have profound life-and-death consequences. The integration of AI in warfare demands careful consideration of the human element, questioning whether such decisions should be left to machines or remain under human control.

The "disregard for thorough assessment and ethical consideration not only highlights the alarming dehumanization inherent in autonomous warfare, but also underscores the potential for – and exemplifies – the catastrophic consequences that can ensue when machines are entrusted with life-and-death decisions."

Prospective research

The combat against organized crime – a two-year prospect

Stratégie 20242026- – De nouvelles façons de penser et d'agir – Global initiative against organized crime, February 2024, https://globalinitiative.net/wp-content/uploads/202402//Strategie-2024%E2932026-%80%GI-TOC-Fevrier-2024.v1.pdf

GI-TOC's theory of change focuses on four areas of action: 1) analytical work; 2) disrupting criminal markets; 3) building resilience; and 4) creating inclusive networks.

The Global Initiative Against Transnational Organized Crime (GI-TOC) is an international network of 600 experts founded in 2013, aimed at fostering debate and developing innovative strategies to combat organized crime globally.

The February 2024 report outlines GI-TOC's strategic plan for the next two years to tackle vulnerabilities created by organized crime and mitigate its impact on people, businesses, governments, and the environment.

The report introduces GI-TOC's "theory of change," which focuses on reducing organized crime and its detrimental effects. It proposes four key areas of action: 1) enhancing analytical work and data; 2) disrupting criminal markets; 3) building resilience; and 4) creating inclusive action networks.

First, GI-TOC plans to improve analytical work by conducting research on illicit economies to better understand and respond to organized crime. This includes expanding publications based on the Global Organized Crime Index and addressing emerging crime types. Activities include raising awareness in regions like Central Asia and developing an online platform to share best practices in combating organized crime.

The second area involves disrupting criminal markets through innovative programs. GI-TOC will provide guidance to governments, law enforcement, the private sector, and civil society. This includes using technological tools, such as the ECO-SOLVE program, which aims to enhance intelligence and data to combat environmental crime more effectively.

The third focus is on strengthening community resilience to reduce organized crime's impact. GI-TOC has established a Resilience Fund supporting individuals and groups in over 50 countries and plans to increase funding and develop tools for sharing experiences and strategies to enhance community resilience.

Additionally, GI-TOC aims to build global action networks, exemplified by proposed collaborations with UNODC and INTERPOL. This includes forming annual partnerships with private sector entities to strengthen global efforts against organized crime.

Finally, the report emphasizes improving GI-TOC's operational efficiency through an Enterprise Resource Planning (ERP) system for better integration of functions and project audits to enhance performance, with a focus on staff well-being.

"Reducing organized crime and mitigating its negative impact on people, the environment, businesses and governments."

GI-TOC's theory of change focuses on four areas of action: 1) analytical work; 2) disrupting criminal markets; 3) building

"Reducing organized crime and mitigating its negative impact on people, the environment, businesses and governments."

2 Applied research

AI in education: impacts

Nguyen, N. D. (2023). Exploring the role of AI in education. London Journal of Social Sciences, (6), 8495-.

In this paper, Nguyen explores the role of Artificial Intelligence (AI) in education. Published in 2024 in the London Journal of Social Sciences, this paper reflects on AI applications in education, focusing on the approaches adopted up to the 2020s, in order to better plan their use in the future. The impacts of AI in education are categorized into three aspects: "guidance", "teacher" and "student".

The "Guidance" AI approaches refer to programs that support students and teachers in making decisions. These applications can, for example, facilitate academic choices for students with certain learning disabilities. The author gives the example of a study published in 2021, where "AI was used to predict students at risk of failing to provide intervention" (Hlosta et al., 2021). Here, AI helps to fill certain gaps in education, and to promote a more accessible and adapted education for all.

The "Student" AI approaches refer to technological and educational tools that improve the quality of education, such as 'learning AI', which implements innovative learning tools, such as game-based learning or learning analytics. "According to the Entertainment Software Association, 65% of Americans, or 212.6 million, play at least 1 hour of video games a week" (Pierre-Louis, 2023). Therefore, it's easy to see why using the appeal of video games in education can help make the learning experience more adapted, efficient, and engaging.

The "Teacher" AI approaches are all technologies that help teachers to teach. AI tools become true partners for the teaching staff, who see their preparation time reduced, and can therefore devote more of their time to the teaching itself. For example, "automated essay scorers", which use machine learning and natural language processing to score essays, enable teachers to spend less time grading papers by hand, and more time interacting with their students. Nguyen demonstrates the importance of categorizing the impacts of AI in education, as this enables a better understanding of improvements in the field, while providing a very clear framework. The impact categories also enable us to better envisage the future, by distinguishing grey areas, which would deserve more attention in the future.

The paper does, however, put the results into perspective with some of the drawbacks that the use of AI in education could represent, notably in relation to questions of lack of human interaction, costs, or even ethics in relation to privacy and data security.

The author concludes that the rapid development of AI call for careful examination of its applications and regulations in education, as AI could become integral to the sector in the coming decades. The categorization of AI applications can help developers in creating targeted solutions while leveraging existing principles. However, it is essential to address ethical concerns, technical limitations, and costs to ensure the safe and effective implementation of AI in education.

Pierre-Louis, S. (2023, July 6). Essential Facts - Entertainment Software Association. Retrieved from https://www.theesa.com/2023-essential-facts/.

The impacts of AI in education are categorized into three aspects: "guidance", "teacher" and "student".

"65% of Americans, or 212.6 million, play at least 1 hour of video games a week, highlighting the appeal of video games in making the learning experience more adapted, efficient, and engaging."

Applied research

Out-of-distribution detection in multi-label classification: a crucial theoretical framework

Zhang, Dell, and Bilyana Taneva-Popova. "A Theoretical Analysis of Out-of-Distribution Detection in Multi-Label Classification." https://doi.org/10.11453578337.3605116/.

The article "A Theoretical Analysis of Out-of-Distribution Detection (ODD) in Multi-Label Classification" by Dell Zhang and Bilyana Taneva-Popova explores the theoretical foundations of detecting out-of-distribution (OOD) inputs specifically within multi-label classification contexts. The need for effective OOD detection is critical for the safe deployment of machine learning models, especially in real-world applications like medical diagnostics and financial fraud detection, where encountering inputs significantly different from training data can lead to severe consequences.

Traditionally, OOD detection research has concentrated on multi-class classification problems, where each input belongs to only one class. In contrast, multi-label classification involves scenarios where a single input can belong to multiple classes simultaneously, complicating the OOD detection process. This paper aims to bridge this gap by analyzing existing methods and providing a deeper understanding of their mechanisms.

The authors systematically review various OOD detection methods such as Maximum Softmax Probability (MSP), Maximum Logit, and JointEnergy. They classify these methods based on two dimensions: label-wise scoring functions (e.g., softmax probabilities, logistic probabilities) and aggregation functions (e.g., maximum, sum, average). Interestingly, they find that some methods yield equivalent results under appropriate conditions, such as MaxProb and MaxLogit, indicating that multiple approaches can achieve similar performance outcomes.

A significant contribution of the paper is the proof that JointEnergy is the optimal probabilistic solution for OOD detection in scenarios where class labels are conditionally independent. This insight offers a more rigorous interpretation of JointEnergy's effectiveness compared to its original joint-likelihood interpretation, emphasizing that its performance relies more on the independence of labels than on their interrelationships.

The paper discusses practical implications for deploying OOD detection methods in multi-label classification tasks, especially in fields where inputs can be ambiguous or multifaceted. The findings suggest that understanding the underlying assumptions and relationships of various methods can lead to better model designs and improved detection accuracy.

The authors highlight potential future research areas, including the exploration of label relationships in OOD detection and the development of new models that can effectively leverage these relationships. They call for further empirical studies to validate the theoretical findings and enhance the practical applicability of OOD detection techniques in multi-label settings.

In summary, this paper provides a crucial theoretical framework for understanding OOD detection in multi-label classification. By analyzing existing methods and establishing the optimality of JointEnergy under specific conditions, the authors contribute valuable insights that could lead to advancements in machine learning practices, particularly in safety-critical domains. The exploration of label relationships and the proposed future research avenues underscore the importance of ongoing inquiry into this complex area of machine learning.

Effective OOD detection is critical for the safe deployment of machine learning models, especially in real-world applications like medical diagnostics and financial fraud detection.

Understanding the underlying assumptions and relationships of various methods can lead to better model designs and improved detection accuracy.

Applied research

How can geopolitics affect scientific research? The example of Russia

Zhang, L., Cao, Z., Sivertsen, G. et al. The influence of geopolitics on research activity and international collaboration in science: the case of Russia. Scientometrics (2024). https://doi.org/10.1007/s11192-024-04984-

In recent years, the tension between open science policies and those focused on competition and security has highlighted a paradox: global scientific collaboration is not keeping pace with defense alliances. Despite political tensions, the United States collaborates massively with China and Russia. The Russia-Ukraine war has led to sanctions affecting scientific collaboration, but scientific communities are resisting, favoring individual exchanges.

This phenomenon reflects the idea that science should be above political boundaries, although the geopolitical situation is gradually influencing these relationships. To test the hypothesis of the relative stability of Russia's collaboration and publication patterns, we used a long-term perspective, with annual and monthly analyses. The data come from the Web of Science™ and InCites, covering 461,366 international publications from January 2022 to April 2023. Two indicators were developed: relative intensity of collaboration (RIC), measuring bilateral activity, and balance in collaboration (BIC), measuring the balance of a country's collaboration profile. These indicators make it possible to analyze the impact of geopolitics on Russia's scientific collaborations.

The results of this study show a complex evolution in Russia's scientific contribution to international journals. Between 2000 and 2014, the share of Russian publications declined, as it did for other countries, due to the increase in contributions from other regions, notably China and India. However, after 2014, Russia managed to reverse this trend for a while thanks to scientific policies, such as the 5top100 project, aimed at improving academic mobility and international cooperation. But since 2022, this dynamic has declined sharply, partly due to sanctions and geopolitical difficulties linked to the war in Ukraine.

Analysis of international collaboration, measured by the rate of foreign co-authors, shows a relative stability in scientific cooperation despite a decline in Russian scientific output. However, collaboration with countries such as Germany and the U.S. has decreased, while with China and India it has increased. In addition, the study reveals significant variations in certain domains such as particles and fields, where Russia has seen a significant reduction in its partnerships, in contrast to fields such as astronomy, where collaborations have been maintained. These results suggest that geopolitical decisions influence scientific fields differently.

The results confirm the hypothesis that geopolitical conflicts marginally affect long-term trends in international scientific collaboration. Russian science is well integrated into global science, and the intensity of bilateral collaboration remains stable, particularly with the U.S. and China. However, collaboration with Germany is declining, while it is increasing with China and India. The decline in Russian contributions to scientific journals seems to be due to internal factors, such as the repression of academic freedom.

Science should be above political boundaries.

Geopolitical conflicts marginally affect long-term trends in international scientific collaboration.

Applied research

The future of cybersecurity: findings and insights

Cybersecurity Futures 2030 – World Economic Forum, 2023, https://www3.weforum.org/docs/WEF_Cybersecurity_Futures_2030_New_Foundations_2023.pdf

The Cybersecurity Future 2030 was published by the UC Berkeley Center for Long-Term Cybersecurity (CLTC), the World Economic Forum Centre for Cybersecurity and CNA's Institute for Public Research. The report brings together findings and insights, observations and variances to lay the groundwork for thinking about the strengths, weaknesses and objectives of cybersecurity in the years ahead.

The first part is a collection of observations, based on the results of a series of in-depth workshops held in six international locations (Dubai, Washington DC, Kigali, New Dehli, Singapore and virtually in a few European countries), revealing the challenges, uncertainties and opportunities represented by today's cybersecurity landscape.

Innovations in the world of technology are accelerating daily, both in a licit and illicit way. The increase in mis- and disinformation, the risk of cyber-attacks, the lack of trusted and expert regulatory bodies in some regions are all challenges with which decision-makers have to contend

Therefore, according to the authors of this report, it is necessary to take advantage of the opportunities offered by the world of cybersecurity, such as the multiplication of public-private partnerships, the exchange of standard-setting processes between developing countries and those who have become 'trusted brands' in the field, or the strategic use of regulations designed to guard against the downsides of AI products.

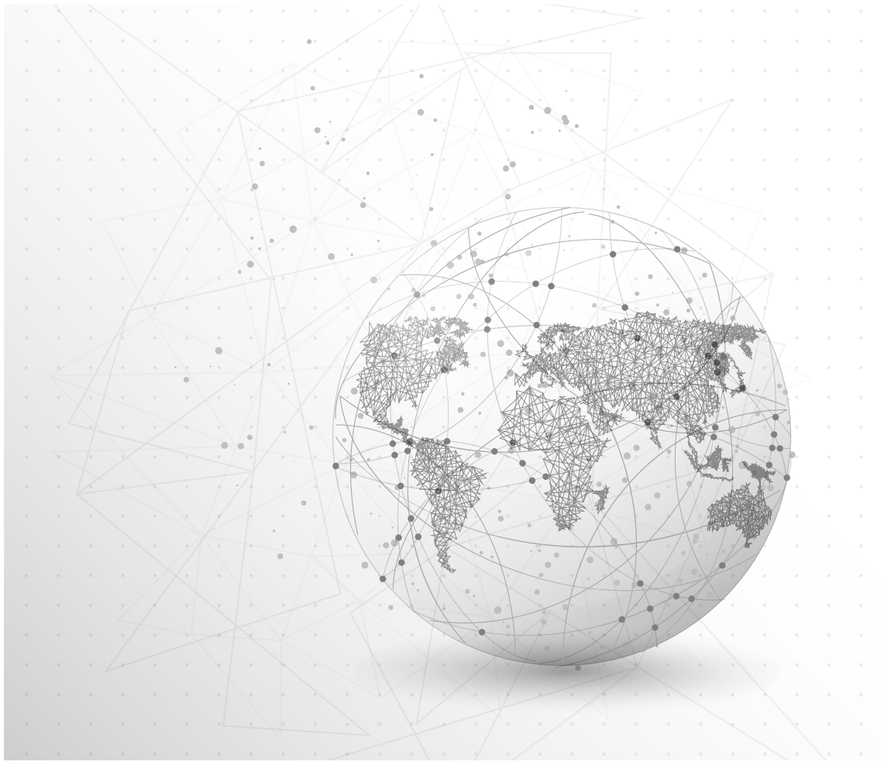
The findings of this report will greatly help decision-makers (government, industry, academia and civil society) to understand the risks and challenges posed by cybersecurity and take initiative to mitigate the risks and securely harness the technological progress.

"Countries should form and strengthen trusted research institutions, particularly in less-developed economies, to support governments in addressing the most challenging social and technical cybersecurity problems of 2030."

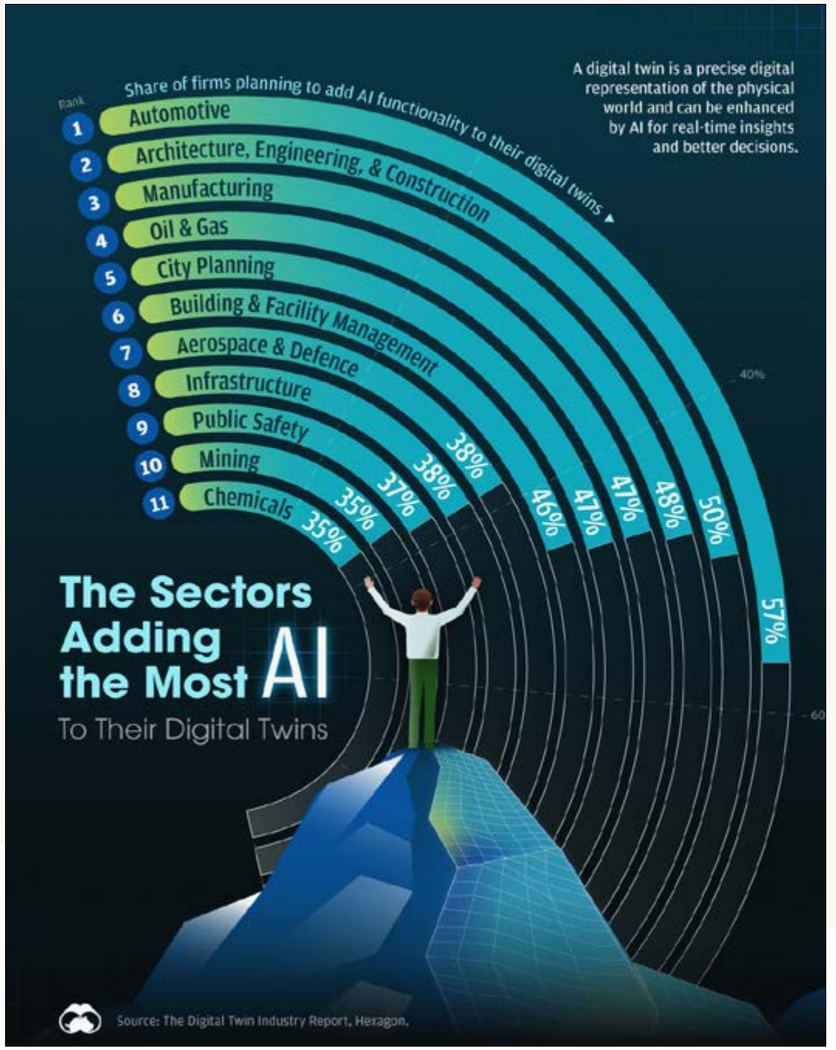
"Cybersecurity will become less about protecting the confidentiality and availability of information and more about protecting its integrity and provenance."

"Countries should form and strengthen trusted research institutions, particularly in less-developed economies, to support governments in addressing the most challenging social and technical cybersecurity problems of 2030."

3 The future in numbers

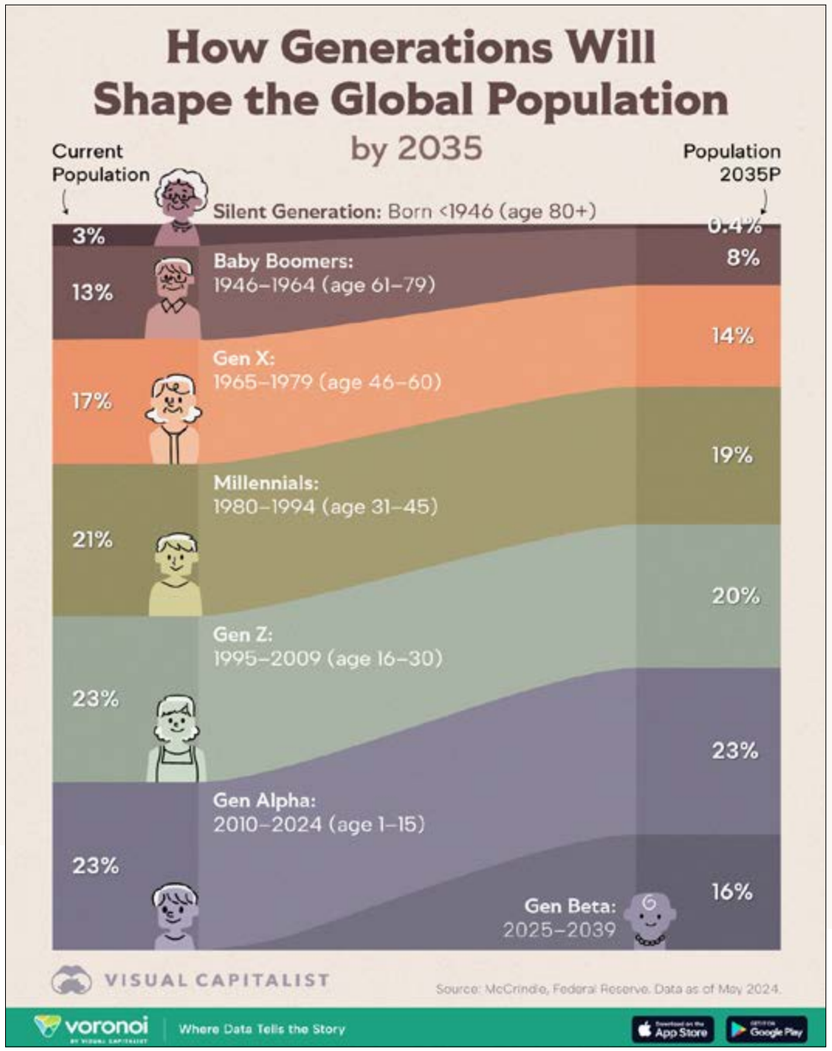


The Sectors Adding the Most AI to Their Digital Twins

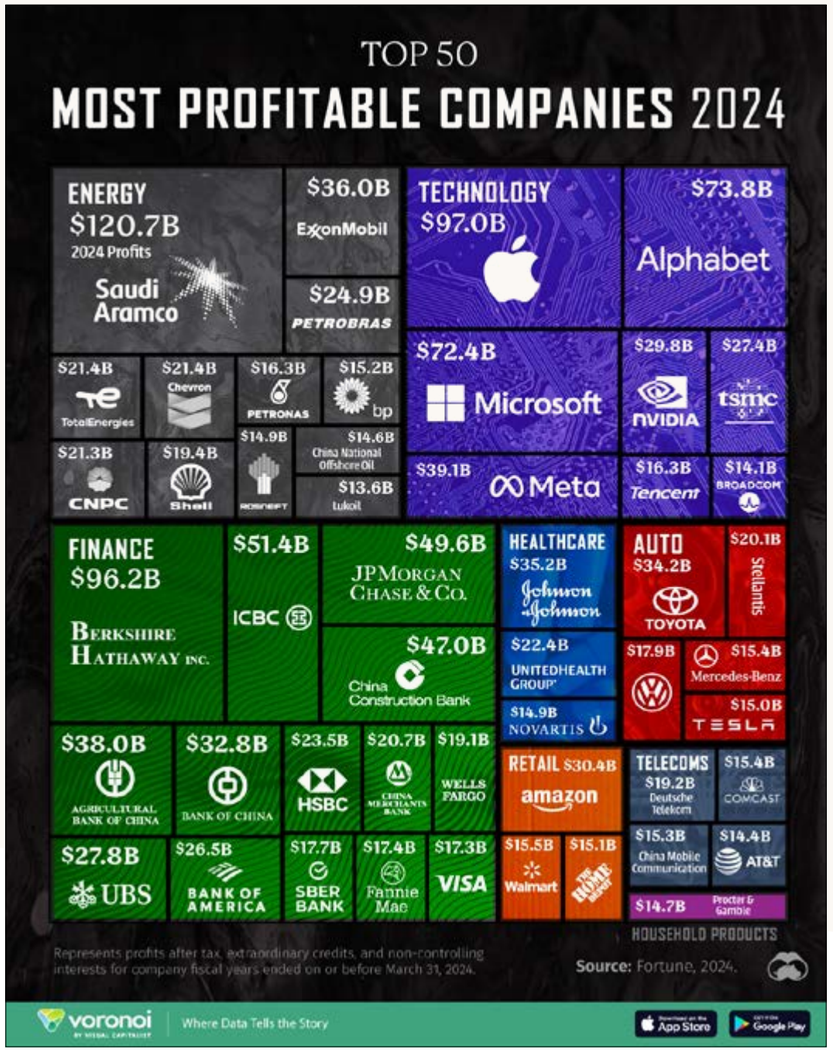


https://www.visualcapitalist.com/dp/the-sectors-adding-the-most-ai-to-their-digital-twins/

the Global Population in 2035, by Generation



The World's 50 Most Profitable Companies in 2024



8

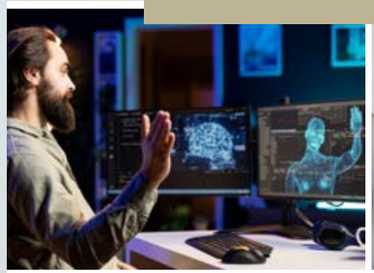
Issue No. 08

(March 2025)

FUTURE TRENDS

Report

Issue no. 8 - March 2025



Future Trends Report

Future Trends Report, published in English and Arabic by TRENDS Virtual Office in Montreal, stands out as a distinctive publication dedicated to highlighting:
1. the most important forward-looking studies that aim to identify future trends, analyze various variables that may influence these trends, and determine the best future scenarios.
2. the most important applied studies that explore the application of knowledge, scientific theories, and information to solve current problems and overcome future challenges.
3. the most important illustrative and graphic forms that visually summarize significant studies, helping readers understand the trends and challenges of the future world.

Contents

1 Prospective research

The internet of things in the GCC

Albreem, M. A., Sheikh, A. M., Bashir, M. J., & El-Saleh, A. A. (2023). Towards green Internet of Things (IoT) for a sustainable future in Gulf Cooperation Council countries: Current practices, challenges and future prospective. Wireless Networks, 29(2), 539567-

This article introduces the concept of the Internet of Things (IoT), considered by the authors to be crucial to the development of smart cities and the achievement of sustainability goals, including energy efficiency and e-waste management. The Gulf Cooperation Council (GCC) comprises six countries: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. These countries are experiencing rapid urbanization, leading to environmental problems such as air pollution and water scarcity.

Governments are investing in green innovations, such as solar and wind power, and seeking to improve e-waste management for a sustainable future. However, effective e-waste management policies and IoT infrastructure are still needed to reduce the carbon footprint. The economies of the GCC countries are mainly based on oil revenues, making them vulnerable to fluctuations in oil prices. Despite strong economic development, they face environmental challenges such as pollution, desertification, and water scarcity. They are the world's largest consumers of desalinated water, an energy-intensive process. However, they are betting on renewable energy, notably solar and wind power, to diversify their energy sources and meet growing demand.

The Internet of Things (IoT) is a network of interconnected physical objects (sensors, software, electronic devices) that enable communication between these elements and users. IoT services leverage technologies such as RFID, NFC, ZigBee, Bluetooth, and 5G. The latter, by facilitating fast and efficient connectivity, is essential for IoT, particularly in the healthcare, smart home and city, and energy sectors. However, IoT leads to high energy consumption, particularly through data centers and machine-to-machine communications, highlighting challenges in energy efficiency and sustainability.

IoT applications span many sectors, including manufacturing, transportation, energy, retail, healthcare, agriculture, and smart cities. In the Gulf, IoT projects are expanding, with notable initiatives in Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE. However, IoT faces challenges, including managing massive amounts of data, security, and dealing with faulty devices. Security concerns, such as cyberattacks, are increasing with greater digitization in these countries, prompting heightened cybersecurity strategies.

Green Connected Objects (GIoT) are IoT technologies aimed at reducing carbon footprints, minimizing environmental impact, and optimizing operating costs. They are based on strategies such as eco-friendly design, production, use, and recycling. In the Gulf countries (GCC), smart city projects are underway, such as Abu Dhabi's Masdar City, which integrates renewable energy for sustainability. These countries are investing in renewable energy and adopting technologies such as wireless sensor networks, green communications, and e-waste management to support the transition to a green economy.

In short, this article shows that the Gulf countries are exploring renewable energy sources, mainly solar and wind, to diversify their revenues and reduce dependence on hydrocarbons. GIoT technologies, such as green sensors and green data centers, aim to reduce energy consumption and carbon footprints. E-waste management and security issues related to IoT and blockchain require further research.

BIG DATA

"Over two-thirds of the global population is estimated to migrate to cities by 2050."

IoT

The Internet of Things (IoT) is a network of interconnected physical objects (sensors, software, electronic devices).

Prospective research

Depression amongst Syrian refugees in Canada

Kuo, B. C., & Rappaport, L. M. (2024). A prospective longitudinal study of depression, perceived stress, and perceived control in resettled Syrian refugees' mental health and psychosocial adaptation. Transcultural Psychiatry, 13634615241227696.

In 2020, the United Nations High Commissioner for Refugees (UNHCR) estimated that there were 82.4 million displaced people, including 26.4 million refugees. Depressive disorders are common among refugees, particularly those affected by war, with persistent effects of post-migration stress. Although resilient, refugees face many barriers to accessing mental health care. This recent study focuses on Syrian refugees in Canada, exploring the impact of depression on stress, perceived control, social support, and anxiety.

It aims to fill the gap in longitudinal research on their mental health and coping mechanisms.
Drawing on stress and resilience theories, this study examines the extent to which initial depressive symptoms predict perceived stress and control one year later. Participants (235 Syrian refugees) were recruited in Windsor, Ontario, and followed for one year. Secondary analyses also explored the impact of depressive symptoms on anxiety and social support. The results show mild depressive symptoms on average in Syrian refugees both at baseline and after one year, with a moderate prevalence of depressive symptoms. Although below clinical thresholds, anxiety symptoms were reported by a proportion of participants. Analysis revealed that depressive symptoms at baseline predicted low self-efficacy and low perceived control after one year, whereas self-efficacy or feelings of helplessness at baseline did not influence later depressive symptoms. Furthermore, initial depressive symptoms were linked to lower perceived social support and higher anxiety symptoms after one year. Participant dropout at follow-up assessment was low and mainly associated with marital status. Analyses also showed that age, gender, and marital status were only weakly related to control and psychological well-being variables.
This longitudinal study examines the impact of depressive symptoms on the psychosocial adjustment of Syrian refugees after resettlement in Canada. Results indicate that depressive symptoms at departure are associated with impaired psychosocial well-being, including low perceived control and increased powerlessness. Furthermore, these symptoms predict low self-efficacy and social support after one year. These findings corroborate similar studies on Iraqi refugees, underlining the importance of treating depression in the early stages of resettlement to mitigate long-term effects.
The authors recommend early detection and targeted management of depressive disorders in Syrian refugees. They emphasize the need for an integrated, trauma-sensitive healthcare model and suggest culturally appropriate interventions to help refugees cope. Finally, the research highlights the importance of a holistic approach that considers the social determinants of health to improve refugee well-being. These findings have implications for other refugee populations worldwide, including those from Ukraine, Afghanistan, and Myanmar.

According to the UNHCR, 82.4 million people were displaced in 2022, including 26.4 million refugees.

Early screening for depressive symptoms among refugee newcomers within a culturally and trauma-informed, integrated health setting is highly important.

Prospective research

International students and transnational setworks

Robinson, O., Somerville, K., & Walsworth, S. (2024). Building, negotiating and sustaining transnational social networks: Narratives of international students' migration decisions in Canada. Global Networks, 24(1), e12442.

International students represent a fast-growing migratory category, and understanding their migration decisions is becoming increasingly important, as explored in this article by two sociology professors (Robinson and Somerville) and one industrial relations professor (Walsworth), all associated with Canadian universities. This study examines the role of social networks in the migration decisions of international students to Canada, highlighting the importance of transnational ties. Informal social networks play an essential role in providing information, reducing fears, and supporting integration. Even when the information transmitted is incomplete, these networks offer important symbolic support. The study also shows how these networks function as informal migration agents, facilitating successful student migration.

The number of international students in Canada has grown considerably over the past two decades, with institutions relying increasingly on the earnings of these students. Students also benefit from the possibility of becoming permanent residents, making them particularly attractive to the job market. Social networks play a crucial role in the migration decisions of international students, offering information, emotional, and financial support. However, these networks can also be limited by incomplete information. This study focuses on how transnational networks influence students' migration decisions and processes.

The study examines the experiences of international students at a medium-sized Canadian university. It was carried out in two phases: an online survey followed by in-depth interviews with 30 participants from 16 countries. The students, aged between 18 and 35, shared their motivations and experiences of studying abroad. The analysis of the interviews, conducted using the grounded theory method, highlights the influence of social networks on immigration decisions and their evolution during the migration process. Study participants did not use formal migration agents to make decisions about studying abroad. They relied mainly on informal social networks, such as family, friends, and ethnic or religious groups. The Internet and social media platforms such as Facebook played a key role in providing personal testimonials and information about destinations and educational institutions. Families often influenced country choices, offering practical and emotional advice. Transnational friendship networks also filled information gaps and supported settlement, providing reliable advice and a sense of security.

Transnational professional and community networks strongly influence the migration decisions of international students. Colleagues, friends, and community members share experiences and advice, facilitating orientation towards study abroad. For example, students were encouraged by work colleagues or friends to apply to certain universities. In addition, ethno-cultural and religious networks offer moral, practical, and emotional support, acting as host families. These networks help students integrate while also sparking new migrations by offering advice and support along the way.

This study shows that international students, like other migrants, create and maintain social networks to obtain information about migration, receive support, and shape their decisions to study abroad. These networks—often family, professional, or religious—play a key role in students' adaptation and integration. Although some networks provide incomplete or misleading information, they remain crucial in offering emotional and symbolic support. Students also become informal migration agents, sharing their experiences to help others migrate, creating an ongoing transnational dynamic.

In 2019, Canada hosted approximately 640,000 international students, representing a 185% increase from 2010, making it the world's fourth most popular destination for international study. (CBIE, 2020)

The decision to study abroad is evidently immersed in a continuous migration process involving transnational network building, negotiating and sustaining.

Prospective research

War and its impacts on societies: the Russia-Ukraine case

Lim, W. M., Chin, M. W. C., Ee, Y. S., Fung, C. Y., Giang, C. S., Heng, K. S., Kong, M. L. F., Lim, A. S. S., Lim, B. C. Y., Lim, R. T. H., Lim, T. Y., Ling, C. C., Mandrinos, S., Nwobodo, S., Phang, C. Su. C., She, L., Sim, C. H., Su, S. I., Wee, G. W. En., & Weissmann, M. A. (2022). What is at stake in a war? A prospective evaluation of the Ukraine and Russia conflict for business and society. Global Business and Organizational Excellence, 41(6), 23–36 https://onlinelibrary.wiley.com/doi/full/10.1002/joe.22162

War is a complex phenomenon that impacts societies and businesses, often in devastating ways. This article explores the impact of war on business and society through the conflict between Russia and Ukraine, a subject that has been little explored in contemporary research. The effects of war are multidimensional: economic (inflation, reduced investment), environmental (deforestation, pollution), health-related (destruction of health systems, malnutrition), and social (forced displacement, psychological trauma). The article highlights the need to study these impacts to better understand the consequences of war on modern societies and businesses.

This article adopts a case study approach to examine the impact of war on business and society, focusing on the conflict between Russia and Ukraine, which began on February 24, 2022. The aim is to explore the consequences of this war on business and society on a global scale. The study was conducted by analyzing over 100 relevant press articles until a data saturation point was reached. The information gathered was analyzed thematically to ensure the credibility, transparency, and reliability of the results. This study provides new perspectives on the impact of this conflict.

The results show that war, as a result of armed conflict, has a profound impact on business and society, both within and between opposing forces. An analysis of article headlines reveals that Russia's invasion of Ukraine has led to cybersecurity risks, economic disruption, international sanctions, and forced migration. The impact on society includes limited access to essential resources, rising unemployment, reduced purchasing power, and an increase in asylum seekers. On a global scale, the war has caused supply shortages and inflation, particularly in the wheat and oil sectors. In addition, misinformation has proliferated due to increased reliance on social networks, making it more difficult to distinguish between true and false information. These impacts also affect businesses, which face cyberattacks and technological sanctions.

This study highlights the impact of war not only in terms of armed conflict but also in terms of cyberattacks. Russia, as a leading cyber actor, has targeted Ukrainian companies (communications services, power grids) with cyberattacks, while Russian companies have also been subjected to cyberattacks in response to the invasion. These attacks are disrupting the operations and supply chains of digital companies. In addition, the war is affecting digital growth and business sustainability, particularly in the technology industry, where sanctions have had a major impact. International sanctions have led to boycotts but also to support for Ukraine, as demonstrated by the actions of solidarity-based companies. Brand management strategies and ethical decisions play a crucial role in companies' responses to global crises. This research opens new avenues for future studies, which will greatly enhance action and support for affected companies. Four main lessons emerge: 1) War limits access to resources and creates shortages, unemployment, and refugees in war-torn countries. 2) It causes supply shortages, inflation, and misinformation risks in external countries. 3) Companies in conflict zones face cyberattacks, sanctions, and risks to digital growth risks. 4) Companies must manage ethics and brand image in response to these challenges.The article also highlights the importance of collaborative research in addressing these global issues.

War, as a result of armed conflict, has a profound impact on business and society, both within and between opposing forces.

Russia's invasion of Ukraine has led to cybersecurity risks, economic disruption, international sanctions and forced migration.

Prospective research

How do prospective teachers understand educational research?

Perines, H., & Ion, G. (2020). How Do Prospective Teachers Understand Educational Research? The Teacher Educator, 56(1), 101–116. https://doi.org/10.108008878730.2020.1846831/

This study explores conceptions of educational research among future teachers at a Chilean university. The focus groups, conducted in Spanish, lasted about an hour, and the transcribed data was analyzed according to the principles of grounded theory. The results show that participants' conceptions are influenced by research methodology courses and their professors' approach.

The majority of participants perceive research as an essential tool for improving their teaching practices. They see it as a means of diagnosing and solving educational problems based on reliable data rather than common sense or rehearsed approaches. The authors cite the example of a key course, Methodology for Educational Diagnosis, taken in the first year, which left a lasting impression on students. This course, focused on identifying and solving problems in real school contexts, reinforced their instrumental view of research. However, students lament a lack of continuity, as research experiences are rare after this course, creating a gap in their training.

Teachers play a central role in shaping students' conceptions of research. Some students value teachers who integrate scientific articles or encourage research projects. For example, one teacher motivated a student to present his work to other programs. However, criticisms also emerge, particularly regarding a lack of organization in data collection activities or a rigid approach to teaching research.

Participants also regret the absence of regular research activities throughout the program. This leads to feelings of insecurity when carrying out their own projects, such as final theses. Some express difficulty in choosing a subject or structuring their project, reflecting a need for more consistent support.

Students recognize the importance of educational research for their professional development, but their conceptions remain largely instrumental. They perceive research as a set of techniques rather than a broader epistemological process. This finding suggests that teacher training programs do not foster a thorough understanding of research. Participants hope that the curriculum reforms introduced since 2019 will improve the integration of research into teacher training. They suggest adding more research-related courses with an emphasis on the practical application of findings to solve real-world problems.

The study highlights the key role of research methodology courses and teachers in the training of future educators. However, current approaches fail to develop a comprehensive vision of research. It is recommended that universities review the place of research in their training programs, integrating ongoing research activities and training teachers to encourage a critical and reflective approach.

One limitation of the study is that it took place at a single university. Further research in a variety of contexts, as well as a quantitative approach, could enrich these findings. Despite this, the study provides valuable insights for improving teacher training and integrating research into future practice.

Teachers play a central role in students' conception of research.

Universities and faculties involved in teacher education should critically evaluate the way educational research is treated.

2 Applied research

Urban spatial strategies in the GCC

Arif, M., & Aldosary, A. S. (2023). Urban spatial strategies of the Gulf Cooperation Council: A comparative analysis and lessons learned. Sustainability, 15(18), 13344.

This article explores the urban spatial strategies of the member countries of the Gulf Cooperation Council (GCC), taking a comparative approach to understanding how these nations manage rapid urbanization and the associated socio-economic challenges. The GCC countries, rich in oil resources, are experiencing some of the fastest urbanization in the world, with 85% of the population living in urban areas. They are striving to reduce their dependence on hydrocarbons by focusing on economic diversification and sustainability.

This study uses a SWOT analysis to assess the National Spatial Strategies (NSS) of these countries and identify both similarities and specificities in each national vision. Common strengths include considerable financial resources from oil revenues, the ability to fund ambitious projects such as smart cities and modern infrastructure, and regional collaboration to harmonize policies and foster sustainable development. Common weaknesses, on the other hand, include excessive dependence on oil, inequalities in resource distribution between urban and rural areas, and a lack of effective coordination between central governments and municipalities.

The opportunities identified lie in economic diversification through tourism, technology, and non-oil industries, the integration of smart technologies for better urban management, and the use of spatial strategies to stimulate innovation and create jobs. However, threats include regional geopolitical tensions, climate challenges such as water scarcity and extreme temperatures, and rapid population growth increasing infrastructure demands.

The case studies analyzed highlight the specificities of each country's strategies. In Saudi Arabia, Vision 2030 aims to diversify the economy with projects such as NEOM, a smart city, while promoting decentralization and regional development. In Qatar, National Vision 2030 focuses on sustainability and climate resilience, integrating multi-centric urban planning to limit urban sprawl. The United Arab Emirates emphasizes technological innovation and environmental sustainability in projects such as those in Dubai and Abu Dhabi, guided by Visions 2021 and 2030. Oman, with Vision 2040, focuses on a diversified and sustainable economy, actively involving local communities to balance economic growth and environmental conservation.

The paper suggests ways to strengthen urban strategies. Improving coordination between national and local levels, promoting inclusive policies that integrate social, environmental, and economic dimensions, and incorporating more smart technologies for efficient resource management are essential steps.

In conclusion, the study highlights that GCC countries can shape resilient and prosperous cities by sharing best practices and adopting sustainable strategies. By capitalizing on their financial strengths, these nations have the opportunity to collaborate in addressing the common challenges of rapid urbanization and economic transition.

The GCC countries, rich in oil resources, are experiencing some of the most rapid urbanization in the world, with 85% of the population living in urban areas.

GCC countries can shape resilient and prosperous cities by sharing best practices and adopting sustainable strategies.

Applied research

Professional development of university teachers through research

Biémar, S., Quinting, B., & Bragard, I. (2023). Soutenir le développement professionnel des enseignants en haute école par la recherche: analyse d'un dispositif d'appel à projets interne. Revue internationale de pédagogie de l'enseignement supérieur, 39(39 (2)).

This article examines the impact of a call for research projects scheme set up at Belgium's Haute École Libre Mosane (HELMo) on teachers' professional development. This mechanism is part of the context of Belgian higher education institutions, which have favored professional training and sought to integrate applied research into their missions since the introduction of the 2013 decree. Historically, teachers at Belgian universities have focused their efforts on teaching practice, but they are increasingly encouraged to engage in research projects.

This dual function, combining the roles of pedagogue and researcher, raises questions about their professional identity, as well as the obstacles and levers that may influence their commitment.

A questionnaire survey was carried out among 145 teachers who had participated in calls for projects between 2009 and 2019, with 51 responses retained for analysis. The questionnaire aimed to explore the reasons for teachers' involvement, the skills they developed, and the impact on their teaching practices. A qualitative analysis of the responses identified trends and highlighted areas for improvement. Teachers cited various reasons for participating: 21.6% sought to enrich their teaching practices, 15.7% responded to external solicitations, and 25.5% found that the accessible format of the HELMo call facilitated their involvement.

Participants reported several skills acquired through these projects. Some 60% stated that they developed new knowledge, 42% improved their project management skills, and 36% strengthened their research skills. Additionally, 54% of respondents reported an improved ability to collaborate in interdisciplinary teams. These skills significantly impacted teachers' pedagogical practices, with almost 75% claiming that their participation transformed the way they teach. Research findings enable them to illustrate concepts in the classroom, while integrating new pedagogical approaches, such as webinars or podcasts, enhances their teaching. Moreover, some teachers involve their students in stages of the research process, reinforcing active learning.

The results of this study show that research is a powerful driver of teachers' professional development. It encourages them to reflect on their practices and promotes interaction with the professional world. However, these initiatives require appropriate support to overcome organizational challenges and establish a research culture in a predominantly teaching-oriented environment. The integration of research within higher education helps develop a teacher-researcher identity and enrich inter-professional collaboration. It also strengthens the link between research, teaching, and professional practice, particularly through projects rooted in real-world needs.

This dynamic fosters pedagogical innovation, meeting the expectations of both students and external partners. However, the authors note that further efforts are needed to remove structural obstacles and strengthen teachers' research skills. This could include specific training and personalized support to better integrate research into their daily work. A holistic approach would enable teachers to fully embrace their role as researchers while enriching the educational experience and contributing to the development of innovative solutions suited to contemporary challenges.

Research is a key driver of teachers' professional development, fostering self-reflection and engagement with the professional world.

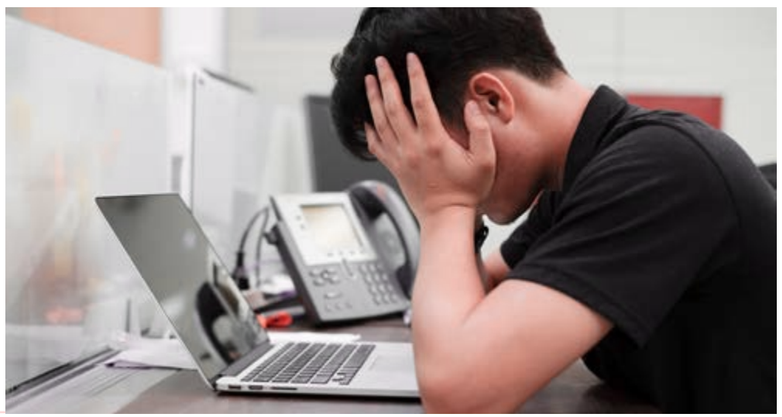
Further efforts are still needed to remove structural obstacles and strengthen teachers' research skills.

Applied research

Taking the researcher's emotions into account in research design

Pesle, M. (2023). De l'expérience subjective à l'objet de recherche. La prise en compte des émotions du chercheur dans la construction de la recherche. La thèse Cifre en SHS. L'art de la double contrainte, 171186-.

This article analyzes how the researcher's emotions and subjective experience influence the construction of the research object, based on a study carried out as part of a CIFRE thesis in political science. Author Manon Pesle explores the dual posture of employee and researcher and examines the tensions and opportunities arising from this situation. This unique framework, characterized by multi-positionality, combines operational missions within an organization with academic objectives.



Pesle draws on her own experience, gained between 2011 and 2016 as a salaried doctoral student at the Grenoble Alpes Métropole urban community, to study the development of educational policies in disadvantaged neighborhoods.
In this context, the author adopts a methodology centered on participant observation. This method, by integrating personal experiences and emotions into the analysis, enables her to better understand the institutional and political dynamics underlying her object of study. Immersion in this dual posture reveals several key aspects of the researcher's experience. First, the constant tension between the roles of employee and researcher is a major challenge. Pesle underlines the difficulty of reconciling institutional expectations, often focused on administrative or operational tasks, with academic requirements that demand significant research time. This duality, often unbalanced, gives rise to a feeling of unease and a questioning of personal legitimacy. It also reveals the power relations implicit in the relationship between the institution and the researcher.
The author also highlights the importance of emotions in the research process. Emotions experienced in the field, such as frustration, anger, or satisfaction, are not merely personal experiences; they become valuable tools for understanding institutional and political tensions. For example, these feelings help reveal latent conflicts between metropolitan officials, local councilors, and communes, as well as the limitations of existing educational systems. Emotions thus become indicators of social and political dynamics that might otherwise remain invisible.
Pesle's experience also led to a significant shift in her research focus. Initially centered on educational policies in disadvantaged neighborhoods, her thesis expanded to include a broader reflection on the professional practices of metropolitan managers. Immersion in the workings of an institution allowed her to observe in depth the relationships between local authorities, the technical challenges of managing these programs, and the practices of the stakeholders involved. This reflexive posture, in which personal experiences enrich the understanding of systemic dynamics, demonstrates that subjectivity can be an asset in knowledge production.
The article concludes with a discussion of the methodological and sociological implications of this approach. Far from representing biases or weaknesses, emotions provide valuable insights into social realities. They offer a better understanding of institutional logics and the tensions that shape interactions between different actors. This perspective enriches sociological analysis by integrating subjective elements that are often overlooked. The author also highlights the structural limitations of CIFRE schemes, where the expectations of host organizations and academic ambitions are not always aligned. These tensions, sometimes a source of identity conflicts for the researcher, call for clearer guidance and a precise definition of objectives for both parties.
In conclusion, Manon Pesle demonstrates that emotions, far from being disruptive, play a central role in social science research. They provide a deeper understanding of institutional and political realities while enriching sociology with a more comprehensive, contextualized approach. The researcher's subjective experience, when integrated reflexively, broadens the field of analysis and produces more nuanced results. This work underscores the importance of valuing these subjective dimensions in research practices to better apprehend complex social dynamics.

Applied research

Does AI genuinely improve our lives?

Have our lives improved since AI became a daily part of them? - Conference 2024 - Milieux Institute for arts, culture and technology – Canada https://milieux.concordia.ca/rebuilding-ai-at-the-2024-mutek-forum/

On August 30, 2024, during the closing day of the MUTEK Forum, Professor Karim Jerbi of Université de Montréal urged the audience to reflect on artificial intelligence's (AI) impact on our daily lives. He raised key questions: Does AI genuinely improve our lives? Does it address the pressing issues in our communities?

These reflections guided the discussion during the panel "Abundant Intelligences at the Intersections of Neuroscience, AI, Art, and Indigenous Knowledge." Moderated by Concordia University professor Jason Edward Lewis, co-director of the Abundant Intelligences program, the panel underscored the need to address bias and data sovereignty in AI. Lewis highlighted that recurring biases in AI models indicate systemic flaws requiring a foundational redesign. The Abundant Intelligences program, grounded in Indigenous epistemologies, aspires to transform AI by advocating for representation and support for Indigenous communities. It emphasizes the inclusion of diverse perspectives and intelligences, both human and non-human.

Professor Jackson Two Bears of Western University warned that technological advancements often marginalize Indigenous communities, some of which lack basic resources like clean water or internet access. Integrating Indigenous voices into AI development is critical to avoiding such exclusions. The program fosters interdisciplinary collaboration among researchers, labs, and Indigenous communities worldwide. As a research-creation initiative, it bridges science and art, challenging the dominance of computer science in defining AI. Māori neurobiologist Dr. Melanie Cheung observed that this interdisciplinary approach fosters creativity and expands scientific possibilities.

Running through 2029, the project initially focused on building a robust infrastructure for collaboration. Workshops, cross-disciplinary integration, and team-building efforts laid the groundwork. Among its pilot projects is an initiative described by Dr. Jerbi, exploring AI models capable of analyzing brain signals during dreams to generate visuals.

Throughout the day, ethical and non-human dimensions of AI were explored, including at Milieux's "Wilding AI Lab." Presented in collaboration with the Applied AI Institute, this lab invited participants to imagine how AI could be made "wilder"—more attuned to human and non-human realities.

The MUTEK Forum, held August 20–23, 2024, at Montreal's Monument-National and Society for Arts and Technology, served as an international hub for ideas on digital culture, art, technology, and society. Its 10th edition highlighted innovative artistic practices while fostering discussions on the ethical and political dimensions of technology. Concordia University's Milieux Institute played a pivotal role, presenting panels and performances at the intersection of AI, art, and Indigenous knowledge. Maurice Jones, curator and doctoral candidate at Concordia's Centre for Interdisciplinary Studies in Society and Culture, emphasized the importance of such forums in fostering open dialogue on societal challenges posed by technology.

A standout session led by Jason Lewis examined designing AI systems rooted in Indigenous knowledge. It emphasized the development of culturally sensitive AI that acknowledges diverse forms of intelligence while exploring intersections between neuroscience, AI, art, and Indigenous traditions. The forum also addressed broader themes like AI infrastructure and societal impacts. In a previous edition, researcher Dr. Sarah Myers West called for rethinking deterministic narratives about AI and envisioning a more adaptable technological future. She advocated for challenging big tech monopolies and fostering alternative trajectories for AI through continuous experimentation.

In summary, MUTEK Forum 2024 provided a critical platform to discuss AI's implications, emphasizing Indigenous perspectives and interdisciplinary collaboration. This approach aims to foster a more equitable and inclusive technological future, aligning AI development with diverse cultural and ethical considerations.

Applied research

Power dynamics during childbirth

Schaaf, M., Jaffe, M., Tunçalp, Ö., & Freedman, L. (2023). A critical interpretive synthesis of power and mistreatment of women in maternity care. PLOS Global Public Health, 3(1), e0000616.

This article explores how power dynamics contribute to the mistreatment of women during childbirth. The authors conducted a critical interpretive synthesis in three phases to analyze power-related factors underlying such mistreatment. In the first phase, the researchers defined the scope of their inquiry by reviewing 63 studies that employed diverse methods and spanned various geographical contexts. They identified power-related factors across multiple levels.

At the intrapersonal level, a lack of awareness of one's rights emerged as a key issue. Interpersonally, the hierarchical relationship between patients and providers often reinforced unequal dynamics. At the community level, widespread discrimination against Indigenous women was a recurring theme. Organizationally, the pressure on healthcare workers to meet performance targets created conditions conducive to mistreatment. At the legal and political levels, the absence of accountability mechanisms for rights violations was a critical concern. While most studies addressed multiple levels of the social ecological model, some focused exclusively on interpersonal factors.

In the second phase, the authors expanded their analysis to include 104 studies, delving deeper into underexplored power-related themes. These included the normalization of mistreatment in maternity care, perceptions of women's suitability for motherhood, the geopolitical and ethnopolitical agendas tied to fertility, and the emphasis on achieving quantifiable performance goals in healthcare systems. These areas revealed the pervasive influence of societal and institutional structures on the treatment of women during childbirth.

The final phase involved synthesizing and analyzing the findings, which highlighted several overarching themes. Social norms were shown to play a significant role in shaping how women are treated during childbirth, often perpetuating mistreatment. The design of healthcare systems emerged as another critical factor, with some systems reinforcing power imbalances while others offered opportunities to mitigate them. The study emphasized the necessity of adopting multi-level strategies to address these issues comprehensively.

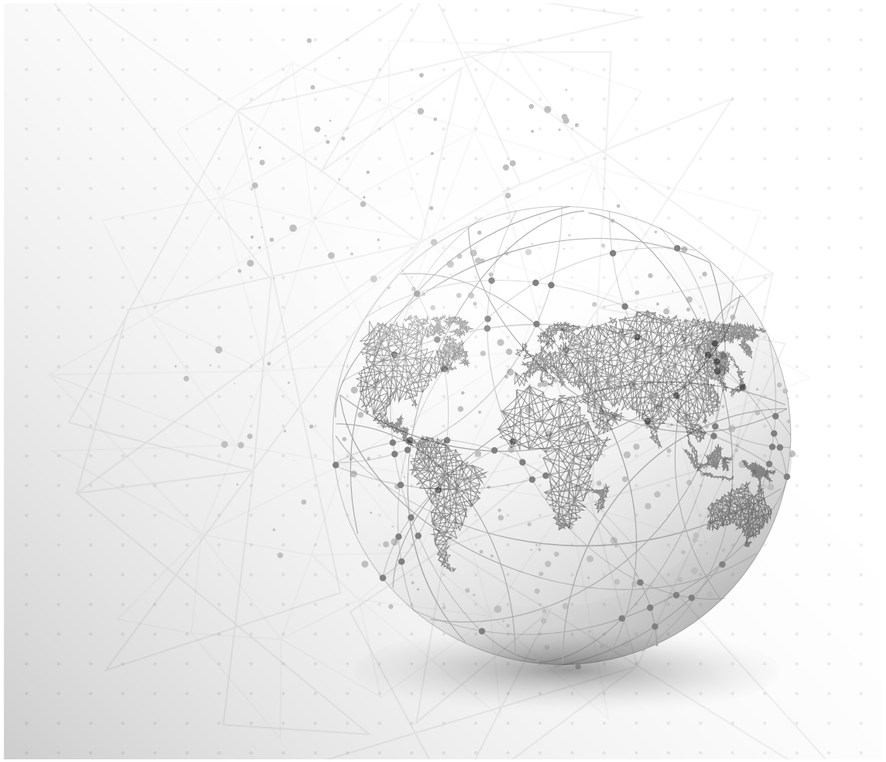
The analysis also underscored the importance of examining power dynamics as "drivers of drivers" of mistreatment—fundamental forces that shape broader systemic issues. By understanding these dynamics, transformative interventions can be developed. The authors called for further exploration of social norms, the structural design of health systems, and the effectiveness of multi-level approaches in promoting respectful maternity care.

In conclusion, this synthesis highlights the importance of examining power dynamics across all levels of the social ecological model to understand and combat the mistreatment of women in maternity care. An interdisciplinary approach and a willingness to challenge existing power structures are essential to fostering respectful and equitable maternal healthcare systems. The study provides a critical framework for addressing these issues and underscores the transformative potential of integrating insights into power dynamics into health policy and practice.

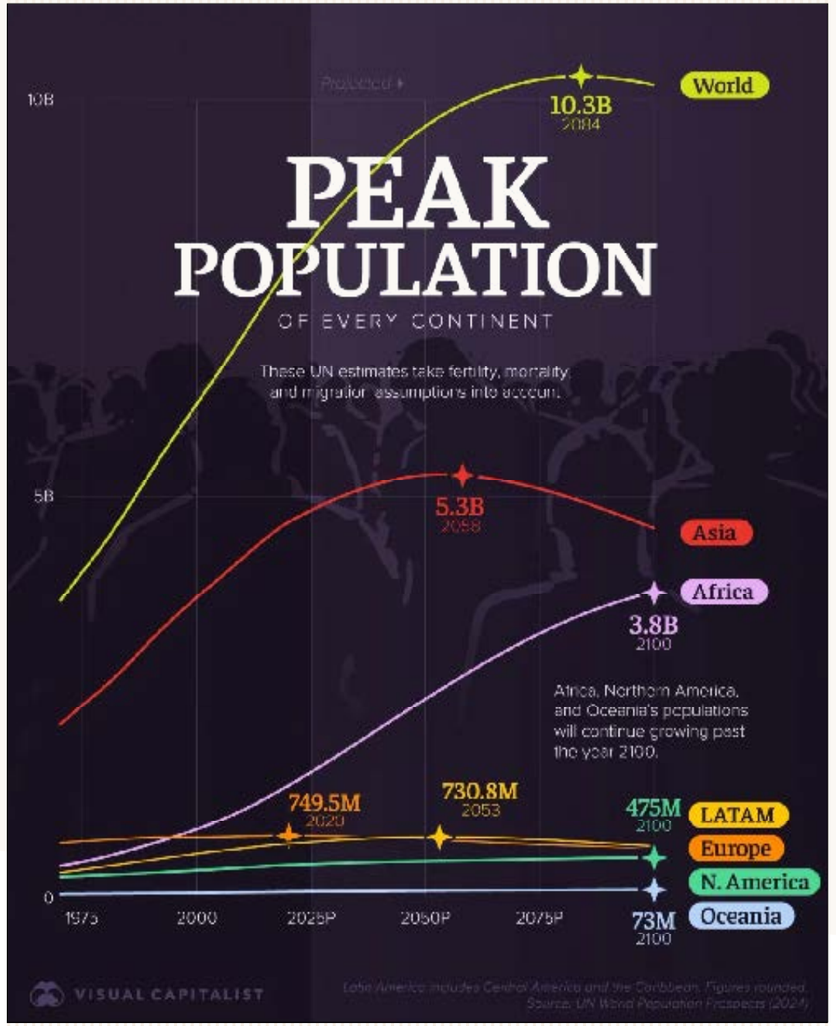
The hierarchical relationship between patients and providers often reinforced unequal dynamics.

Social norms play a significant role in shaping how women are treated during childbirth, often perpetuating mistreatment

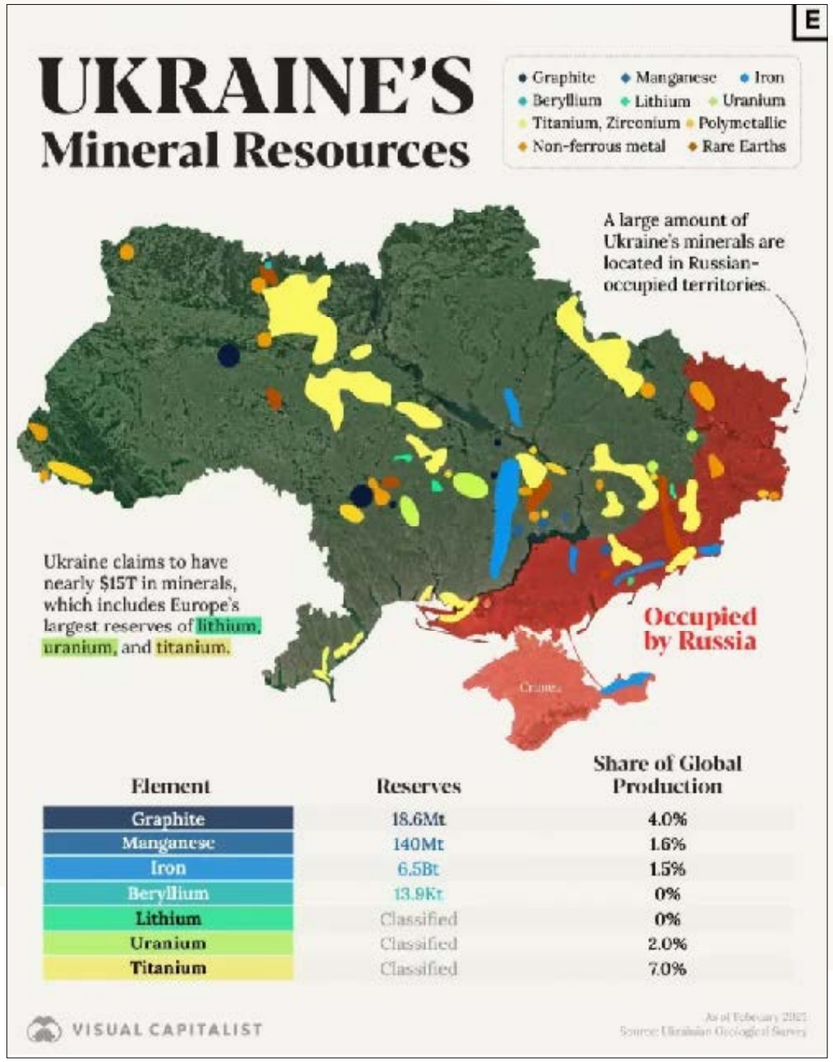
3 The future in numbers



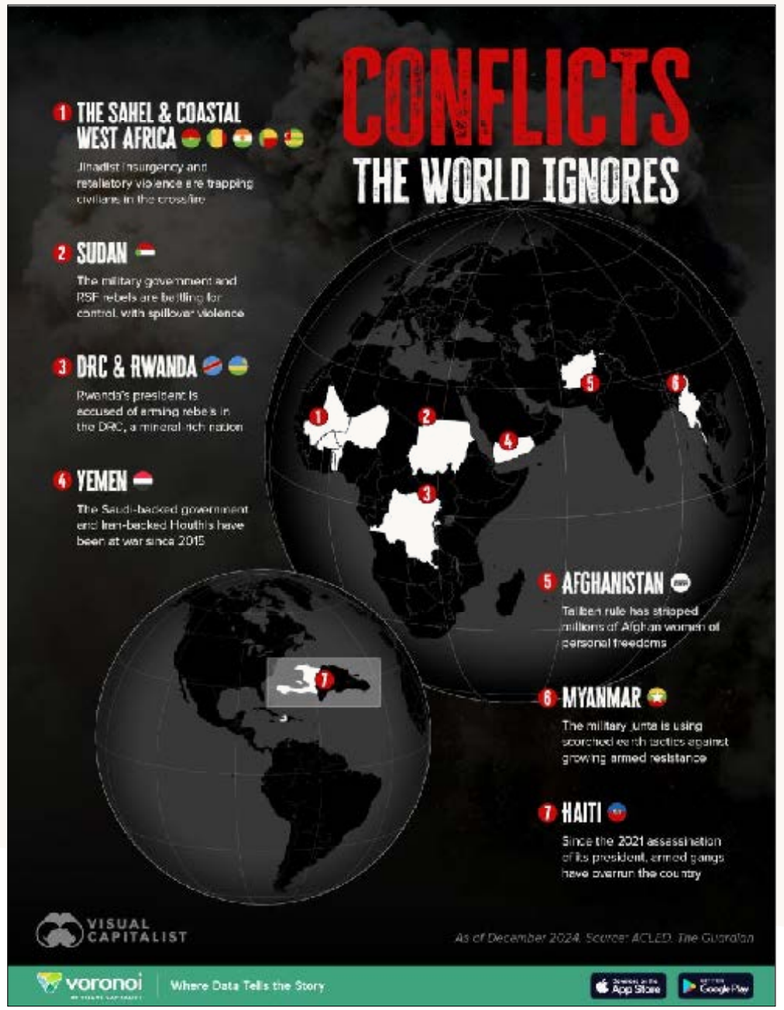
When Every Continent's Population Will Peak This Century



Ukraine's Mineral Resources

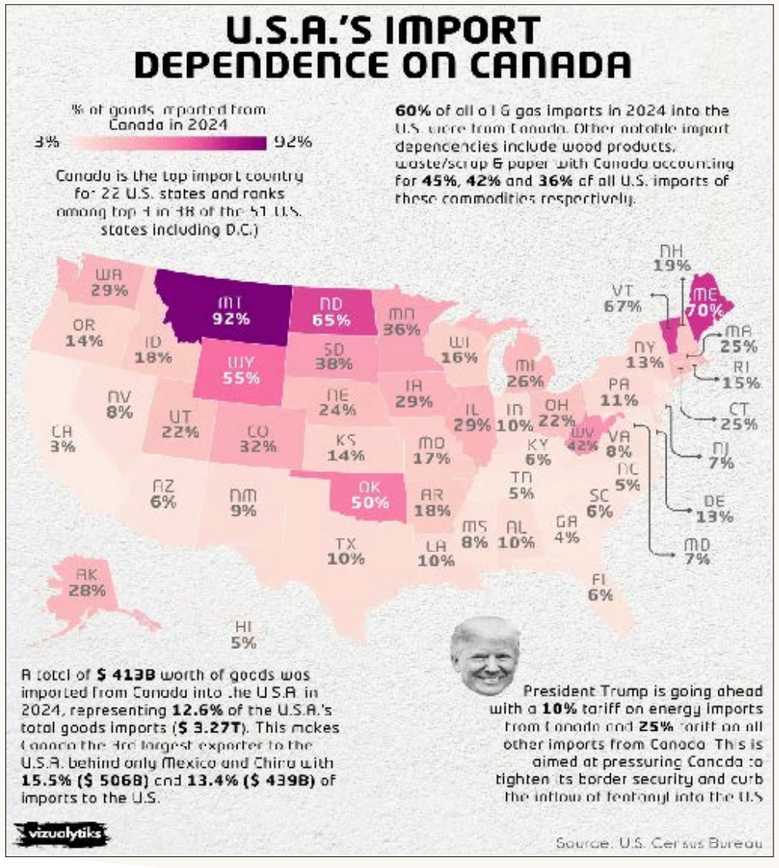


Ongoing Conflicts in the World, Aside From Ukraine & Palestine



How Top Economies Performed in the Last 10 Years, After Adjusting For Inflation

Import Dependence Between U.S.A and Canada



Issue No. 09

(April 2025)

FUTURE TRENDS

Report

Issue no. 9 - April 2025

Future Trends Report

Future Trends Report, published in English and Arabic by TRENDS Virtual Office in Montreal, stands out as a distinctive publication dedicated to highlighting:
1. the most important forward-looking studies that aim to identify future trends, analyze various variables that may influence these trends, and determine the best future scenarios.
2. the most important applied studies that explore the application of knowledge, scientific theories, and information to solve current problems and overcome future challenges.
3. the most important illustrative and graphic forms that visually summarize significant studies, helping readers understand the trends and challenges of the future world.

Contents

1 Prospective research

AI in the public sector

Bertolucci, M. (2024). L'intelligence artificielle dans le secteur public: revue de la littérature et programme de recherche. Gestion et management public, (5), 118139-.

The article examines the increasing integration of AI into the public sector, a rapidly evolving domain with significant opportunities and challenges. Drawing on three systematic literature reviews and an analysis of recent publications (2021–2022), it provides an overview of key themes, impacts, and research prospects.

AI is considered a major technological revolution of the 21st century. In the public sector, it offers various applications such as predictive policing, fraud detection, and chatbots. However, AI raises ethical, social, and organizational issues, along with questions about transparency, equity, and algorithmic governance. The public sector's lag the private sector in technological implementation underscores the urgency of adaptation. Challenges include reducing user dissatisfaction with disconnected services and improving public management through predictive and generative tools.

The article is based on three systematic reviews: Sousa et al. (2019), covering 2010–2018, reviews 59 publications on AI usage in various public domains (healthcare, education, urban planning). The study highlights benefits such as process automation and efficiency gains but points out a lack of empirical research in public management. Zuiderwijk et al. (2021), covering 2018–2020, identifies 26 publications exploring benefits (efficiency, cost reduction, predictions) and challenges (data bias, ethics, technical skills). The focus is on governance and organizational impact. Wirtz et al. (2021) analyzes 189 publications up to 2020, revealing a strong concentration on governance and administration at the expense of other topics such as health or the environment. Qualitative methods dominate, reflecting the growing interest of social sciences in AI. The study examines 22 articles from journals ranked in public management. Topics include implementation, where adoption factors vary by organizational context and process stages; discretionary power, with AI transforming the role of public agents by reducing or expanding their autonomy; discrimination, where AI usage can exacerbate biases; the state-society relationship, with value co-creation with citizens emerging as a central issue; and virtual agents and privacy, where citizens often accept chatbots despite concerns about confidentiality.

However, challenges are numerous: data (quality, homogeneity, and bias); organization (resistance to change, interinstitutional collaboration); skills (shortage of AI experts in the public sector); ethics and transparency (need for explainable systems to ensure accountability); and social impact (job displacement, increased inequalities, and negative citizen reactions).

AI represents a unique opportunity to transform the public sector, but its deployment must be accompanied by careful reflection on its ethical, organizational, and social implications. Researchers play a crucial role in guiding this transition and ensuring that AI benefits all citizens.

BIG DATA

AI raises ethical, social, and organizational issues, along with questions about transparency, equity, and algorithmic governance.

IOT

The benefits of AI in the public sector include improved service quality, personalization, cost reduction, and better risk management.

Prospective research

AI and its use in family medicine

Green, M. (2024). L'intelligence artificielle pourrait-elle améliorer les soins aux patients et réduire la charge de travail des médecins? Canadian Family Physician, 70(3), 215215-.

According to the CFPC, AI can enhance family medicine by improving efficiency, diagnostic accuracy, therapeutic decision-making, and work-life balance for physicians. This article explores AI's transformative potential in family medicine, focusing on its ability to reduce administrative burdens and improve patient care.

Family doctors often struggle with time-consuming tasks that detract from patient-centered care. AI offers promising tools to address these challenges. As part of Canada's broader national strategy, AI is being integrated into various sectors, including healthcare. The federal government, in partnership with the Canadian Institute for Advanced Research (CIFAR), supports initiatives like the Canada-CIFAR AI Chairs Program to promote AI-driven health innovations.

At a recent College of Family Physicians of Ontario summit, Dr. Avi Goldfarb emphasized how AI can revolutionize primary care. Existing applications include AI scribes that automate note-taking and predictive analytics that assist in diagnosing conditions, offering personalized recommendations and targeted preventive advice. These tools improve clinical decision-making and allow physicians to focus more on compassionate care.

A CFPC working group report outlines a roadmap for incorporating AI into family medicine. It highlights the need for sufficient funding, high-quality data, and collaborative teamwork to implement AI effectively. Anticipated benefits include better workflow efficiency, improved diagnostic accuracy, and more sustainable work-life balance. However, successful integration depends on aligning AI development with family medicine's core values.

The article also raises important concerns. Since AI depends on machine learning, biased or incomplete datasets can result in inequitable care. Ethical dilemmas arise when AI tools are developed by pharmaceutical or tech companies, raising questions about whether such tools prioritize corporate interests over patient well-being.

To mitigate these risks, the CFPC advocates for involving family physicians and patients in guiding AI development. Ensuring fairness, transparency, and patient-centered outcomes is essential. The CFPC also promotes AI literacy through resources such as online courses, podcasts, and articles. A notable initiative is a fellowship led by Dr. Jacqueline Kueper, which focuses on integrating AI with compassionate care.

In conclusion, AI holds great promise for transforming family medicine, but its implementation must be responsible and inclusive. By emphasizing equity and trust, AI can enhance healthcare outcomes and relieve pressures on physicians. Ongoing oversight and collaboration will be essential to ensure that AI strengthens rather than undermines the quality and fairness of care.

According to the CFPC, AI can enhance family medicine by improving efficiency, diagnostic accuracy, therapeutic decision-making, and work-life balance for physicians.

By focusing on equity and inclusivity, AI can be a powerful tool to improve healthcare outcomes for patients while alleviating the pressures on physicians.

Prospective research

Green finance and green technology

Li, T., Yue, X. G., Qin, M., & Norena-Chavez, D. (2024). Towards Paris Climate Agreement goals: The essential role of green finance and green technology. Energy Economics, 129, 107273.

In "Towards Paris Climate Agreement Goals: The Essential Role of Green Finance and Green Technology," the authors explore how green finance (GF) and green technology (GT) support the objectives of the Paris Climate Agreement (PCA). The study uses advanced quantitative tools—particularly wavelet-based quantile-on-quantile regression (QQR)—to examine how GF and GT impact PCA goals across varying time frames.

The PCA seeks to limit global temperature rise to below 2°C, preferably 1.5°C, compared to pre-industrial levels. It emphasizes reducing greenhouse gas emissions to net-zero in the latter half of the 21st century. Achieving this requires strong strategies, with GF and GT serving as central pillars.

Green finance includes financial activities that support environmental sustainability, such as project financing, investments, and risk management in renewable energy, clean transport, and environmental protection. The surge in green bonds is a prominent example of GF's rising role in climate action.

Green technology includes innovations that reduce pollution, enhance resource efficiency, and maintain ecological balance. Key examples include carbon capture, utilization, and storage (CCUS) for emission-heavy industries and the expanding use of affordable renewable energy sources like wind and solar.

The study finds that both GF and GT positively impact PCA goals in the short term, especially at extreme quantiles. GF shows a stronger influence, largely due to its role in mobilizing and allocating financial resources for sustainable projects. It reduces investment risk through environmental, social, and governance (ESG) criteria and promotes international cooperation on climate policies.

GT also plays a vital role by enabling industrial transformation, lowering emissions, and boosting the development of low-carbon products and technologies. However, its effectiveness is often tied to the availability of green financing, which limits its standalone impact.

In the medium term, both GF and GT continue to support PCA progress, though the effects slightly diminish. Long-term analysis confirms sustained positive impacts, with GF retaining a slightly greater influence. This ongoing impact highlights the importance of continuous financial investment and technological innovation to meet climate goals.

The authors conclude that both GF and GT are crucial to achieving PCA objectives, with GF having a more pronounced effect due to its broader role in enabling and scaling green initiatives. They call on policymakers to enhance green financial systems, accelerate technological innovation, and promote global collaboration to improve the effectiveness of climate mitigation strategies.

In sum, integrating green finance and green technology is vital for a sustainable future and the successful implementation of the Paris Climate Agreement.

Green bonds have experienced significant growth, surging from $37 billion in 2014 to $509 billion in 2021.

Both GF and GT are critical to achieving the Paris Climate Agreement goals.

Prospective research

Climate change, emotions and the mobilization of young environmental activists in the UK

Pickard, S. (2021). "You are stealing our future in front of our very eyes." The representation of climate change, emotions and the mobilisation of young environmental activists in Britain. E-rea. Revue électronique d'études sur le monde anglophone, (18.2).

The article "You Are Stealing Our Future in Front of Our Very Eyes: The Representation of Climate Change, Emotions, and the Mobilization of Young Environmental Activists in Britain" by Sarah Pickard explores the emotional and political dimensions of youth-led climate activism in the UK. It examines how climate change is portrayed as a crisis and emergency, and how these portrayals catalyze emotional responses and mobilization among young people.

The study situates the rise of youth environmental activism within a broader context of political and social crises, including austerity, Brexit, and increasing digital connectivity. It highlights the influence of movements like Fridays For Future (FFF) and Extinction Rebellion (XR), and figures such as Greta Thunberg, who have framed climate change as an existential emergency. This framing has spurred unprecedented youth engagement in environmental protest and political discourse.

Two central themes emerge: crisis narratives and generational responsibility. Crisis narratives use urgent, apocalyptic language to convey the immediate threat posed by climate change. Terms like "climate emergency" and "ecological crisis" have shifted from activist slogans into mainstream political vocabulary, reflecting growing concern over environmental degradation and the urgency for action.

Generational responsibility is another key motif, as young activists hold older generations accountable for the environmental crisis. They demand urgent measures to secure a livable future. Greta Thunberg and other youth leaders frequently use moral language, confronting political leaders with direct appeals to their responsibility.

The article also delves into the emotional experiences of young activists, using qualitative interviews with youth involved in climate protests. A wide range of emotions drive their engagement. Initial reactions to the climate crisis often include fear, anxiety, sadness, and despair. While these feelings can be overwhelming, they are often transformed into anger, frustration, and ultimately, motivation for activism.

Anger and frustration stem from perceived governmental inaction and intergenerational injustice. This emotional shift—from despair to action—is key to sustaining long-term engagement. The concept of "Do-It-Ourselves" (DIO) politics illustrates young activists' resolve to act independently when institutions fail to respond adequately.

Involvement in movements like XR and FFF also produces emotions such as solidarity, joy, and hope. Participation fosters a sense of belonging and shared purpose, which counters isolation and despair. Protests offer emotional catharsis and allow young people to express agency, strengthening their commitment to environmental causes.

Politically, youth climate activism has influenced discourse and policy. For example, the UK Parliament's 2019 declaration of a "climate emergency" was partly in response to sustained youth-led protests. Though symbolic, it signals the growing political influence of these movements.

In conclusion, the article underscores the power of emotion in climate activism. Framing climate change as a crisis and invoking generational responsibility have been central to mobilizing young people. These activists challenge political inertia while cultivating hope, resilience, and a shared vision for a sustainable future.

Prospective research

Urban and regional planning in Quebec, Canada

Le Berre, S. (2017). From planning to spatial foresight in Québec: what future-telling means in a context of sub-regional governance. The case of vision 2031. Revue Gouvernance, 14(2), 2345-.

The article "From Planning to Spatial Foresight in Québec: What Future-Telling Means in a Context of Sub-regional Governance. The Case of Vision 2031" by Sylvain Le Berre explores the evolution of urban and regional planning in Québec, focusing on the shift from traditional planning approaches to spatial foresight within sub-regional governance. The study uses the case of Vision 2031, developed by the Regional County Municipality (RCM) of Rivière-du-Loup, to illustrate this transformation.

Since the adoption of Québec's sustainable development strategy in 2006, RCMs have been required to develop strategic visions for land-use planning, known as Schéma d'aménagement et de développement (SAD). The Vision 2031 project, conducted between 2009 and 2013, exemplifies this shift towards foresight-oriented planning. Unlike traditional top-down approaches, Vision 2031 fostered a more inclusive, participatory process involving public and private stakeholders, as well as civil society.

The article identifies three major trends emerging from this new planning paradigm: prospective planning, transversal approaches, and collaborative practices. Prospective planning emphasizes forward-looking strategies, considering long-term social, economic, environmental, and technological changes. This approach helps regions anticipate future challenges and opportunities rather than merely reacting to current issues.

The transition from sectoral to transversal planning represents another key shift. Instead of isolated, department-specific strategies, Vision 2031 integrates multiple sectors and disciplines, fostering holistic development. This integration is crucial for addressing complex, interconnected issues like climate change, economic resilience, and demographic shifts. Collaboration is the third significant trend. Vision 2031 broke traditional barriers by involving a broad coalition of stakeholders, including local governments, businesses, community organizations, and residents. This inclusive approach enhances democratic legitimacy and ensures that diverse perspectives shape regional development strategies.

The governance model underpinning Vision 2031 reflects a move towards "governance by the future." This concept emphasizes the role of foresight in guiding decision-making processes, encouraging proactive rather than reactive governance. It highlights the importance of shared responsibility for regional development, shifting the focus from centralized authorities to collective community engagement.

The article also discusses the methodological framework used in Vision 2031, combining document reviews, strategic planning sessions, and semi-structured interviews with key stakeholders. This approach facilitated the co-creation of a strategic vision that resonates with local values and aspirations.

Vision 2031's impact extends beyond planning documents. It has influenced policy discourse, promoted civic participation, and strengthened the political capacity of sub-regional institutions. By embedding foresight into planning practices, Vision 2031 has helped the RCM of Rivière-du-Loup navigate uncertainties and build resilience against future challenges.

In conclusion, the article argues that spatial foresight represents a significant evolution in planning practices, particularly within the context of sub-regional governance. Vision 2031 demonstrates how integrating foresight, transversal approaches, and collaborative governance can create more adaptive, inclusive, and future-oriented regional development strategies. This case study offers valuable insights for other regions seeking to enhance their planning processes and governance frameworks in the face of contemporary global challenges.

2 Applied research

How to support immigrant men in Canada?

El Amraoui A., Le Gall J. (2024), Les ateliers de prise de parole du comité « Espaces-hommes » du Cari St Laurent : une pratique d'intervention novatrice auprès des hommes immigrants à Montréal, Institut universitaire SHERPA, Montréal, 36p.

The report "Les ateliers de prise de parole du comité Espace-Hommes du CARI St-Laurent" explores an innovative intervention developed by CARI St-Laurent to support immigrant men in Quebec. Conducted in collaboration with the Institut universitaire SHERPA, the study documents the impact of these speaking workshops while identifying best practices and challenges.

CARI St-Laurent, a non-profit organization supporting immigrants in Montreal since 1989, recognized a lack of services tailored to male immigrants. To address this, the Espace-Hommes committee was created, offering specialized activities, notably the speaking workshops. These workshops provide a safe space for men to share experiences and discuss challenges related to integration, employment, housing, and well-being.

The workshops consist of ten sessions on cultural adaptation, professional integration, health, family dynamics, and financial literacy. Sessions blend presentations with discussions, fostering participation. Facilitators, often immigrants themselves, play a key role in building trust. The program follows an intercultural approach, acknowledging diverse backgrounds while promoting mutual learning.

Participants face major challenges, particularly in securing housing and employment. Many struggle to navigate the rental market or find jobs that match their qualifications, leading to frustration. A lack of structured information upon arrival in Canada leaves many feeling lost. The workshops bridge this gap by providing essential information and resources.

Social isolation is another pressing issue. Many immigrant men arrive alone, leaving their families behind, and societal norms discourage them from seeking help. The workshops create a sense of community where participants exchange advice and form support networks. Many initially hesitated to share their struggles due to stigma, but the workshops provide a judgment-free environment that encourages openness.

Running the workshops presents challenges. Recruiting participants is difficult since many immigrant men are unaware of available services. The workshops are conducted primarily in French, excluding non-French speakers. While past cohorts had translation assistance, funding constraints have limited this support. Additionally, ensuring accessibility while managing program requirements remains a challenge. Initially designed for permanent residents and work permit holders, the program has informally extended to asylum seekers and individuals with precarious immigration statuses. Facilitators stress that their immigrant backgrounds help them connect with participants. Having faced similar integration challenges, they relate personally. However, working closely with individuals in hardship takes an emotional toll. Providing training and support for facilitators could enhance their ability to manage complex cases.

The study recommends strengthening the program by increasing outreach, offering multilingual sessions, and collaborating with other organizations for specialized support. Further research is needed to assess the long-term impacts on integration.

Ultimately, the Espace-Hommes workshops fill a critical gap in services for immigrant men. By providing a supportive environment where they can express themselves, gain knowledge, and build connections, the program eases their transition into Quebec society. Despite challenges, its community-driven approach and focus on empowerment make it a promising model for other organizations supporting immigrant populations.

Applied research

Ethical implications and future prospects of artificial intelligence

Kasula, B. Y. (2024). Ethical Implications and Future Prospects of Artificial Intelligence in Healthcare: A Research Synthesis. International Meridian Journal, 6(6), 17-.

The research paper "Ethical Implications and Future Prospects of Artificial Intelligence in Healthcare: A Research Synthesis" explores the role of AI in healthcare, focusing on its applications, ethical challenges, and future directions. AI is transforming diagnostics, treatment planning, and patient care by improving accuracy, efficiency, and enabling personalized medicine. However, these advances also raise significant ethical concerns that must be addressed.

One of the most pressing concerns is patient privacy. AI systems depend on vast amounts of medical data, raising issues about data security and misuse. Protecting patient information from breaches and unauthorized access is a critical challenge. Another major issue is algorithmic bias. AI models trained on non-representative datasets may lead to disparities in healthcare outcomes, potentially worsening existing inequalities and disproportionately impacting marginalized populations.

The paper also highlights ethical concerns around decision-making transparency. AI-driven recommendations can be difficult for healthcare professionals to interpret, complicating accountability. If an AI system recommends a treatment that leads to an adverse outcome, it becomes unclear whether responsibility lies with the developers, healthcare providers, or institutions. This complexity underscores the need for transparent AI systems that explain how they reach their conclusions and how they integrate into clinical workflows.

Patient autonomy and informed consent are also challenged by AI in healthcare. Traditionally, patients consent based on an understanding of medical procedures. However, with AI involved, patients may not fully grasp its role in their care. Educating patients about the capabilities and limitations of AI is essential to maintaining trust and ethical practices.

From a broader perspective, the impact of AI on healthcare accessibility raises ethical concerns. While AI can improve efficiency and lower costs, it may also deepen the digital divide. Wealthier institutions may gain more from AI technologies, while under-resourced areas risk being left behind. Policymakers must ensure equitable access to AI benefits to prevent disparities in healthcare delivery.

However, the paper emphasizes the promising future of AI in healthcare. Predictive analytics can enable earlier disease detection and personalized treatment plans, improving patient outcomes. Natural language processing (NLP) helps streamline clinical documentation and reduce administrative burdens, allowing healthcare providers to spend more time with patients. Emerging tools like AI-powered robotics and augmented reality are enhancing complex surgeries and rehabilitation processes.

To harness AI's potential while addressing ethical concerns, the study recommends several key strategies. First, robust ethical frameworks must guide the development and deployment of AI in healthcare. Second, collaboration among AI developers, healthcare professionals, and ethicists is essential to ensure alignment with medical and ethical standards. Third, ongoing monitoring and evaluation can help address biases or unintended consequences before they cause harm.

Addressing concerns such as data privacy, algorithmic bias, transparency, and equitable access is essential to ensure AI-driven healthcare remains effective, and centered on patient well-being. With thoughtful oversight, AI can advance global healthcare while upholding ethical standards.

Applied research

The influence of environmental regulations on green technology development in Europe

Khurshid, A., Huang, Y., Cifuentes-Faura, J., & Khan, K. (2024). Beyond borders: assessing the transboundary effects of environmental regulation on technological development in Europe. Technological Forecasting and Social Change, 200, 123212.

The article "Beyond Borders: Assessing the Transboundary Effects of Environmental Regulation on Technological Development in Europe" by Khurshid et al. investigates how environmental regulations influence green technological innovation across European countries. Using a panel dataset from 25 European nations spanning 1994 to 2020, the study employs the Spatial Durbin Model to analyze the direct, indirect, and spatial spillover effects of environmental policies on green technology innovation (EINV).

The research highlights that environmental regulations (EPY) play a significant role in fostering green technology. These regulations compel producers to adopt sustainable technologies, thereby stimulating innovation. The study finds that EPY has a notable total impact of 0.636%, with a direct effect of 0.187% and a spatial spillover effect of 0.449%. This indicates that environmental policies within a country not only enhance green technology domestically but also influence positively neighboring countries through knowledge transfer and competitive dynamics.

Key factors influencing EINV include environmental taxes, fiscal expenditure, urbanization, foreign direct investment (FDI), and research and development (R&D) expenditures. Environmental taxes and fiscal expenditures serve as financial incentives, reducing barriers to green investments and promoting R&D in sustainable technologies. Urbanization facilitates resource concentration and stakeholder diversity, enhancing collaboration and the diffusion of eco-friendly practices. FDI supports cross-border technology transfer, while R&D expenditures drive technical advancements in green innovations.

The study underscores the dual nature of environmental regulations: formal (government-enforced policies) and informal (market-driven and societal pressures). Both forms significantly impact green innovation. For instance, stringent formal regulations directly enforce environmental standards, while informal mechanisms, such as public awareness and corporate social responsibility, indirectly promote sustainable practices.

Spatial spillover effects are critical in understanding the broader impact of EPY. The study reveals that stricter environmental regulations in one country can lead to increased green innovation in neighboring countries due to competitive pressures and the diffusion of best practices. Conversely, relaxed regulations may negatively affect regional green technology development by reducing incentives for innovation.

The article also explores the theoretical underpinnings of the Porter Hypothesis, which suggests that well-designed environmental regulations can stimulate innovation and enhance competitiveness. The findings support this hypothesis, showing that environmental regulations not only mitigate negative externalities but also drive technological progress and economic growth.

Policy recommendations emphasize the need for coordinated environmental strategies across Europe. Policymakers should consider both direct and spillover effects when designing environmental regulations. Encouraging cross-border collaboration, harmonizing regulatory standards, and fostering international partnerships can amplify the positive impacts of EPY on green technology innovation.

In conclusion, the article demonstrates that environmental regulations are powerful tools for promoting green technological development. Their effects transcend national borders, highlighting the importance of regional cooperation in achieving sustainable development goals. By integrating economic incentives, fostering R&D, and leveraging both formal and informal regulatory mechanisms, Europe can enhance its leadership in global green innovation.

Applied research

Energy management in Canada, USA and Africa

Ilojianya, V. I., Usman, F. O., Ibekwe, K. I., Nwokediegwu, Z. Q. S., Umoh, A. A., & Adefemi, A. (2024). Data-driven energy management: review of practices in Canada, USA, and Africa. Engineering Science & Technology Journal, 5(1), 219230-.

The article "Data-Driven Energy Management: Review of Practices in Canada, USA, and Africa" by Valentine Ikenna Ilojianya et al. explores the transformative role of data analytics in energy management across diverse regions. It offers a comparative analysis of data-driven strategies in Canada, the USA, and Africa, highlighting their adoption, successes, challenges, and their implications for global energy sustainability.

The introduction underscores a global shift from traditional energy management—based on static data and historical patterns—to dynamic, data-driven approaches. Real-time data, predictive analytics, and advanced technologies now play a crucial role in optimizing energy production, distribution, and consumption.

In Canada, the integration of smart grid technologies and advanced metering infrastructure has enabled real-time monitoring and improved grid efficiency. Machine learning and predictive analytics support renewable energy integration and optimize distribution. These tools enhance system reliability, lower operational costs, and contribute to national sustainability goals. Regulatory initiatives like the Smart Grid Program and the Clean Growth Hub foster innovation and the adoption of advanced energy solutions.

The USA showcases a diverse and expansive energy landscape, with major advances in renewable energy and smart grids. Energy management policies emphasize efficiency and emissions reduction. Data-driven strategies enable dynamic demand response, grid optimization, and accurate energy forecasting. The deployment of advanced metering systems and sophisticated analytics is widespread, though challenges remain—particularly around regulatory complexity, cybersecurity, and data standardization. Federal and state initiatives support innovation and deployment of data-driven systems.

While some countries are advancing centralized energy planning, many rely on decentralized, off-grid solutions to expand access. Data-driven approaches hold significant promise, particularly as digital technologies become more accessible. However, infrastructure gaps, financial constraints, and a shortage of skilled personnel limit broader adoption. Despite these obstacles, pilot projects and international partnerships are emerging to harness data for improved energy planning and renewable integration.

The article outlines key benefits of data-driven energy management, including enhanced system efficiency, cost savings, and greater support for sustainable energy practices. Real-time analytics improve demand forecasting, load balancing, and predictive maintenance, which together enhance grid stability and resource optimization. These approaches also ease the integration of intermittent renewable energy sources, contributing to environmental goals.

Common challenges across regions include technological barriers, concerns over data privacy, and the need for flexible, robust regulatory frameworks. The study emphasizes the importance of collaboration among stakeholders, adaptive policies, and investment in digital infrastructure and human capital to overcome these challenges.

In conclusion, data-driven energy management holds significant potential for advancing global sustainability. Insights from Canada and the USA can inform strategies in Africa and other developing regions. Future research should focus on closing gaps in technology, policy, and skills development to ensure broader adoption and greater effectiveness of these innovative energy solutions.

Applied research

AI and its governance: the case of Canada

Attard-Frost, B., Brandusescu, A., & Lyons, K. (2024). The governance of artificial intelligence in Canada: Findings and opportunities from a review of 84 AI governance initiatives. Government Information

Since then, federal and provincial governments have launched numerous initiatives to regulate, support, and shape AI development across sectors. A review of 84 initiatives from 2017 to 2022 reveals a strong emphasis on fostering AI-driven economic growth and innovation, while areas like ethics, workforce development, and public engagement receive comparatively less focus.

The study categorizes these initiatives into five types: programs, policies, strategic plans, ethics statements, and standards. Programs, which make up the largest share, are government-funded efforts to advance AI research, commercialization, and industrial applications. Policies, such as the Digital Charter Implementation Act (Bill C-27), establish regulatory frameworks for AI use and data protection. Strategic plans, including the Pan-Canadian AI Strategy, define long-term goals for AI development and governance. Ethics statements, like the Montreal Declaration, outline principles for responsible AI use. Standards, though still evolving, aim to set technical and operational benchmarks.

Most initiatives prioritize economic and technological advancement, targeting industry and innovation. Investment is directed toward AI research, technology development, and commercial applications. However, issues such as workforce impact, digital infrastructure, and ethical governance remain underrepresented. This industry-first approach assumes that economic growth from AI will produce broader societal benefits. The study warns that this model carries risks if it neglects AI's wider implications on employment, rights, and environmental sustainability.

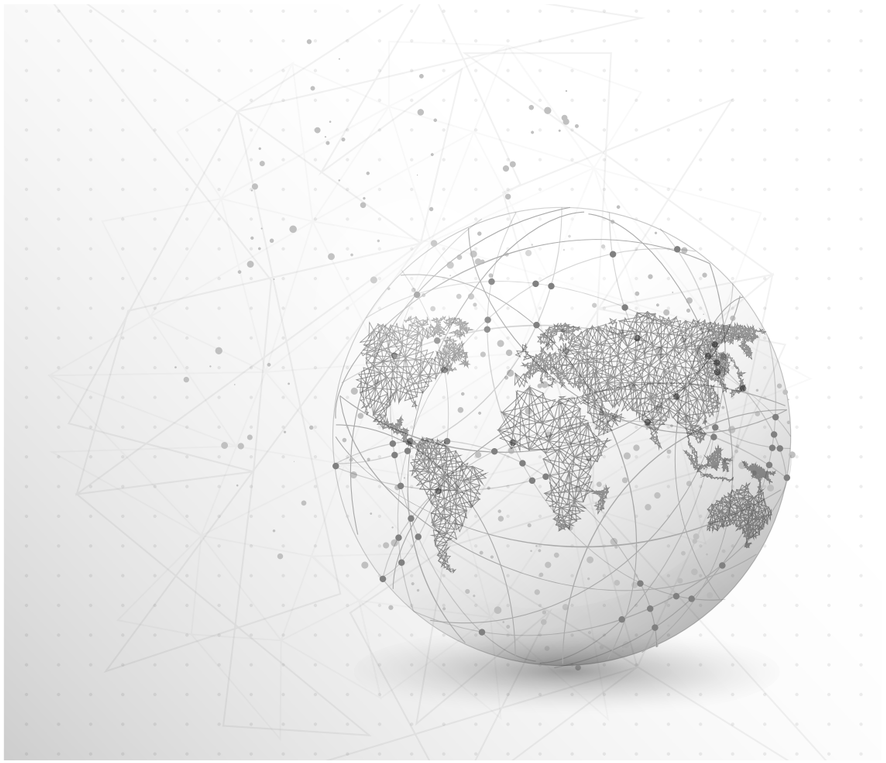
One key challenge is the lack of transparency in reporting outcomes. While some programs, like the Pan-Canadian AI Strategy, publish performance reports, many initiatives lack clear metrics or public accountability. This makes it difficult to assess whether goals are being met. Additionally, public trust in AI governance is fragile. Limited transparency, minimal consultation, and perceived exclusion of public voices have contributed to skepticism about how AI systems are regulated and used.

The study offers several recommendations to strengthen governance. Researchers can evaluate initiatives' effectiveness, explore public trust factors, and assess how governance addresses social and environmental issues. Policymakers and public servants can improve transparency by establishing performance targets, publishing reports, and ensuring accountability. Public engagement should go beyond consultations to involve citizens and stakeholders in co-designing AI policy frameworks.

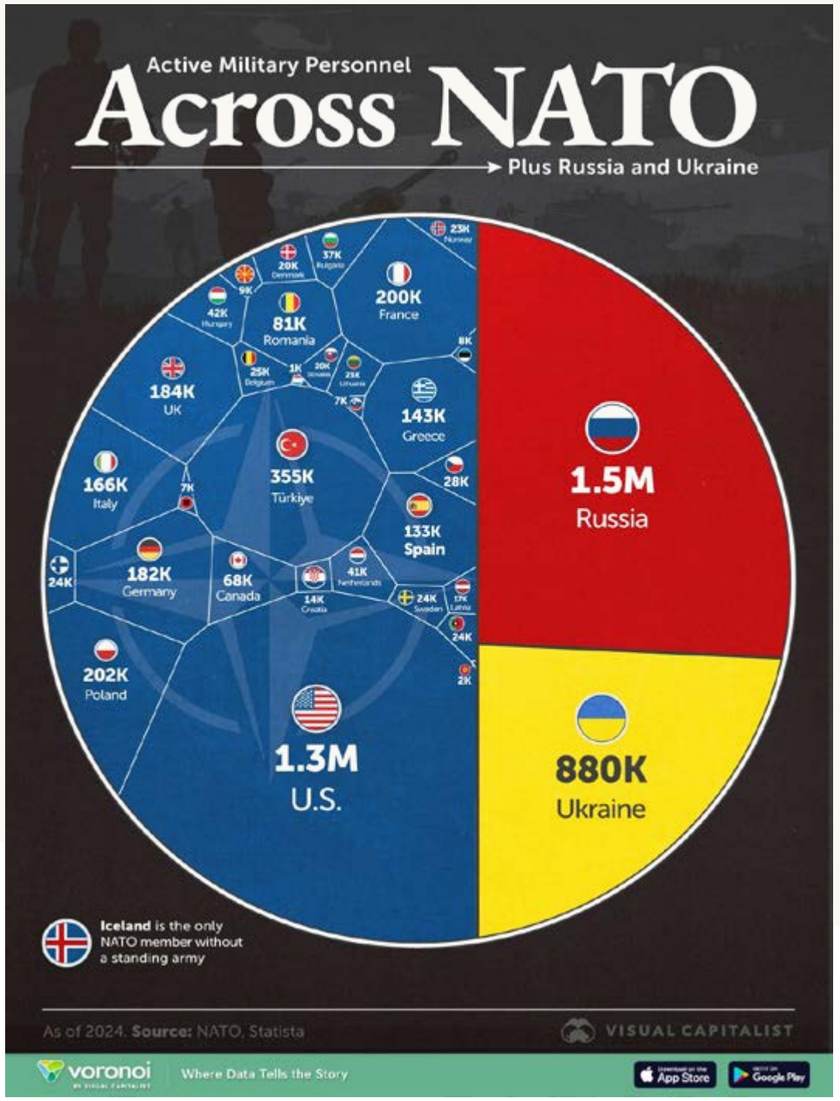
Canada also has an opportunity to adopt a more balanced governance model by expanding focus beyond economic goals. Greater attention should be paid to AI's impact on labor, environmental sustainability, and societal well-being. A unified national governance structure could help address current fragmentation, which is largely concentrated in Innovation, Science, and Economic Development Canada. Coordinated efforts involving multiple government agencies and civil society groups could support a more inclusive and effective governance system.

While Canada has made important strides in AI policy, further work is needed to ensure transparency, build public trust, and adopt a holistic approach to AI's societal impact. By enhancing accountability, encouraging collaboration, and broadening the scope of governance, Canada can continue to lead in responsible and equitable AI development.

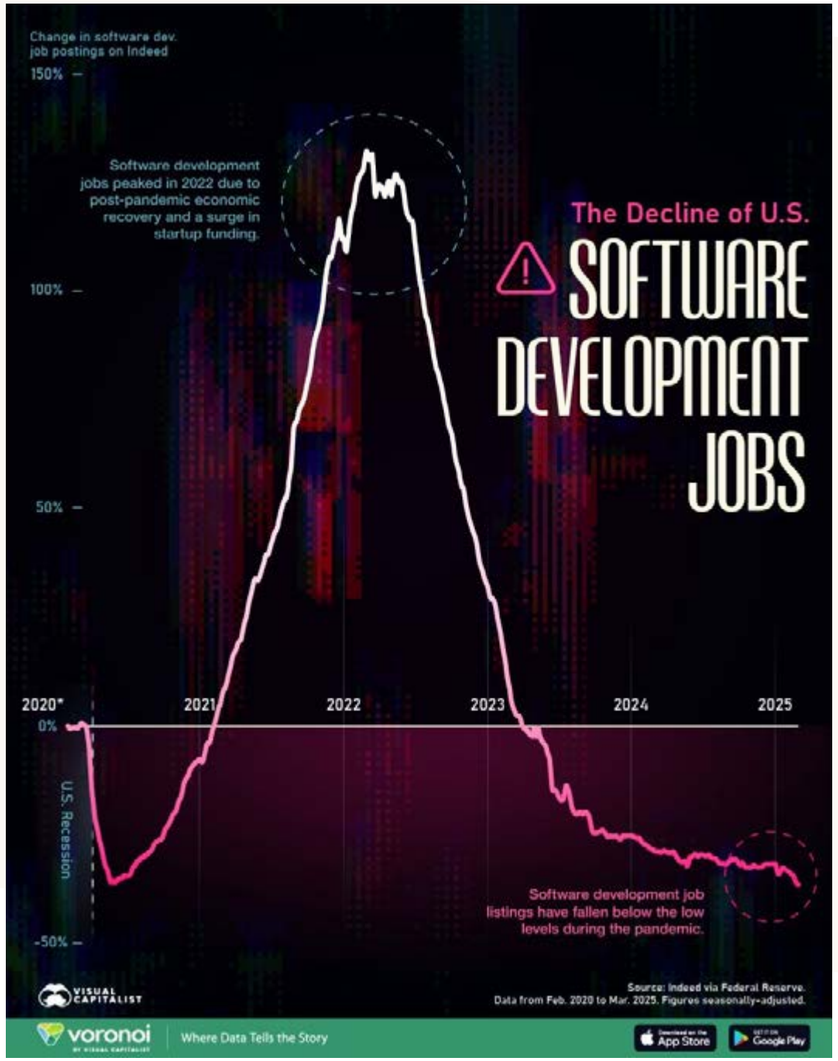
3 The future in numbers



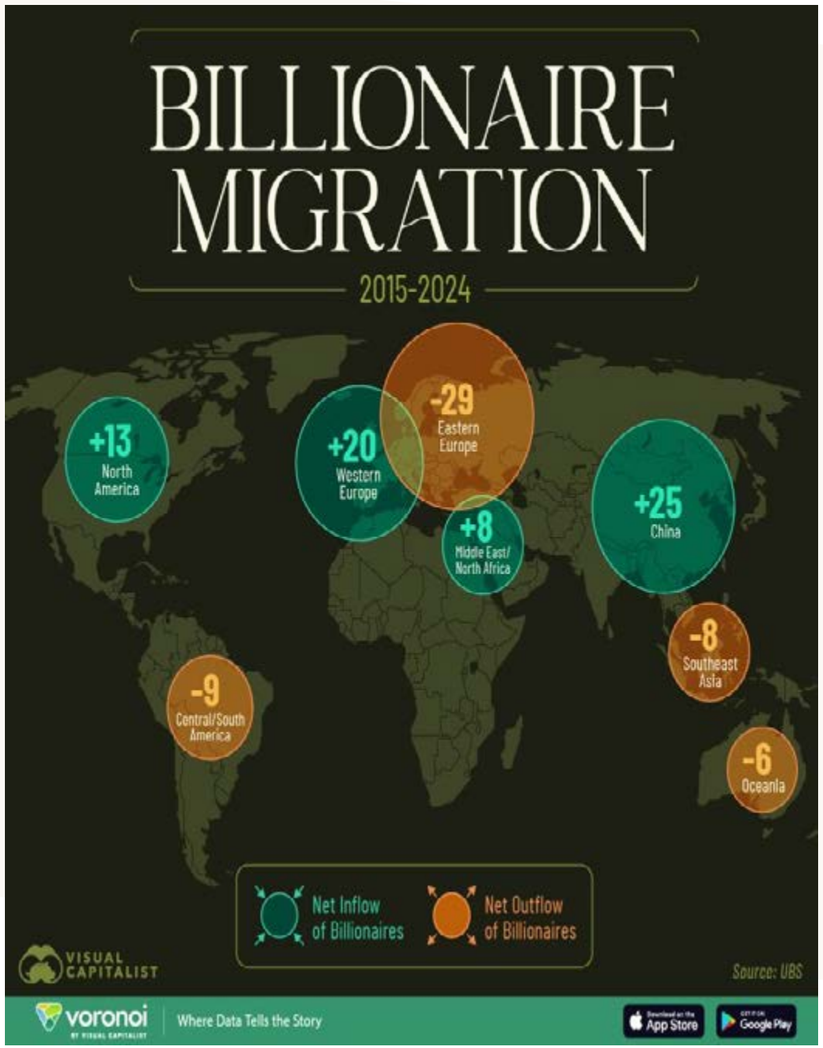
Army Sizes of NATO, Russia, and Ukraine



Software Developer Hiring Boom Is Over

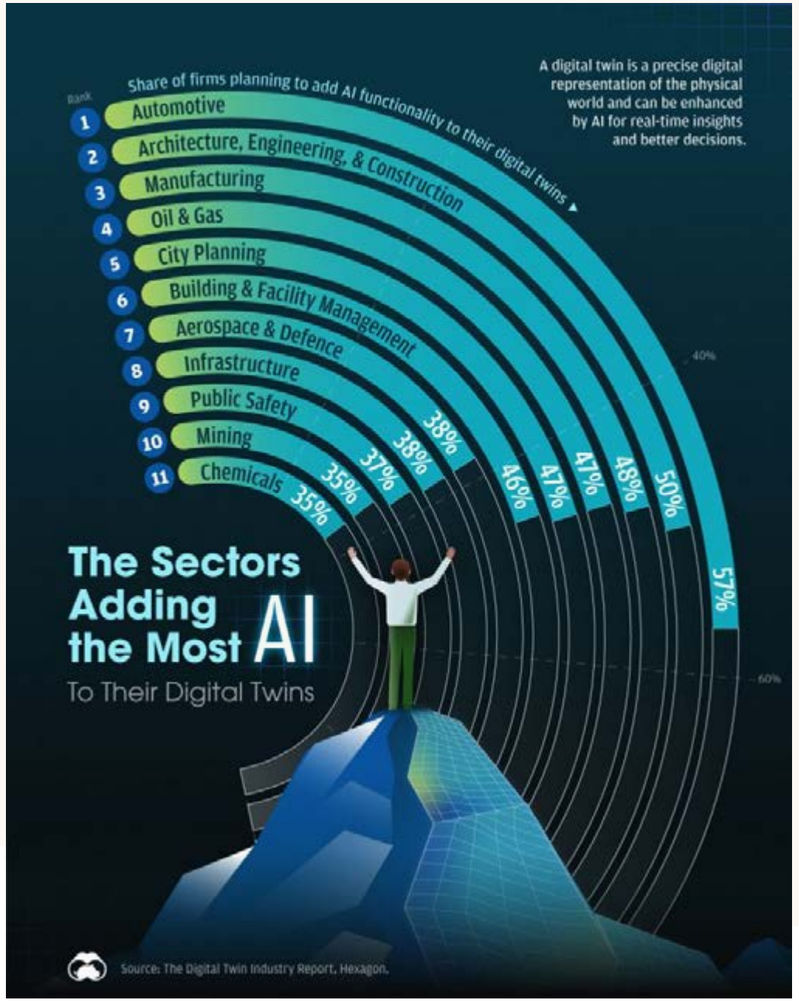


Billionaire Migration Over the Last Decade



2025's Best Countries to Live & Work In

The Sectors Adding the Most AI to Their Digital Twins



10

Issue No. 10

(May 2025)

FUTURE TRENDS

Report

Issue no. 10 - May 2025

Future Trends Report

Future Trends Report, published in English and Arabic by TRENDS Virtual Office in Montreal, stands out as a distinctive publication dedicated to highlighting:
1. the most important forward-looking studies that aim to identify future trends, analyze various variables that may influence these trends, and determine the best future scenarios.
2. the most important applied studies that explore the application of knowledge, scientific theories, and information to solve current problems and overcome future challenges.
3. the most important illustrative and graphic forms that visually summarize significant studies, helping readers understand the trends and challenges of the future world.

Contents

1 Prospective research

Can AI Harm Learning?

Bastani, H., Bastani, O., Sungu, A., Ge, H., Kabakcı, O., & Mariman, R. (2024). Generative ai can harm learning. Available at SSRN, 4895486.

This article investigates how generative AI affects students' learning and achievement. The study delves into a basic question: does AI use in learning settings impair the process of skills acquisition? The researchers conducted a field experiment in a Turkish high school with nearly 1,000 students in ninth to eleventh grade.

Students were allocated randomly into a control group with no AI access, a group that used GPT Base, and a group using GPT Tutor, an optimized version designed with safeguards to allow learning through hints and teacher-recommended prompts. The AI software was utilized in math practice sessions, which accounted for 15% of the material.

The results demonstrate a complex dynamic. Students who utilized GPT Tutor outperformed the control group on practice problems by a 127% gain. GPT Base also improved practice performance by 48%. However, these gains did not transfer to independent performance. On follow-up testing, the GPT Base group scored 17% lower than the control group, implying a negative learning effect. Conversely, GPT Tutor users had no loss of test performance, indicating that its design allowed for the maintenance of learning results. Students who used GPT Base treated the tool as a "crutch" and copied the answers directly without any interaction. On the other hand, GPT Tutor promoted positive interaction, requiring students to justify their reasoning and build problem-solving skills.

The article further identifies that the students who used GPT Base were largely unaware of the negative effects on learning. Although their performance was inferior, they perceived that they had done a good job and learned well, showing a gap between perceived and actual learning. On the other hand, users of GPT Tutor reported a better sense of performance and appreciation for the value of the tool's aid, even when their exam results were not higher than the control group. This indicates that well-crafted AI tools can augment the learning experience without harming it.

The research explores the processes behind these findings. The analysis reveals that GPT Base often generates erroneous responses, and students are likely to take these answers at face value without examining them. In particular, even mathematical errors, which students should have been able to react to, had a powerful negative effect—implying failure to engage with the material. Lastly, this study provides a cautionary note: generative AI may enhance performance in the short term but may undermine precisely those learning processes that will ultimately contribute to overall success when executed without limits. Tools like GPT Tutor demonstrate a possible path forward—to leverage the convenience of AI but safeguard instructional integrity.

The researchers call for consideration of meticulous design, transparency, and regulation to ensure that AI used in teaching fosters, rather than replaces, human learning.

BIG DATA

Well-crafted AI tools can augment the learning experience without harming it.

IOT

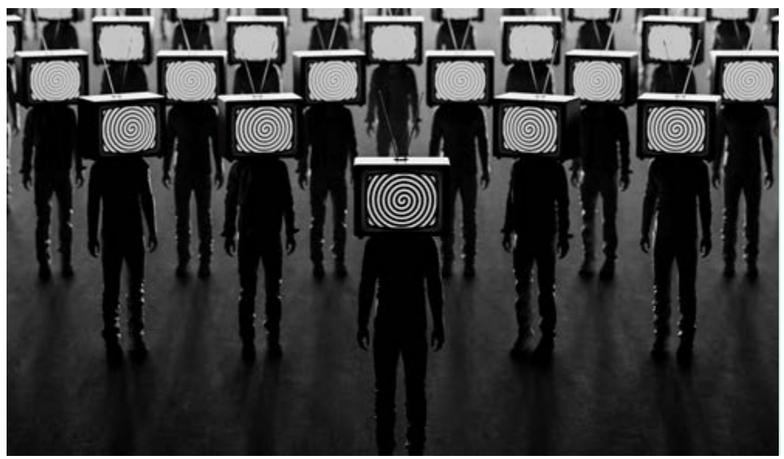
Tools like GPT Tutor demonstrate a possible path forward—to leverage the convenience of AI while safeguarding instructional integrity.

Prospective research

Media Coverage and Insomnia: Exposure to War

Fekih-Romdhane, F., Helmy, M., Alhuwailah, A., Shuwiekh, H. A. M., Naser, A. Y., Maalej, E., ... & Hallit, S. (2024). Mediating effect of depression and acute stress between exposure to Israel-Gaza war media coverage and insomnia: a multinational study from five Arab countries. BMC public health, 24(1), 1498

The study assesses the influence of war media coverage on insomnia, with a specific focus on the mediating roles of depression and perceived stress. Two weeks following the outbreak of the October 2023 Israel-Gaza war, 2,635 Egyptian, Jordanian, Kuwaiti, Omani, and Tunisian adults participated in this cross-sectional study. Participants completed an online questionnaire measuring exposure to war media, depressive and stress levels, and insomnia severity.



The results indicate that indirect experience through mass and social media strongly relates to mental disorders. In particular, exposure to war in the media was associated with elevated symptoms of depression and stress, which were in turn linked with greater insomnia. Yet, the direct link between media exposure and insomnia was not statistically significant, indicating that psychological factors completely mediate this relationship. The study relies on earlier research that has demonstrated that both direct and indirect exposure to trauma can disrupt sleep. Previous studies have shown comparable results following natural disasters and terrorist attacks, but the present study extends this information to a non-Western Arab population. The authors argue that exposure to horrific and disturbing media content can instill emotional and cognitive arousal, disrupting both falling asleep and maintaining sleep. Moreover, depression and acute stress, typically compounded by such exposure, are established predictors of insomnia. The most significant strength of the study is its use of a newly redeveloped scale to assess war-related media exposure in terms of hours per day, which is more precise than previous studies based on subjective or imprecise estimations. The report highlights the necessity of considering the psychological effects of media consumption during conflict, particularly in regions like the Middle East and North Africa, where mental health threats are already exacerbated by ongoing instability. The study also suggests that the media's impact can cross geographic boundaries, affecting audiences far removed from the conflict location.

Mediation analysis showed that both depression and stress were significant and full mediators of the association between media exposure and insomnia, and that "focused interventions are needed." The authors suggest screening for and treating symptoms of depression and stress in those with high levels of media exposure as a potential avenue to alleviate insomnia. The authors assert the need for public awareness of the potential perils of war-related media coverage and advocate for a pre-view warning before such content is broadcast.

While the study is constrained by its cross-sectional design, self-report measures, and non-random sampling, it provides significant early evidence of how psychological processes mediate the connection between war media exposure and sleep disturbance. The findings have important public health implications and suggest that mental health professionals and policymakers ought to monitor and regulate the psychological effects of war media coverage, especially during times of heightened conflict. More longitudinal and cross-cultural studies should be conducted to confirm these results and determine more effective prevention and intervention approaches.

Depression and acute stress, compounded by exposure to horrific and disturbing media content, are established predictors of insomnia.

Mediation analysis showed that both depression and stress were significant and full mediators of the association between media exposure and insomnia, and that "focused interventions are needed."

Prospective research

The Normative Constraints of Project-Based Research

Obadia, L. (2024). "Programmation, pilotage, politique, prospective… Les contraintes normatives de la « recherche sur projet » en SHS (France-Europe)." Communications 114(1), 161- 172.

Lionel Obadia's article examines the political and economic constraints placed on the funding of project-based research in the social sciences and humanities (SSH) in France and Europe. It is a critical survey of how the shift towards competitive funding, made operational by national and European agencies, has rebalanced the research landscape. Since the early 2000s, the traditional model of public support has given way to a system that requires researchers to continually compete for funds by answering calls for proposals.

While intended to serve excellence and creativity, this system generates excessive administrative burdens, promotes hyper-individualism, and can undermine long-term scholarly autonomy and researcher solidarity. In France, the creation of agencies such as the Agence nationale de la recherche (ANR) marked the institutionalization of this model, in line with concurrent European trends. The state's transition from an enabler to a controller of research is evident in performance measurement and audit cultures that quantify scientific output in economic terms. Although this approach promises greater thematic concentration, it generally limits thematic focus and marginalizes non-explicitly related disciplines, such as most SSH fields.

The article reveals a paradox: despite an increase in the number of SSH-specific funding instruments, they are often symbolic or offer uneven benefits. Thierry Mandon's 2016 "Plan for the SSH," for instance, included several supportive measures, but only those taken by the ANR had tangible effects. Despite this, SSH projects remain underrepresented in terms of their demographic and institutional impact within the academic paradigm. Obadia also considers the European context, including the evolution of research programs like Horizon 2020 and Horizon Europe. While early frameworks reserved specific spaces for SSH, later ones sacrificed their autonomy by embedding them in broader interdisciplinary themes. This transformation, with gradual increases in budget share, has made SSH research harder to identify and have an impact. There is now a twofold organization: one where SSH is recognized through targeted labels, and the other where it comes under more general societal concerns, articulated in techno-economic terms.

Despite recent evidence of transformations, such as the expansion of ANR's SSH funding axes and their increasing inclusion in large-scale research projects, the boundaries are still vast. The author warns that these advances may obscure deeper structural issues, as SSH remains vulnerable to top-down programming that inhibits imagination and promotes reliance on uncertain political agendas. Finally, while acknowledging some beneficial tendencies, the paper asserts that SSH is still far from being recognized, gaining independence, or being seriously embedded in national and European research environments shaped by economic rationale and managerial governance.

The shift towards competitive funding, implemented by national and European agencies, has rebalanced the research landscape.

Deeper structural issues as SSH remains vulnerable to top-down programming, inhibiting imagination and promoting reliance on uncertain political agendas.

Prospective research

Living-lab in Architecture, Urbanism and Landscape Research

Fleury, F., & Nguyen, T. H. (2024, June). «Xoay», laboratoire vivant de prospective en architecture, urbanisme et paysage. In Formation, recherche et pratiques francophones en architecture, aménagement et paysage en Asie du sud-est: innovation et entrepreneuriat.

This article mentions the potential construction of a Franco-Vietnamese "living laboratory" targeting architectural, urban, and landscape research. Through an intercultural approach, the project is meant to innovate and encourage imagination, extend epistemological debate, and enlarge methodological variety through cooperative research. The authors determine that cultural dissonance, such as that which Western researchers encounter upon their arrival in Vietnamese realities, provokes intellectual appetite and opens horizons.

Such intercultural tension, supported by precedent literature, is regarded as a key driver of creativity and innovation, particularly in topics still in the process of defining scientific foundations, as in architecture.

The proposed lab serves as a fertile ground for hybrid research and transdisciplinary collaboration, where scholars would have an opportunity to cross-reference methodologies, test fielded solutions in practice, and engage in co-productive practices. The lab bridges knowledge gaps between academic research and the real world, supplementing the limitations of conventional architecture studies. The authors are calling for research based on reality and with the potential to generate generalizable knowledge. They are advocating for methodologies like action research, in-situ experimentation, and project-based inquiry, all of which necessitate direct engagement with rich, dynamic, and real-world settings.

The Franco-Vietnamese living lab would revolve around eco-design, which is seen as central to addressing the urgent socio-ecological transitions the world is confronting. The aim is to study and put in place adaptive responses that minimize environmental footprints and enhance social justice. Three research issues of greatest priority include: construction materials and recycling facilities, mechanisms to mitigate urban heat islands, and water management across scales.

To illustrate how the living lab is able to work, two samples of ongoing projects are presented. The first analyzes the informal system of waste collecting in Hanoi. From it, the connection between waste pickers, or "đồng nát," and the institutional system of garbage collecting is observed, including recycling chain contribution. It highlights territorial waste movement logic, stakeholder relationships, and socio-environmental impacts.

The second case study, "Archi-Adapt," focuses on thermal comfort of city housing during heatwaves. The project presents three methodology choices: finding urban heat islands by mapping, sorting buildings in terms of vulnerability type, and applying in-situ measurements of user perception and indoor climate. It aims to co-create responsive solutions with citizens, architects, and government officials.

Overall, the article argues that a Franco-Vietnamese living lab would offer an engaged paradigm to generate relevant knowledge, foster intercultural collaboration, and create more sustainable and just urban environments. By linking research to on-the-ground realities without ignoring universal challenges, such a lab can become a powerful tool of socio-ecological transformation.

The cultural dissonance which Western researchers encounter in their arrival at Vietnamese realities provokes intellectual appetite and opens horizons.

A living lab would offer an engaged paradigm to generate relevant knowledge, foster intercultural collaboration, and create more sustainable urban environments.

Prospective research

Anticipation and Strategic Deployment of Organizations Facing the Future

Dartiguepeyrou, C., & Saloff-Coste, M. (2024). La prospective en action: Anticipations et déploiements stratégiques des organisations face au futur (Vol. 17). ISTE Group.

"La prospective en action: Anticipations et déploiements stratégiques des organisations face au futur", examines how organizations use strategic foresight to anticipate future challenges, seize opportunity, and define their transformation. The book collates different case studies to show how anticipation is applied within industries—ranging from firms and universities to public institutions and municipalities—emphasizing that foresight is not just prediction but action, collaboration, and innovation.

The book demonstrates that foresight is sensing weak signals, imagining possible futures, and mobilizing collective intelligence to make informed choices in the here and now. The first part introduces theoretical and practical approaches and tools used by futurists. It illustrates how systematic foresight tools help businesses develop resilience and manage uncertainty, using examples from industries like tourism and journalism. One chapter is dedicated to the impact of generative AI on businesses, highlighting its disruptive power and the need for reimagining professional habits in the context of new technologies. The book also looks at the development of foresight globally, particularly in countries like China, and offers a comparative view of the adoption of anticipatory strategies.

The second part goes on to discuss how organizations and public institutions use foresight to guide strategic transformation. Through rich examples from institutions such as Michelin and Bouygues Construction, the book describes how foresight is embedded in innovation processes and decision-making. It illustrates how anticipation is not only used to forecast trends but to reimagine organizational mission and identity.

At the academic level, foresight is becoming an institutional development instrument strategically. Universities such as the Université Catholique de Lille and the University of Strasbourg are cited as examples of how higher education institutions are using foresight to create long-term strategies, enhance collaboration, and promote innovation in teaching and research.

The final part of the book deals with territorial governance and territorial foresight. It highlights that local authorities such as the Greater Lyon and Isère departments utilize foresight to facilitate policy alignment towards longer-term visions like sustainability, inclusion, and climate adaptability. It takes the Rev3 initiative for the Hauts-de-France region as a case study to introduce foresight into public action through collaborative partnerships with institutions, enterprises, and people.

Overall, La prospective en action makes a solid case for foresight to be integrated into every level of organization. Where vision and action are mixed together and uncertainty is embraced, foresight acts as a means to involve diverse stakeholders, facilitate flexibility, and initiate transformative change. With theory, observation of the real world, and examples across sectors, the book gives useful guidance for leaders, researchers, and public servants who are bent on overcoming the challenges of the future.

Foresight is sensing weak signals, imagining possible futures, and mobilizing collective intelligence to make informed choices in the here and now.

Where vision and action are mixed together and uncertainty is embraced, foresight acts as a means to involve diverse stakeholders, facilitate flexibility, and initiate transformative change.

2 Applied research

Healthcare in Canada's Francophone Minority Context

Bouchard, L., Savard, J., & Dumond, M. (2024). La santé en contexte francophone minoritaire au Canada: 20 ans de recherche: introduction. Minorités linguistiques et société, (22).

This paper provides an overview of twenty years of health research in Canadian Francophone minority communities (CFSM). It traces the evolution of this research, referencing the support of federal agencies such as Health Canada and the Consortium national de formation en santé (CNFS), which facilitated the creation of academic research centers across the country. These projects were also supplemented by funding from the Canadian Institutes of Health Research (CIHR) and led to the development of networks, research teams, and dedicated chairs in health services and access for Francophones in minority contexts.

One of the issues in this literature concerns how linguistic minority status affects access to healthcare. Three assumptions about research emerge: belonging to a CFSM affects determinants of health; linguistic concordance between practitioners and clients is central to quality of care; and fear that one will not be able to receive services in one's own language could discourage timely care-seeking.

The thematic section summarizes research in five domains: language and health policies, determinants of health, service delivery, human resources, and professional education and user experience. Some papers document progress in these areas. For instance, studies show how health law is often not implemented in practice, particularly where providers have no awareness or institutional support.

Access to services remains problematic, especially in mental health and for seniors. Research shows that Francophone seniors often have inadequate home care and lack access to bilingual health professionals. In more remote areas of Western and Northern Canada, people with neurocognitive disorders face considerable barriers due to the limited availability of services in French and a shortage of adapted materials.

New methods and tools have been created to address these deficiencies, such as databases of the mapping of service availability, studies on virtual care technologies, and models of estimating potential access to French-speaking physicians. Such tools enable the targeting of underserved areas and propose targeted interventions. However, systemic barriers like a paucity of quality data on languages spoken in the delivery of care and the inability to undertake large-scale research on small populations persist as obstacles.

The other priority has been preparing for the future health and social service workforce. Since 2008, there have been efforts to integrate the concept of active offer into training, develop evaluation tools, and better equip trainers.

The paper concludes by proposing some avenues for further research. There is a need to study more geographically diverse CFSMs, strengthen national health databases with language variables, and secure long-term funding for research beyond pilot projects. The authors suggest creating an observatory on Francophone minority health to guide efforts, synthesize research, and inform better health planning and policy. Through continued investment and collaboration, research can more effectively address equity in access to health and health status for Francophone minority communities in Canada.

Linguistic minority status affects access to care and health status for Canadian francophone communities.

Through continued investment and collaboration, research can more effectively address equity in access to health and health status.

Applied research

Sino-Russian Security and Military Ties

Facon, I. (2024). La coopération militaire et de sécurité sino-russe. In Annuaire français de relations internationales (pp. 435448-). Éditions Panthéon-Assas.

The article by Isabelle Facon examines the evolution and strategic implications of Sino-Russian security and military ties. Since the 2014 annexation of Crimea, Russia-China relations within the sphere of security have intensified, yet without culminating in a treaty of alliance. The relationships are driven by a shared vision of a disturbing Western order, specifically embodied by the U.S. and NATO. Military exercises, joint patrols, and more intricate coordination between the two nations are aimed at extending a stabilizing presence in the Asia-Pacific region and beyond and sending clear signals to Western powers.

The cooperation has spilled over into combined naval and air training, some well beyond their shores, such as the Mediterranean and off Alaska, that indicate reciprocal strategic support. These exercises are typically framed as defensive but clearly exist to demonstrate their growing military capacity and interoperability. While actual interoperability—like permanent headquarters and weapons that can work together—remains in its youth, both sides have made considerable strides in uniting forces, sharing tactics, and harmonizing strategic plans. Russia brings extensive operational experience, and China brings expanding technological range and industrial scale. As regards arms sales, the balance has been altered.

In the 1990s, China relied heavily on Russian weapons to mechanize the military. This was slowed by issues of intellectual property right infringement and China's reverse-engineering capabilities. With the 2014 sanctions imposed on Russia, arms sales between the countries increased again, with huge contracts for advanced systems like the Su-35 fighter jet and S-400 anti-aircraft systems. Yet, Russia remains cautious about selling its most strategic technologies, especially considering China becoming an increasingly capable and competitive defense industry manufacturer.

Collaboration has also escalated in R&D, particularly in areas including AI, aerospace, and missile defense. China desires Russian technology in missile systems and nuclear deterrence while Russia desires to benefit from Chinese commercial and dual-use technologies as Western sanctions constrict its ability to access principal components.

Both share the objective of enhancing strategic deterrence and resilience against assumed U.S. hegemony. Strategically, both nations oppose what they see as U.S. attempts to gain ultimate military supremacy, especially in missile defense and militarization of space. Missile launch notification, nuclear postures, and early warning system arrangements show a high level of mutual confidence.

At bottom, the Sino-Russian defense alliance has not been entirely lacking in asymmetry or strategic ambivalence but has become a healthy and politically valuable one in fact if not name. On impetus from their common disdain for U.S. power and both nations' enthusiasm to determine a multipolar international order, increasingly the two states have come into alignment over their defense planning. Not a defense alliance formally speaking, yet in trend an indicative deeper merging of interests, certainly if interregional tensions show no letdown.

Since the 2014 annexation of Crimea, the Russia-China security relations have intensified, yet without culminating in a treaty of alliance.

China desires Russian technology in missile systems and nuclear deterrence while Russia desires to benefit from Chinese commercial and dual-use technologies.

Applied research

The Interdependence of Climate, Finance, Energy, and Geopolitics

Hoffart, F. M., D'Orazio, P., Holz, F., & Kemfert, C. (2024). Exploring the interdependence of climate, finance, energy, and geopolitics: A conceptual framework for systemic risks amidst multiple crises. Applied Energy, 361, 122885.

This paper presents case studies considering interlinked, multifaceted risks that arise when experiencing simultaneous crises in energy, finance, and the climate system in a global scenario. It offers a conceptual framework for researching and investigating relationships connecting climate change to financial instability and geopolitical crises that cause or facilitate energy transitions, thus addressing different issues facing world systems. The authors argue that traditional approaches only deal with these issues in isolation, failing to capture how short-horizon emergency responses, like those to geopolitical shocks such as the war in Ukraine, can erode long-term climate targets and strain financial systems.

The new approach helps identify ways in which policy in one area can have cross-area interlinkages, which can either encourage or hinder the accomplishment of a world with zero emissions.

Applying this perspective to analyze Germany's response to the 2022 energy crisis, the research focuses on two core policy reactions: the establishment of liquefied natural gas (LNG) terminals as a fossil-fuel-based energy security measure and the adoption of weak, "soft" climate-related fiscal policies. The authors demonstrate that investment in LNG infrastructure contradicts Germany's long-term climate goals and could result in a "fossil lock-in," with future energy systems continuing to depend on carbon-based fuel sources. Such terminals, especially the fixed onshore ones, might become stranded assets, posing risks to public and private investments and hindering the shift towards renewable energy.

Simultaneously, the authors find that German financial regulation has not properly addressed climate risks, leaving the banking sector vulnerable to asset devaluation from emissions-intensive sectors. Financial institutions face transition risks from their investment portfolios, but macroprudential policies remain poorly equipped to address these issues. The disconnection between climate goals and financial regulation further increases systemic exposures. The study outlines four critical transmission channels that illustrate how geopolitical and climate crises drive financial as much as energy systems. These include the direct effect of climate dangers on the fiscal sector, energy transition risk due to geopolitical shocks, the feed mechanism of financial instability in the case of green deficit investment, and the wider economic ramifications when they collide. The German experience indicates that short-term energy security measures, such as the expansion of LNG imports, can potentially divert funds and attention away from renewable energy infrastructure.

Ultimately, the paper warns that crisis-response policies decoupled from climate objectives are unlikely to sustain financial stability or accelerate the energy transition. Instead, the authors propose integrating climate risks into financial decision-making, avoiding fossil infrastructure lock-ins, and balancing short-term emergency responses with long-term climate commitments. They argue that coherent, cross-sectoral policy is required to guide systemic risks and enable a just and sustainable transition. The proposed framework should be employed by policymakers as a tool to compare policy options from a holistic perspective, consider the spillover effects of interest.

Short-term energy security measures may divert funds from renewable energy infrastructure, reduce green finance availability, and delay decarbonization in hard-to-abate sectors such.

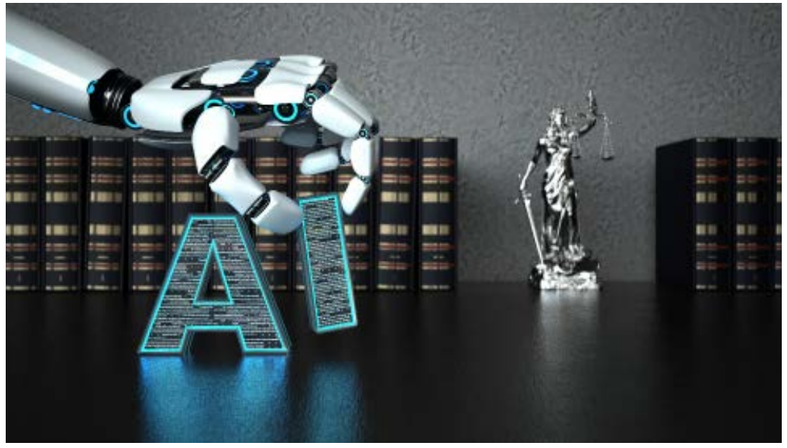
Coherent, cross-sectoral policy can guide systemic risks and enable a just and sustainable transition.

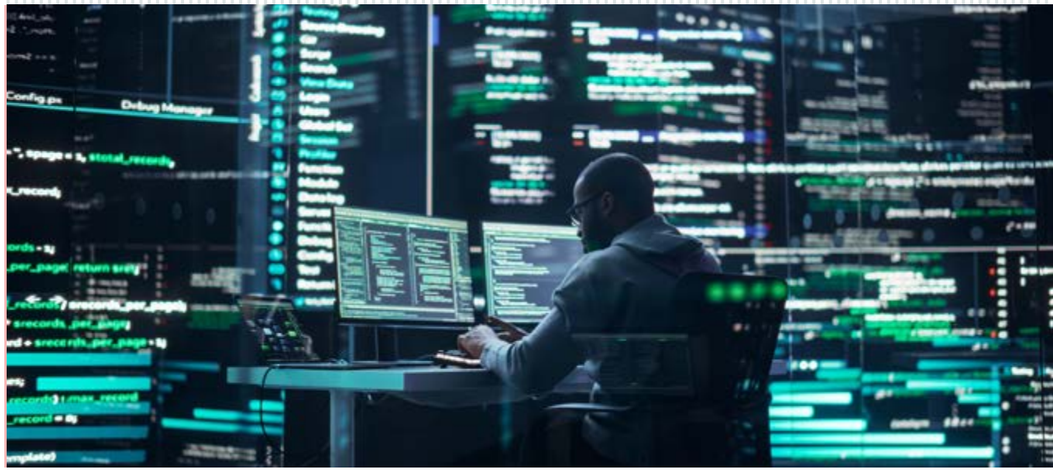
Applied research

Explainable AI for Operational Research

De Bock, K. W., Coussement, K., De Caigny, A., Słowiński, R., Baesens, B., Boute, R. N., ... & Weber, R. (2024). Explainable AI for operational research: A defining framework, methods, applications, and a research agenda. European Journal of Operational Research, 317(2), 249272-.

This paper presents a comprehensive framework for understanding how explainable artificial intelligence (XAI) can be utilized in operational research (OR). As data-driven decision-making is increasingly practiced, the ability to explain and interpret AI models is becoming increasingly important to build trust and ensure accountability as well as effective implementation. The authors of XAIOR have described it as an intersection of three main dimensions: performance analytics, which ensures model accuracy; attributable analytics, which identifies reasons for a model's predictions; and responsible analytics, which speaks to ethical, transparent, and equitable use of AI systems.





They note that while most OR models prefer performance, increasingly stakeholders need greater transparency over decision-making and how results are obtained. The paper describes how these dimensions cut across the entire analytics pipeline, from data collection and preparation through model selection, post-hoc explanation, and evaluation. It also discusses a few technical methods, such as sensitivity analysis, feature importance, counterfactual explanations, and explainable models like decision trees and additive neural networks.

The paper also discusses some domains of XAIOR application in different areas of OR, such as forecasting, supply chain management, inventory control, and risk analysis. Each of these areas does have some challenges about interpretability and accountability. For instance, in forecasting, the ability to know the cause of a forecast can help an organization better prepare for future demand. In risk management, the ability to know the reason behind a high-risk assessment is crucial for regulatory response and strategic adjustment. The authors note, however, that while performance analytics is relatively mature for the majority of OR applications, there is very much a lag in the development and application of attributable and responsible analytics that is hampering the broader ramifications of XAI in practice.

Five major themes to enable prospective research and application are listed by the paper. Among them are spearheading data innovation to produce more superior quality inputs and interpretability, developing interpretable methods for deep models, integrating all three dimensions of XAIOR in one comprehensive framework, addressing novel societal needs such as fairness and reduction of biases, and entering novel domains of deployment where explainability is instrumental. The authors suggest that this agenda can help researchers and practitioners to build AI systems that are not just resilient, but also understandable and ethically accountable.

Overall, the research argues that as operational research is increasingly engaged with AI and machine learning, it must evolve to meet an increasing demand for transparency and accountability. Explainability must be designed into the process, rather than added on subsequently. By framing XAIOR as a trade between performance, attribution, and responsibility, the paper presents a structured approach to the design of effective and reliable decision support systems. The model can potentially improve decision-making in contexts of complexity without undermining the alignment of AI system outputs with human values and social requirements.

The ability to explain and interpret AI models is becoming increasingly important to build trust and ensure accountability as well as effective implementation.

As operational research is increasingly engaged with AI and machine learning, it must evolve to meet an increasing demand for transparency and accountability.

Applied research

The Impact of Realism on US Foreign Policy during the Trump Presidency

Taim, A. (2024). The Impact of Realism on US Foreign Policy during the Trump Presidency. Presidency, 4, 2.

This article by Adam Taim explains Donald Trump's foreign policy from 2017 to 2021 through the lens of the realist theory of international relations. It examines if Trump adhered to classical realism or developed his own distinct variant, which the author refers to as "Trumpian unique realism." Trump's foreign policy was a significant departure from that of his predecessors on the basis of its national interest centrality, skepticism of multilateral institutions, and favoring of transactional diplomacy.

Although grounded in realist fundamentals like power politics and state centrality, Trump's approach was shaped by his unconventional political style, which often included unilateral action and abrupt policy flip-flops.

The article draws the connection between Trump's "America First" philosophy and classical realist thinkers like Hans Morgenthau and Kenneth Waltz, and how Trump's emphasis on sovereignty, military strength, and economic advantage constituted a realist agenda. Nevertheless, it also states that his policies regularly diverged from the traditional practice of realism, namely in undermining long-term alliances, eschewing institutional cooperation, and favoring short-term political gains. Trump's withdrawal from major international agreements such as the Paris Climate Accord and the Iran nuclear deal was a characteristic of his divergence from multilateralism. While these actions were described as an effort to reassert U.S. power and independence, they also strained relations with allies and hurt America's credibility around the globe.

The article discusses specific elements of Trump's foreign policy, including his trade wars, most prominently with China, his "maximum pressure" campaign against Iran, and his diplomacy with North Korea. Each is given as an illustration of Trump's application of realist principles in his own unique manner. For example, Trump's tariffs and renegotiation of trade deals were in accordance with realism's emphasis on national interest and relative gains. However, retaliatory measures by trade partners and instability in the global supply chain illustrated the cost of such a strategy. His national security strategy, based on coercive action and economic pressure, particularly on North Korea and Iran, highlighted his belief in hard power, but more often than not failed to produce desired outcomes, and instead contributed to instability.

Trump's personal style, including his use of social media to conduct diplomacy, also had a profound impact on his foreign policy. Although this unorthodox approach sometimes produced symbolic gains, it more frequently resulted in diplomatic faux pas and confronted traditional global norms. His skepticism of international institutions and scorn for collaborative global governance were realist stances, but his disdain for diplomacy and inconsistency in policy application made his realism typically erratic and disruptive.

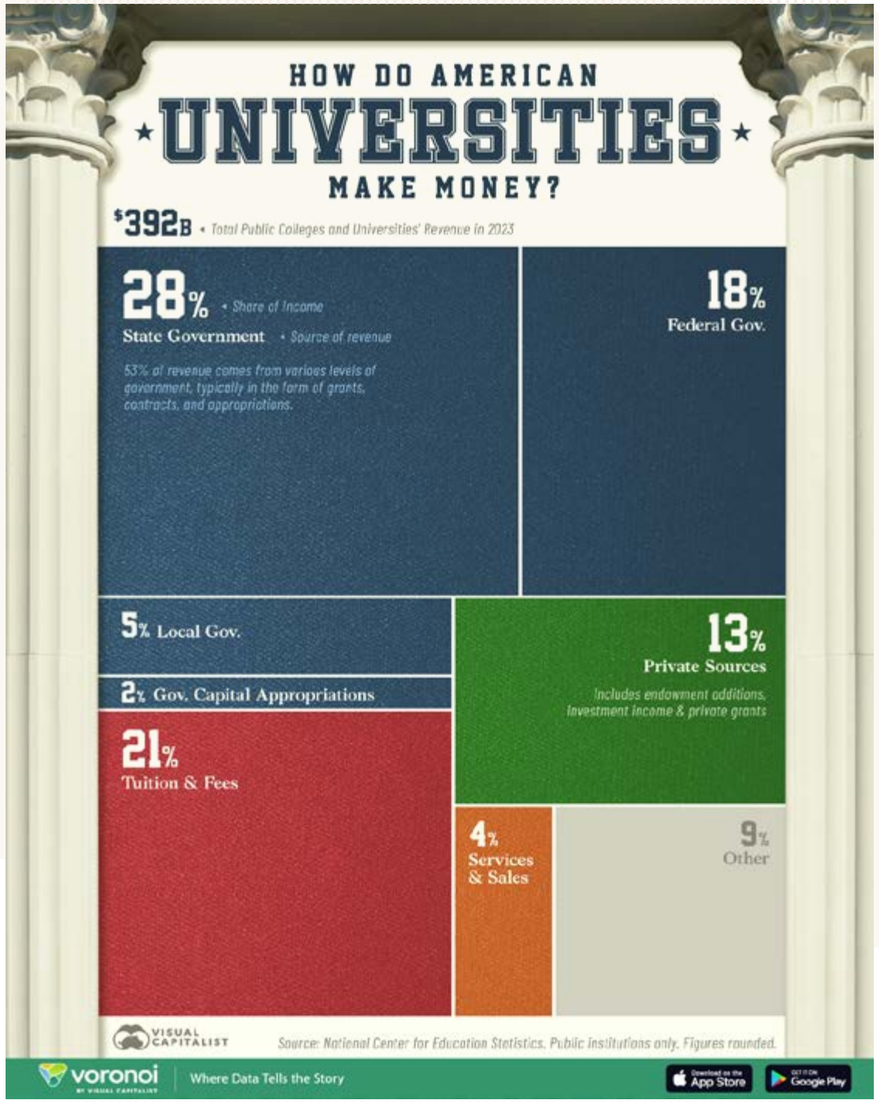
Those who support Trump's foreign policy argue that it reasserted a commitment to U.S. sovereignty and realism in international affairs. Critics, however, contend that it eroded alliances, emboldened competitors, and contributed to global instability. The author contends that future leaders must blend realism with moral leadership and multilateral cooperation to address the complexities of international politics more effectively.

Trump's withdrawal from major international agreements is a characteristic of his divergence from multilateralism.

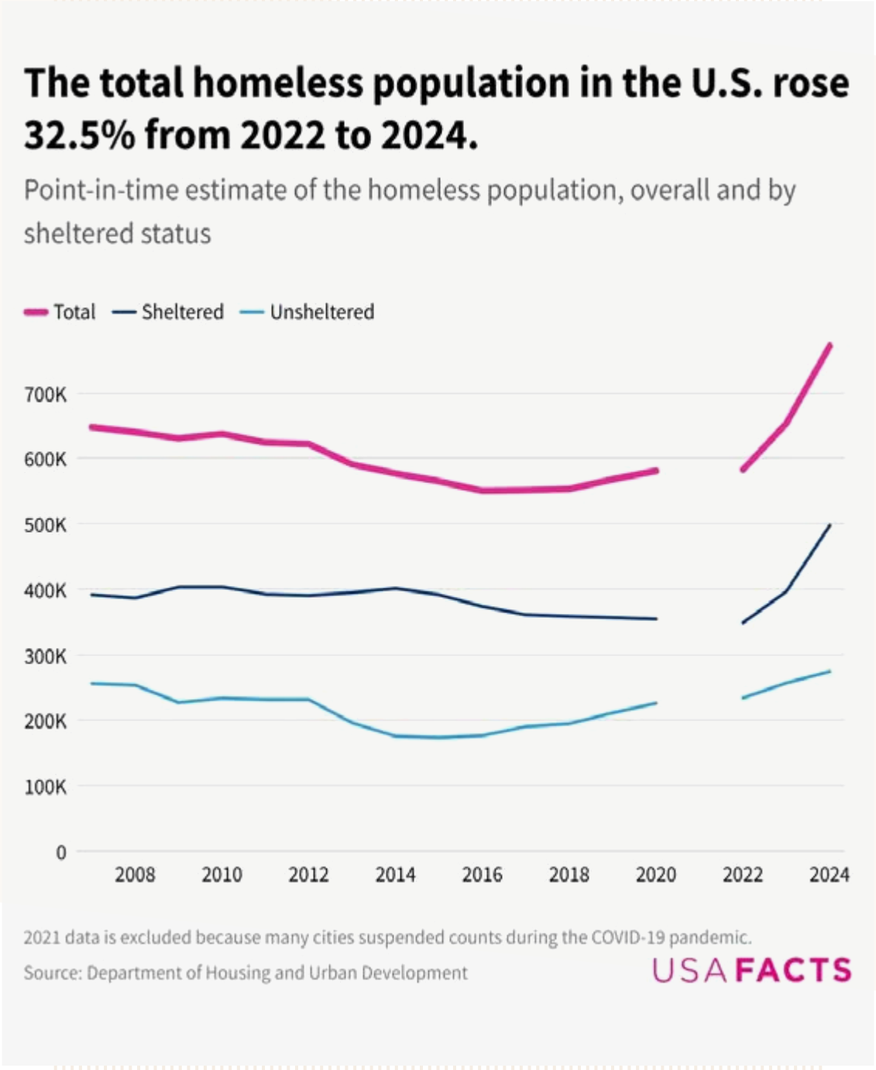
Future leaders must blend realism with moral leadership and multilateral cooperation to address the complexities of international politics more effectively.

3 The future in numbers

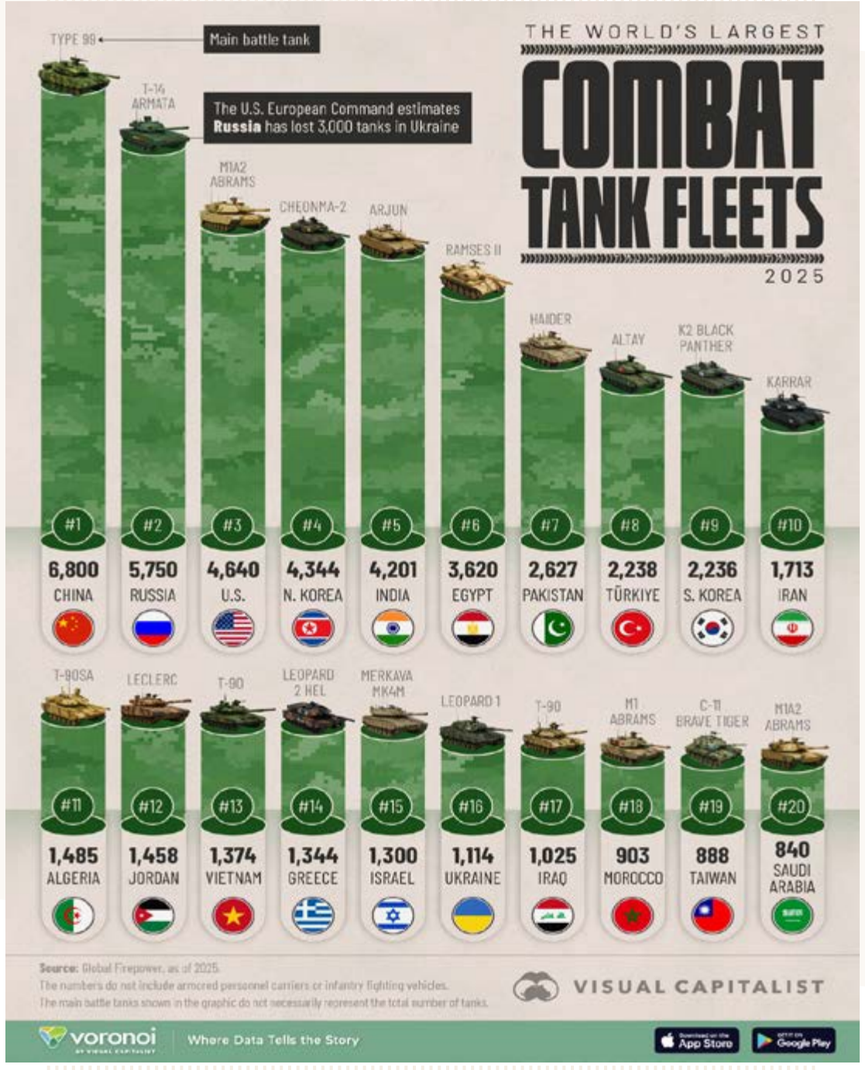
How Do U.S. Universities Make Their Money?



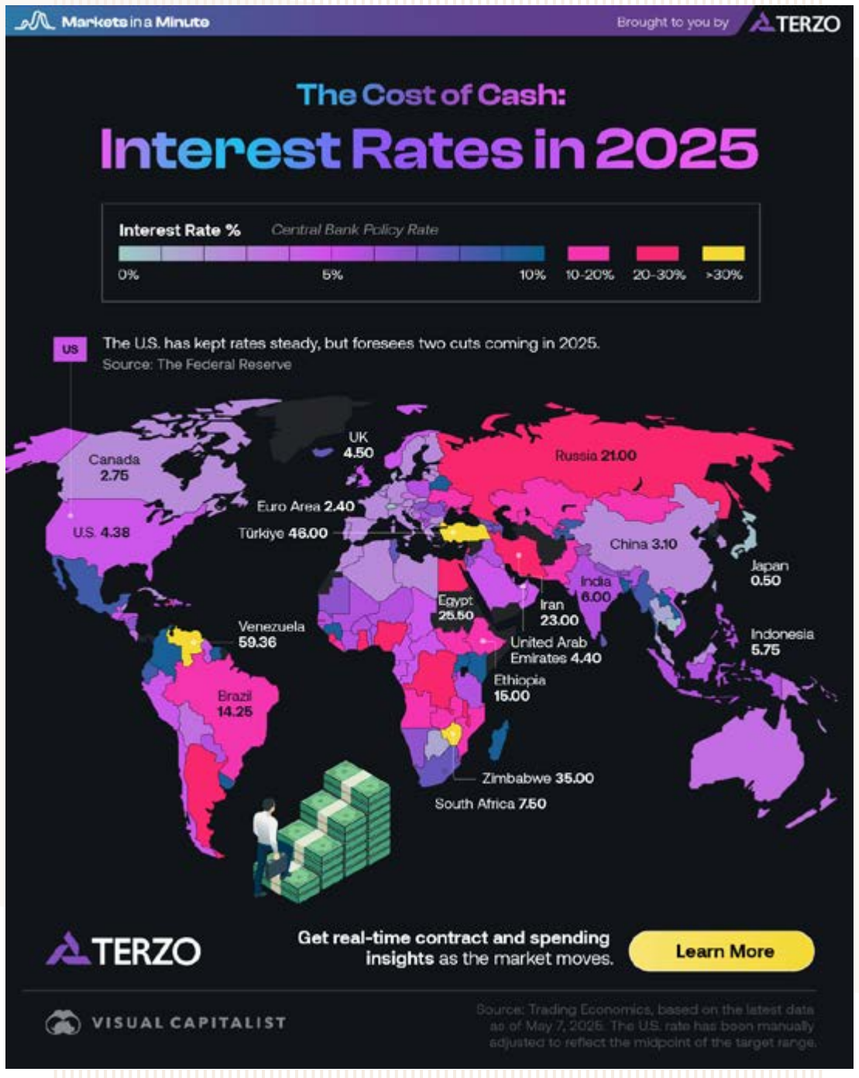
How many homeless people are in the US?



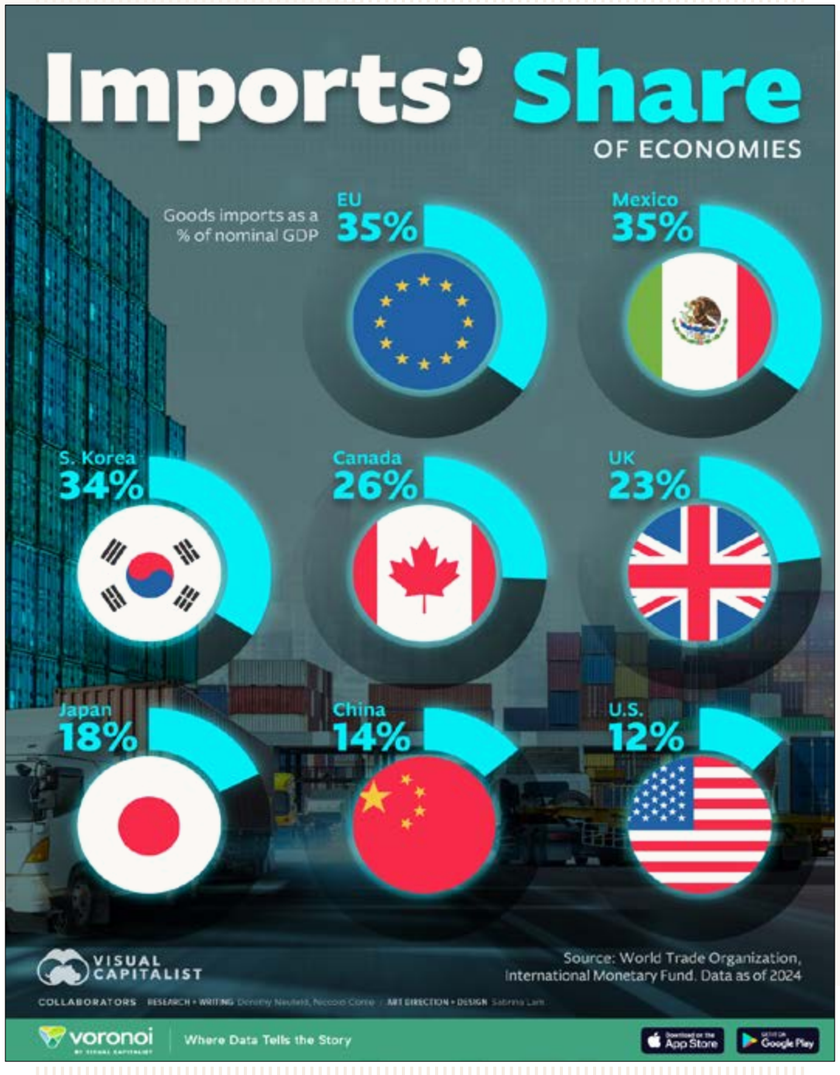
The World's Largest Combat Tank Fleets in 2025



Interest Rates by Country in 2025



The Import Dependency of Major Economies



11

Issue No. 11

(June 2025)

FUTURE TRENDS
Report
Issue no. 11 - June 2025

Future Trends Report

Future Trends Report, published in English and Arabic by TRENDS Virtual Office in Montreal, stands out as a distinctive publication dedicated to highlighting:
1. the most important forward-looking studies that aim to identify future trends, analyze various variables that may influence these trends, and determine the best future scenarios.
2. the most important applied studies that explore the application of knowledge, scientific theories, and information to solve current problems and overcome future challenges.
3. the most important illustrative and graphic forms that visually summarize significant studies, helping readers understand the trends and challenges of the future world.

Contents

1 Prospective research

AI and International Relations

Bode, I. (2024). AI Technologies and International Relations: Do We Need New Analytical Frameworks? The RUSI Journal, 169(5), 66–74. https://doi.org/10.1080/03071847.2024.2392394/

Scholarship on AI technologies in international relations (IR) has evolved significantly since the early 2000s, initially focusing on military applications such as autonomous weapon systems. However, the scope has since expanded with increasing prominence of AI technologies, particularly in the wake of the release of generative models such as ChatGPT in 2022.

Initial work was mostly geared towards the effect of AI on war, but now researchers investigate more general applications, including data screening, decision-assistance systems, and predictive analytics in both military and civilian settings. Ingvild Bode's article addresses how IR paradigms have developed to account for the advent of AI, categorizing available research into four broad categories: balance of power, governance, disinformation, and ethics.

As far as the balance of power, AI is seen as the key component of great power competition between China and the U.S. Scholars debate whether AI really alters military capabilities enough to disrupt existing balances of power or whether its effect is hyped. Much of this literature borrows from established approaches like structural realism and is predisposed to treat technology as either a neutral tool or as a driver with its own dynamic of advancement. Within the EU-Korea, GovTech, and GovCon themes, the focus is on the global array of AI governance efforts, from the EU AI Act to the African Union AI strategy. While these efforts reflect EU-Korea international norms and the urgency for AI governance, they are primarily creating soft law documents with ambiguous principles, leading to wide gaps in substantive international regulation.

The theme of disinformation emphasizes the way AI amplifies the scope of disinformation campaigns, particularly those of state actors like Russia and China. Experts cite fears that deep fakes and AI-driven misinformation will erode public confidence and destabilize democracies. Ethical controversies, the fourth general theme, address more general questions of accountability, human dignity, and agency in the use of AI, particularly in military settings. They are likely to be drawn upon by a wide range of disciplines beyond IR, including philosophy and applied ethics.

Then, Bode identifies three new lines of research. First, scholars advocate a reconceptualization of technology, viewing AI not merely as an outside influence but as deeply entrenched in political and social institutions, a perspective taken from science and technology studies. Second, there is growing disapproval of framing AI development in terms of an unavoidable arms race, suggesting this perception unnecessarily heightens tensions among states and overlooks opportunities for cooperation. Third, attention is increasingly given to actors beyond the great powers.

Overall, although much AI-related IR research continues to leverage familiar concepts, new approaches are compelling the field to reconsider technology's relationship with global power and propose that AI may be an agent of significant disciplinary transformation.

BIG DATA

AI may be an agent of significant disciplinary transformation.

IOT

The evolving scholarship on AI technologies in IR are categorized into four main themes: Balance of Power, Governance, Disinformation, and Ethics.

Prospective research

AI, Global Governance and Digital Sovereignty

Srivastava, S., & Bullock, J. (2024). AI, Global Governance, and Digital Sovereignty. arXiv preprint arXiv:2410.17481.

Artificial intelligence is increasingly dominating world governance, with AI technologies as powerful tools of states and corporations to wield power and assert digital sovereignty. States see AI as an instrument for driving national capabilities and competitiveness, but they remain reliant upon global technological foundations.

At the same time, prominent technology companies such as Alphabet, Meta, and Amazon have become powerful global players by dominating AI development. Rather than replacing states, these companies are involved in a complex dynamic of cooperation and competition with public authorities and undermine traditional concepts of sovereignty.

Authors suggest a typology of the manner in which AI systems amplify instrumental, structural, and discursive power in contexts including violence, markets, and rights. Governments use AI to develop autonomous weapons, enhance surveillance, and tailor propaganda, effectively deepening their grip. Similarly, corporations use AI to advance market control, maximize business, and reshape social norms about privacy and labor. Simultaneously, new AI agents will increasingly act independently, risking decreased human control and accountability in government.

The article argues that AI incorporation into international governance does not erode sovereignty but reshapes it. Institutionally, states are reclaiming power through the regulation of AI and asserting control over digital infrastructures, like Europe's push for regulation and China's techno-nationalism. But from a practice perspective, sovereignty is exercised through coordination between public and private actors, in which governments are dependent on corporate networks for digital innovation and services. Public-private hybrids thus become central to maintaining sovereign capacities, even as traditional claims to monopoly state sovereignty persist.

The authors also point out the risks of AI systems operating independently of human control, jeopardizing both public and private governance structures. As AI technologies become more embedded in decision-making, they may fundamentally alter the exercise of political authority and the balance of global power. Future international relations research should explore how states and corporations manage AI's disruptive potential, how global inequalities may be reinforced or challenged, and how AI agency could redefine governance itself.

Governments use AI to develop autonomous weapons, enhance surveillance, and tailor propaganda.

Prospective research

From Crisis to Foresight: Towards a Long-Term Foreign Policy

Guiffard, J. (2024), De la crise à la prospective : pour une politique étrangère de temps long Institut Montaigne

In this article, Guiffard advocates for a complete shift in France's foreign policy paradigm. He suggests that the crisis-centered mindset that characterizes the present method is no longer adequate to respond to the complexities of the current global order. For Guiffard, the repeated use of the word "crisis" has the effect of hiding the underlying, long-term structural forces shaping world events.

For example, he points out that presenting the Syrian conflict as a crisis wipes out its long historical precedents — from the Arab Spring and the American invasion of Iraq to the much earlier collapse of the Ottoman Empire. This habit of reacting to short-term events without concern for historical and geopolitical context, he warns, leaves France ill-equipped to handle an increasingly fluid world. To escape this reactive cycle, France must adopt a prospective approach — one that's not predictive, but anticipatory and prepared. Prospective thinking requires the capacity to recognize trends, imagine credible futures, and analyze possible policy responses. Guiffard references the Anglo-Saxon world as cases of states that have organized foresight tools to support strategic decision-making. He points out that "anticipating doesn't mean predicting," but setting oneself up to face a diversity of possible futures by probing weak signals and structural trends.

Guiffard advocates the strengthening of France's institutional basis for strategic thinking, e.g., strengthening the position of the Secrétariat général de la défense et de la sécurité nationale (SGDSN) and establishing more inter-agency coordination. He adds that in France, governments too often act separately from each other, with little cross-sectoral discussion, diminishing the capacity to construct cohesive long-term approaches.

He emphasizes that foreign policy in the present era demands a transversal approach, integrating diplomatic, economic, military, technological, and environmental dimensions.

Moreover, Guiffard insists on integrating various voices into the strategic debate. He demands greater openness to researchers, think tanks, NGOs, as well as global partners, referring to the fact that "no administration can alone grasp the complexity of the world." For instance, research-based knowledge in environmental change or technological revolution can assist in new challenges like climate-driven conflicts or digital authoritarianism. He also suggests creating a culture of scenario planning, whereby diplomats and policymakers can experiment with the robustness of their policies against a range of potential futures. However, he warns that without embedding long-term thinking into foreign policy, France risks being perpetually caught off-guard. He points out that the COVID-19 pandemic, the war in Ukraine, and the rise of China's global influence are reminders of how quickly international dynamics can evolve, and how dangerous it is to be unprepared. Through institutionalizing ahead analysis and opening up strategic debate to a wide range of actors, France can better cope with the uncertainties of the 21st century and defend its national interests in the long term.

The repeated use of the word "crisis" has the effect of hiding the underlying, long-term structural forces shaping world events.

Foreign policy in the present era demands a transversal approach, integrating diplomatic, economic, military, technological, and environmental dimensions.

Prospective research

Energy Security and Geopolitics

Wang, Q., Ren, F. & Li, R. Geopolitics and energy security: a comprehensive exploration of evolution, collaborations, and future directions. Humanit Soc Sci Commun 11, 1071 (2024). https://doi.org/10.1057/s41599- 0242-03507-

This article provides a penetrating examination of energy security and geopolitics, exhibiting the complex interfaces between energy supply stability and international politics. Energy security, absolutely vital to business production, movement, and society at large, is also extensively interconnected with security at the country level since disparities in the distribution of energy or price fluctuations would tend to catalyze inflation, economic disaster, and possibly societal instability. Geopolitical dangers like war, terrorism, and foreign tensions are set to largely enhance energy security.

Political revolutions within the Middle East or the conflict between Russia and Ukraine have led dramatic fluctuations in global oil and gas prices, while international sanctions and trading tensions impeded energy imports as well as exports, heightening risk for countries that depend on foreign sources.

The article uses a bibliometric approach to trace the evolution of research in this field. It identifies three major research clusters: the energy transition, the natural environment, and energy markets. Within the energy transition cluster, geopolitical risks can impede as well as enable the shift towards renewables—while conflict can deter investments in renewable energy, it can also encourage countries to diversify away from fossil fuels. The natural environment cluster emphasizes how geopolitical tensions intensify environmental damage, ranging from overexploitation of resources to pollution generated by military actions. The energy market cluster, on the other hand, explores how geopolitical risks affect price volatility and market behavior.

Of special interest, the article notes an increase in international collaboration in this field of research, as China emerges as a central research hub. Author networks place Chi-Wei Su as one of the leading authors, an extremely interconnected global world of research.

A salient argument presented is that geopolitical risks may not always undermine energy security. For instance, panel analyses of China have suggested a two-way causal relationship where energy security also determines geopolitical risk. This finding contradicts the common perception that geopolitical instability always weakens energy stability.

The paper also highlights methodological advances, using advanced text mining and topic modeling to map knowledge networks and research trends. It also acknowledges certain limitations, such as its restriction to the use of the Web of Science database, which may lack gray literature and non-scholarly sources. It also invites future research to include conference papers and books to better understand the field.

Among key findings is that geopolitical pressures often lead to sudden shifts in national energy policies. Governments must strike a balance between energy security, environmental goals, and economic development. As one author puts it, "the emergence of the term 'geopolitical risk' as a conceptual framework is an indication of an increased awareness of the impact of geopolitical events on energy markets and the wider world economy." Lastly, the article calls for increased global cooperation and policy coordination to mitigate these risks, ensure safe energy supplies, and accelerate the transition toward sustainable energy systems.

Geopolitical dangers like war, terrorism, and foreign tensions are set to largely enhance energy security.

Geopolitical risks may not always undermine energy security.

Prospective research

Canada and US Relations

Institute For Peace & Diplomacy. (2025), Canada: Background and U.S. Relations, Congressional Research Service (CRS)

This report is an in-depth evaluation of the U.S. and Canada's complicated relationship. With their shared 5,525-mile border, they have a relationship based on mutual history, religion, and deep economic and security partnerships. Both the U.S. and Canada maintain a solid diplomatic relationship, with high-level interactions occurring regularly and common international cooperation. Both nations are central actors in global organizations such as the UN, NATO, and the G7, often working together on foreign policy objectives.

Occasionally, however, there are disagreements, particularly in terms of trade policies and eco-governance responsibilities. Disagreements over softwood lumber and dairy products, for instance, have been recurring sources of tension that have required ongoing negotiations to settle mutually beneficial arrangements.

Economically, Canada and the U.S. are each other's largest trading partners, with bilateral trade in goods and services exceeding $700 billion annually. The United States-Mexico-Canada Agreement (USMCA), which took effect in 2020 to replace the North American Free Trade Agreement (NAFTA), is the cornerstone of their trade relationship. The agreement addresses various sectors, including agriculture, car manufacturing, and digital trade, with the aim of modernizing and strengthening economic ties. Despite the overall positive trade relationship, issues remain, such as tariffs and regulatory disagreements, necessitating continued dialogue and negotiation.

Energy cooperation is a significant aspect of U.S.-Canada relations. Canada is a major energy supplier to the U.S., particularly in crude oil, natural gas, and electricity. The countries are connected by vast pipeline networks and electricity grids, which facilitate energy trade and security. Projects like the Keystone XL pipeline have been political hot potatoes, illustrating the complexities of balancing economic interests with environmental concerns.

Security cooperation is marked by reciprocal participation in defense organizations and initiatives. The North American Aerospace Defense Command (NORAD) is an exemplary binational command structure, highlighting the depth of military collaboration. The two nations cooperate on counterterrorism, border protection, and the sharing of intelligence, which helps build continental security. Matters such as differing levels of defense expenditure and procurement habits occasionally produce policy controversies and adaptations.

The U.S. and Canada have recognized the importance of Indigenous peoples' rights and taken cross-border actions to support them. Efforts are made toward cultural preservation, economic development, and compensation for historical injustices. Cross-border Indigenous peoples need cooperative policies to safeguard their rights and interests in both countries.

The U.S.-Canada relationship is characterized by deep interdependence and cooperation in numerous areas. Despite difficulties, the long-standing partnership continues to evolve, addressing emerging issues and reaffirming mutual values in democracy, prosperity, and security. Ongoing dialogue and cooperation remain essential to navigating the complexities of this bilateral relationship.

Canada and the U.S. are each other's largest trading partners, with bilateral trade in goods and services more than $700 billion annually.

The U.S.-Canada relationship is characterized by deep interdependence and cooperation in numerous areas.

2 Applied research

How Has AI Become a Determinant Factor of Power Relations Among States?

Benyekhlef, K., & Zhu, J. (2025). La géopolitique de l'intelligence artificielle : régulation et puissance. Lex Electronica, 29(1), 68115-.

This article discusses the geopolitical interests of artificial intelligence and how AI has become a determinant factor of power relations among states. The authors explain how virtual space has become a battlefield upon which states compete to dominate technology. AI has been called a "dual-use" technology, i.e., both civilian and military uses, making it highly susceptible to national security.

The United States, for instance, fears its technological advantage is fading as competitors like China integrate AI into economic and military strategy. U.S. policy briefs cited in the article warn that AI technologies may become the "weapons of first resort" in future conflicts, and that rivals already employ AI to conduct cyberattacks, disseminate disinformation, and destabilize democracies.

The authors note that the AI rivalry has triggered a new era of techno-nationalism, under which governments spend billions of dollars on building AI but also practice export controls and demand data storage locally as non-tariff barriers. The case of the recent U.S. export restrictions on shipments of semiconductors to China shows how the trade in technology is turning into a proxy for geopolitics. These policies of protection are reflective of a broader trend in which states seek to defend their technological capital while denying competitors access to critical resources. The article also observes that the big tech corporations, usually referred to as GAFAM (Google, Apple, Facebook, Amazon, Microsoft) in the West or BATX (Baidu, Alibaba, Tencent, Xiaomi) in China, play a quasi-sovereign role in this rivalry, trading across borders and sometimes acting as "mercenaries" in a multipolar world order.

The authors highlight that this transformation is reshaping the concepts of sovereignty and power. They describe cyberspace as a new strategic arena where the battle for control is fought both openly and covertly. For instance, they point out that AI-driven misinformation campaigns extend beyond elections, influencing financial markets, foreign policy, and social movements. These campaigns have the potential to sway public opinion and destabilize societies.

The next issue addressed is the challenge of regulation. Given its open-source nature and global spread, regulating AI effectively remains a significant challenge. Governments are struggling to draft policies that balance innovation, ethical concerns, and national security, especially as traditional legal frameworks prove inadequate in addressing the rapidly evolving and transnational dynamics of AI. The authors also note that public calls for halting AI research, such as the "Pause Giant AI Experiments" letter, reflect growing concerns about the speed of AI development and the potential societal risks.

In conclusion, Benyekhlef and Zhu argue that AI is no longer just a technological issue, but a critical geopolitical commodity that is reshaping the global balance of power. Through their analysis, they demonstrate that AI presents not only military security risks but also challenges to democracy, economic resilience, and global governance.

AI is a "dual-use" technology, with both civilian and military applications, making it particularly vulnerable to national security.

GAFAM in the West or BATX (Baidu, Alibaba, Tencent, Xiaomi) in China, play a quasi-sovereign role in the global AI rivalry.

Applied research

AI Threats to Politics

Islam, M. B. E., Haseeb, M., Batool, H., Ahtasham, N., & Muhammad, Z. (2024). AI Threats to Politics, Elections, and Democracy: A Blockchain-Based Deepfake Authenticity Verification Framework. Blockchains, 2(4), 458481-. https://doi.org/10.3390/blockchains2040020

This article offers a timely reflection on how artificial intelligence shapes political institutions, particularly democratic elections. The authors refer to the rapid advancement of generative AI technologies and their improved ability to produce highly realistic deepfakes—artificial media such as fake images, videos, and audio tracks—that have the potential to deceive citizens and destabilize democratic institutions. These technologies may be employed as weapons to spread disinformation, influence the public agenda, and even decide the outcome of elections, posing a new threat to the integrity of political institutions worldwide.

AI systems are, according to the authors, far from neutral tools. Rather, they are highly subject to the data that trains them and the intentions of those who deploy them. This implies a reality where biases in training data or algorithmic intent can replicate existing social and political divisions, influence voter behavior, and distort public conversation. The authors identify the means by which AI-generated content can be used to power campaigns of disinformation, entrench political polarization, and ultimately undermine faith in democratic institutions. To tackle these threats, the authors propose the Blockchain-based Deepfake Authenticity Verification Framework (B-DAVF), an innovative technological solution aimed at countering deepfake proliferation and political disinformation. The proposed framework leverages blockchain technology, characterized by transparency, immutability, and decentralization, to verify digital media. By recording the original and genuine versions of digital content on a blockchain, B-DAVF allows users, media platforms, and regulators to authenticate and check if a piece of content has been manipulated or is potentially a deepfake. The authors emphasize that such a mechanism not only enhances the technical capacity to detect fake media but also builds public confidence in media systems by providing a reliable system of authentication.

Significantly, the article acknowledges that technological countermeasures are insufficient. The authors advocate for an interdisciplinary effort through the convergence of computer scientists, legal experts, policymakers, media, and civil society organizations to create comprehensive protection against AI-based election interference. They call for governments to establish laws that require transparency and accountability in the use of AI, as well as public awareness campaigns to educate people on the threats of deepfakes and online manipulation. Without broad action, technological measures risk being undercut by loopholes, non-implementation, or common misconceptions.

The article concludes by underscoring the necessity of speed in addressing the political risks posed by AI. As the authors warn, doing nothing can allow disinformation and manipulation to become the normal weapons of political life, eroding public trust and destabilizing democracy itself. The proposed B-DAVF framework, as well as broader regulatory and educational initiatives, forms a proactive plan for safeguarding democratic values in the digital era. The writers' report serves as both an alarm and an appeal to take action, urging us to consider that the fate of democracy itself will depend in part on how societies find ways to oversee and control the powerful technologies of artificial intelligence.

The technologies may be employed as weapons to spread disinformation, influence the public agenda, and even decide the outcome of elections.

B-DAVF is an innovative technology solution with the goal of countering deepfake proliferation and political disinformation.

Applied research

Canada's Engagement with ASEAN Countries

Pan, C. & Li, Y. (2024). Canada's Approach to Climate Cooperation in the Indo-Pacific: Analysis and Suggestions for Canada's Engagement with ASEAN Countries under the Indo-Pacific Strategy. Revue Interventions économiques / Papers in Political Economy, (72).

This paper presents Canada's current climate cooperation with ASEAN nations and offers recommendations on how to improve it. Drawing on government data, policy briefs, and other information, the authors highlight the shift to clean energy as a central element of climate cooperation and argue that both Canada's policies and aid to ASEAN countries are unequal and insufficient. As the Canadian Indo-Pacific Strategy (IPS) declares its purpose of "building a sustainable and green future," the authors note that this goal has not been effectively applied in the region.

A key assertion in the article is that ASEAN countries have varying needs and capabilities regarding clean energy, yet Canada has not adequately addressed these differences. The authors argue that Canada's approach is overly one-size-fits-all, ignoring changing local conditions. For instance, while countries like Singapore have high-tech infrastructure and smoother integration of clean energy solutions, others like Myanmar and Cambodia face significant challenges in political stability and technical capability. According to the article, Canada's aid is also disproportionately distributed, with smaller ASEAN countries at lower development levels often being overlooked, while most focus and assistance are given to them. Moreover, the authors observe that Canada's climate engagement lacks measurable goals and a long-term strategy, which hinders progress assessment and continuity between political cycles.

Another overarching feature of Canada's approach has been its reliance on multilateral institutions, such as operating through ASEAN-wide organizations or global climate partnerships. While this multilateral approach has merits, the authors argue that it also dilutes Canada's leadership and reduces the potential for bilateral cooperation, which could deliver more tailored and efficient measures. In response to these difficulties, the article proposes several strategies to strengthen Canada's involvement.

First, the authors suggest that Canada take the initiative to share experiences, drawing upon its own domestic strength in renewable energy and climate resilience to help ASEAN countries accelerate their transitions. Second, they recommend stepping up business cooperation, encouraging Canadian companies to invest in clean energy projects in ASEAN countries and forging public-private partnerships that can mobilize additional finance and innovation. Third, the paper advocates for Canada to play an active role in ASEAN-led mechanisms, rather than global or Western-led platforms, to demonstrate its commitment to regional ownership and align more closely with regional priorities. The authors believe these actions will not only make Canada a more effective champion of the clean energy transition but also strategically and diplomatically strengthen its position in the Indo-Pacific. Lastly, the article stresses that if Canada is to be a meaningful participant in the creation of a sustainable Indo-Pacific, it must go beyond symbolic guarantees and invest in effective, long-term relationships that cater to the unique needs of ASEAN countries. By strengthening the balance, continuity, and bilateral nature of its climate cooperation, Canada can align its foreign policy with its climate goals while helping to green and harden the region.

Canada's aid is also disproportionally distributed

By strengthening of the balance, continuity, and bilateral nature of its climate cooperation, Canada can bring its foreign policy into alignment with its climate goals.

Applied research

Clearview AI: The Urgent Necessity of Higher Levels of Public Literacy

Shepherd, T. (2024). The Canadian Clearview AI Investigation as a Call for Digital Policy Literacy. Surveillance & Society, 22(2), 179–191. https://doi.org/10.24908/ss.v22i2.16300

This article examines the privacy investigation of Clearview AI in Canada and argues that this issue illustrates the urgent need for higher public literacy around digital policy. Clearview AI is an American company that scrapes hundreds of millions of social media and website photos to build a massive facial recognition database, for sale mainly to police. The Canadian investigation, carried out by the Office of the Privacy Commissioner (OPCC) in 2020, affirmed that Clearview's collection of images of Canadians without their consent was against both federal and provincial privacy law, particularly with respect to the application of biometric data like facial images.

Clearview's technology was not only disturbing because of its invasive nature but also because of its potential harmful impact, particularly in terms of bias and inaccuracy. The firm's software was licensed to police departments, including the RCMP, but was widely used by individual officers off-books without the department's approval. The investigation found that Clearview's business worked to further exacerbate algorithmic bias issues, as facial recognition software is less precise for women and minorities, further solidifying discriminatory trends in policing.

Shepherd contends that while Canada's privacy regulators effectively spotted legal breaches, the remedies offered are still too centered on personal responsibility—assuming individuals will safeguard their own privacy—and do not challenge the broader systemic and political-economic determinants of surveillance technologies. It is here that Shepherd introduces the concept of Digital Policy Literacy (DPL), a framework that goes beyond digital literacy fundamentals to include understanding the ways technology is shaped by policy, infrastructure, and the exercise of power. The article also explores how Clearview operated in a legal loophole by scraping publicly facing data on social media, highlighting weaknesses in current privacy law. Shepherd calls for tighter regulation and highlights that public education needs to address the role of companies, governments, and infrastructures, as well as individual behavior. She contends that without this more comprehensive approach, citizens are left unable to understand or resist the data extraction systems behind modern surveillance.

Worthwhile, Shepherd also faults the international dimension to the issue, highlighting that American-based tech companies often skirt outside-of-country privacy law, making it difficult for them to enforce. She says she has found Canadian regulators being able to harden their stance by looking for direction from such overseas models like the EU's General Data Protection Regulation (GDPR), whose ambit is outside countries.

In short, Shepherd calls for a shift in privacy pedagogy toward a universal, rights-based pedagogy that respects the political, economic, and infrastructural character of digital technologies. She argues that only through this broader vision can society aspire to address the deeply entrenched problems with facial recognition technologies like Clearview AI, beyond the terms of individual data management toward a more just and democratic digital future.

Clearview AI is an American company that scrapes hundreds of millions of social media and website photos.

Digital Policy Literacy (DPL), a framework that goes beyond digital literacy fundamentals to include understanding the ways technology is shaped by policy, infrastructure, and the exercise of power.

Applied research

France's International Strategy for a Feminist Foreign Policy

Ministère de l'Europe et des Affaires étrangères, France, (2025) France's International Strategy for a Feminist Foreign Policy (2025–2030)

The "France's International Strategy for a Feminist Foreign Policy (2025-2030)" document outlines France's commitment to keeping women's rights and gender equality at the core of its international and European policy. The policy builds on France's pioneering move in 2019 to introduce a feminist foreign policy, following in the footsteps of countries like Sweden and Canada. It describes how France will intensify this policy in areas such as peace, security, climate, health, trade, education, digital technology, and humanitarian action.

The report begins by highlighting alarming global gender inequalities: 142 million women lack access to abortion, over 133 women are killed each day by intimate partners or relatives, and women and children are 14 times more likely to be killed in climate disasters. These facts underscore the importance of France's new international agenda. France's strategy is based on five pillars: the protection of rights and freedoms, mobilizing resources for gender equality, combating gender-based violence, reducing gender inequalities, and encouraging women's participation in decision-making. Among the most important initiatives are the Support Fund for Feminist Organizations, which has supported over 1,400 organizations in 75 countries, and the Laboratory for Women's Rights Online, which addresses digital gender-based violence. Individual initiatives, such as "Feminists for Climate and Environment Alternatives" in Africa and "Femmes, dignité, travail" in Latin America, demonstrate France's efforts to tackle intersectional issues like environmental justice and workers' rights.

Some of the most forward-thinking goals include strengthening sexual and reproductive health rights, protecting access to safe abortion, promoting girls' education, and increasing women's political participation. France also plans to scale its commitments through the Feminist Francophone Alliance, additional funding to UN Women and the UN Population Fund, and partnerships within the G7 and G20. Notably, France will intensify legal and institutional frameworks, promote women's access to justice, and address all forms of sexual violence, including conflict-related sexual violence. It also seeks to mainstream gender equality into global financial instruments and ensure accountability through external assessments by the High Council for Gender Equality.

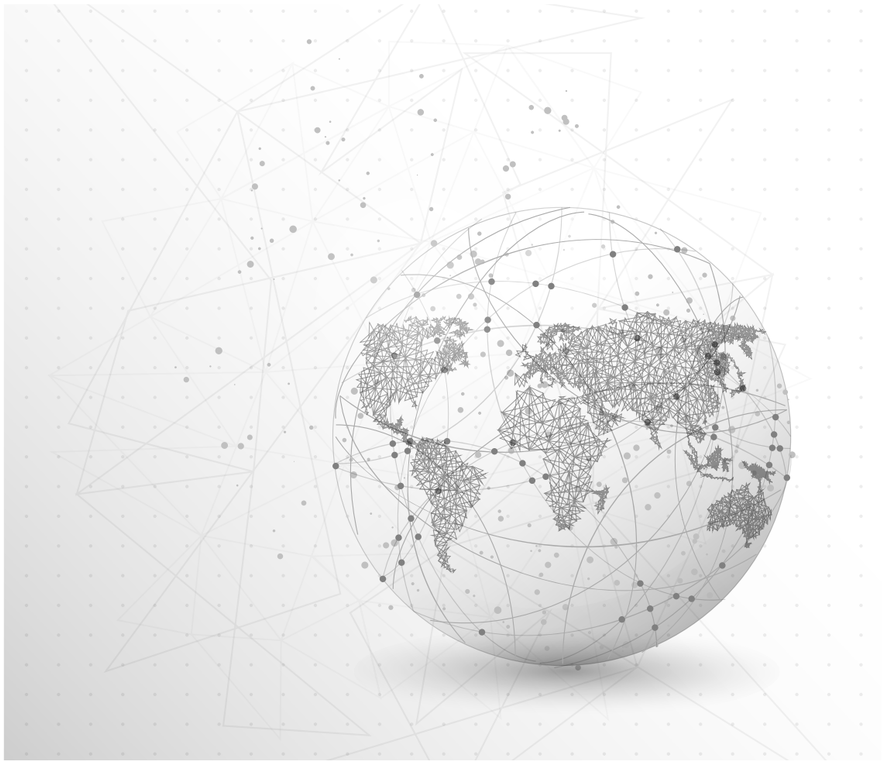
Digital rights is another priority, with efforts aimed at stopping online harassment, addressing gender-based violence online, and integrating gender perspectives in the regulation of artificial intelligence. France also emphasizes the need to train its diplomatic service in gender equality and gender-based violence so that its internal practices reflect its international obligations.

Ultimately, the strategy recognizes that achieving gender equality will take centuries at the current pace and calls for urgent, concrete action. France's feminist foreign policy seeks not only to defend women's rights globally but also to embed gender equality into the very fabric of international relations, development, and peacebuilding efforts. This approach is framed as both a moral responsibility and a practical necessity for building a fairer, more sustainable, and more peaceful world.

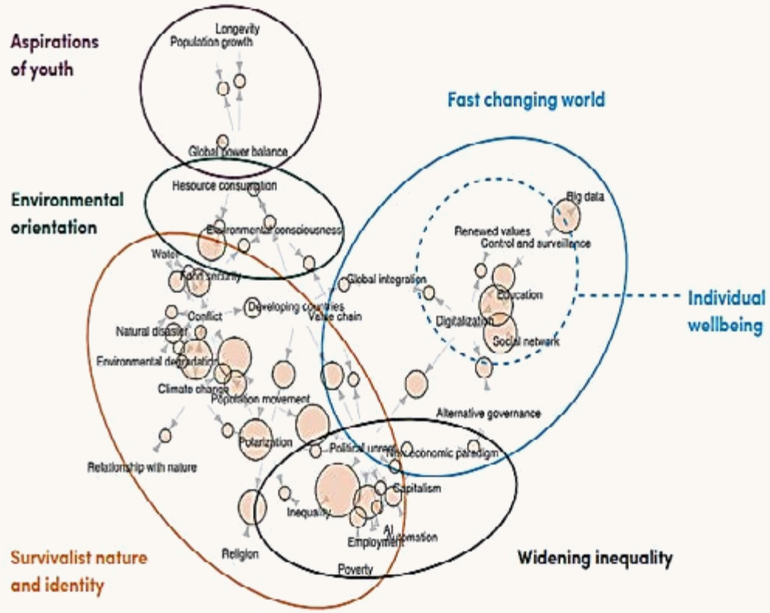
> **Policy in areas of peace, security, climate, health, trade, education, digital technology, and humanitarian action.**

> **142 million women lack access to abortion, over 133 women are killed each day by intimate partners or relatives, and women and children are 14 times more likely to be killed in climate disasters.**

3 The future in numbers

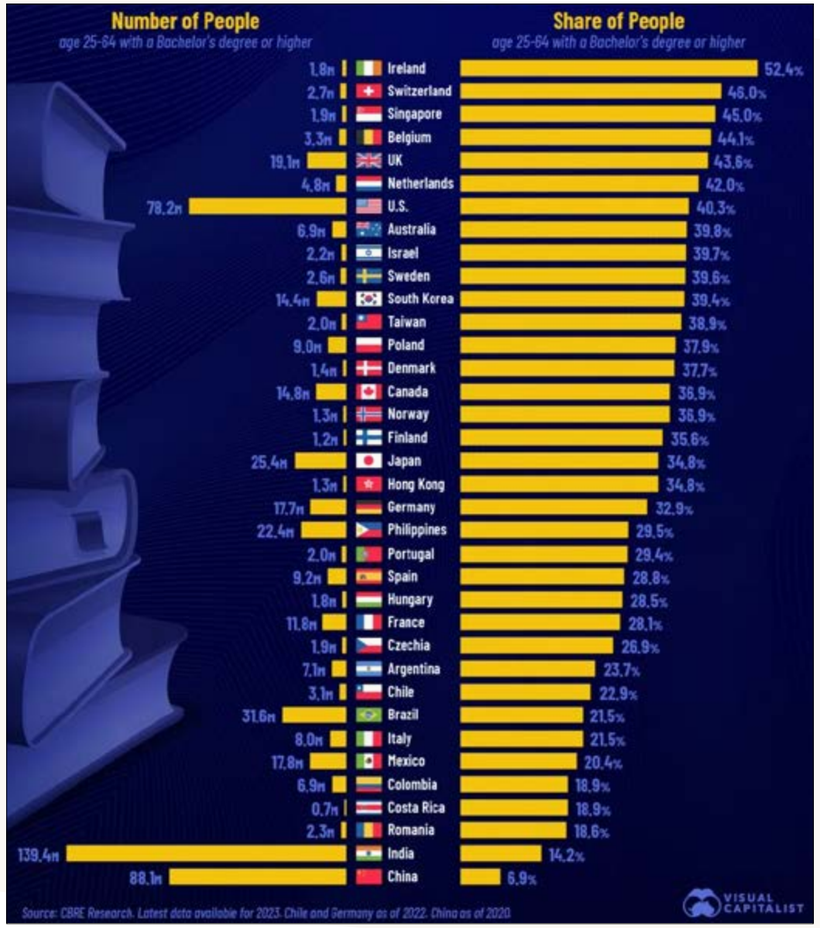


Interlinkages of changes in society by 2050: culture and governance

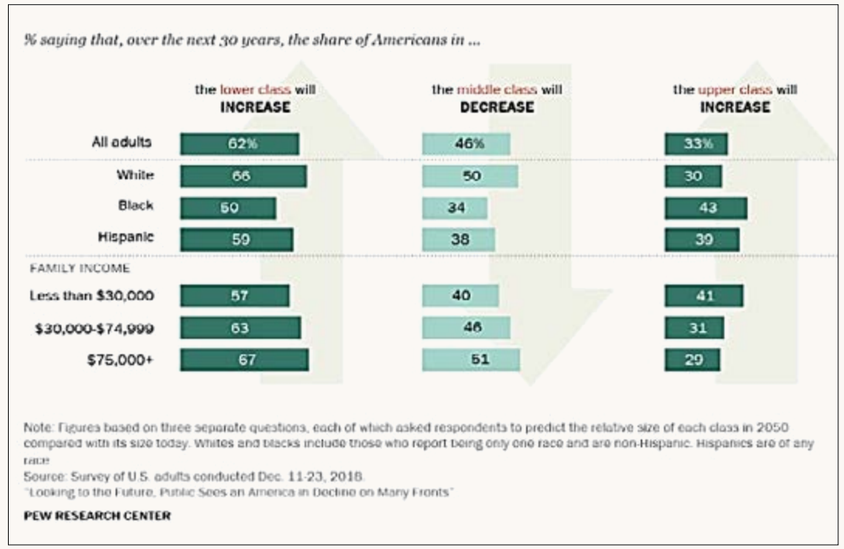


Source: Global Foresight Survey of Potential Changes in Society by 2050.

The World's Most Educated Countries



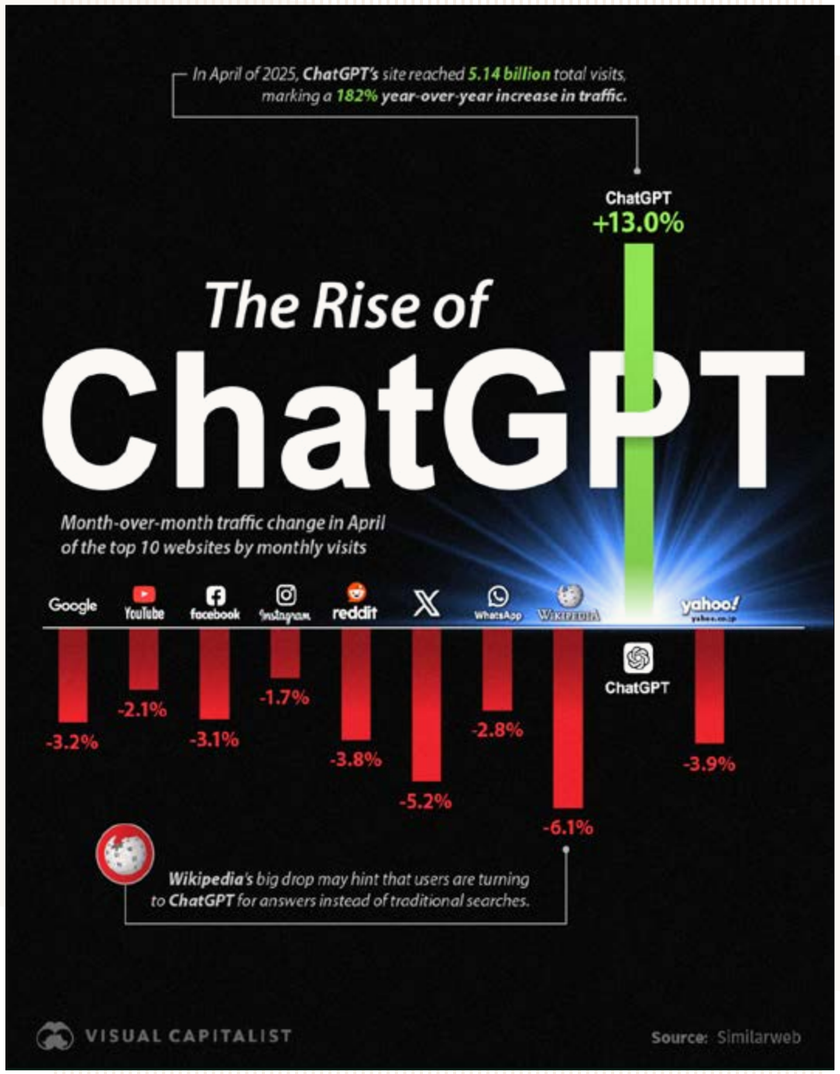
Race and income linked to predictions about the size of the social classes in 2050



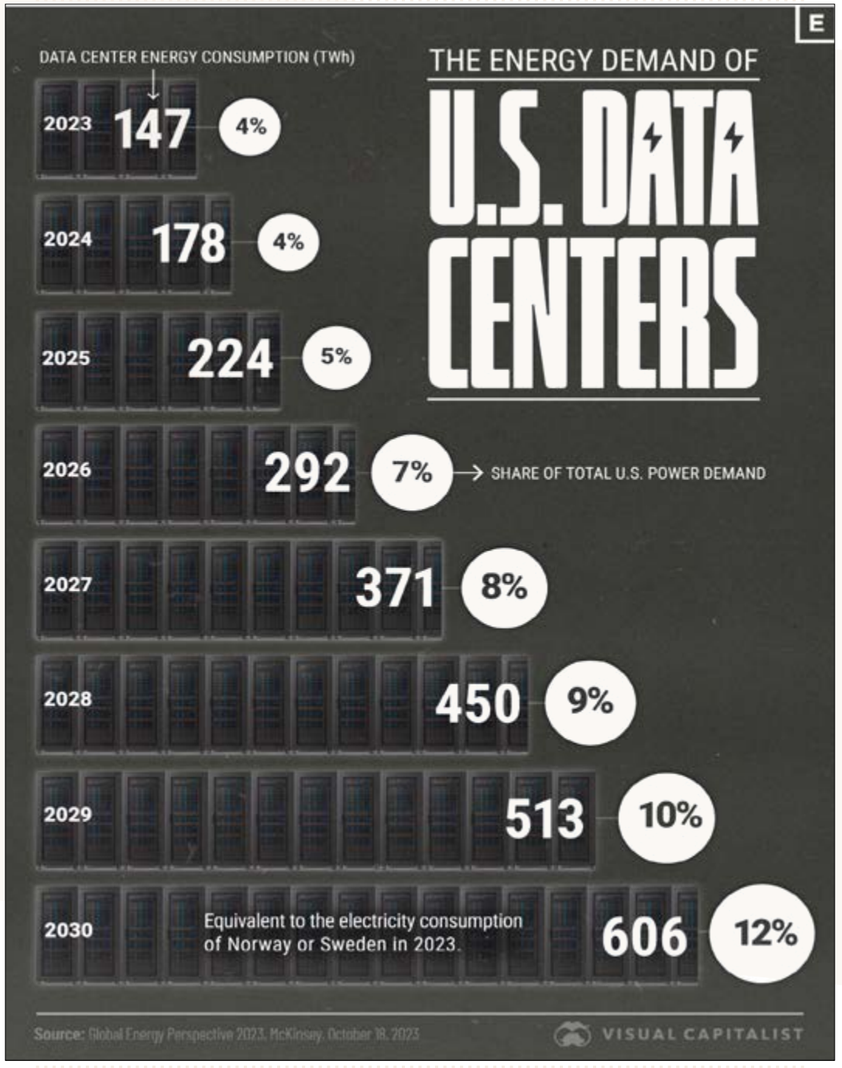
The World's Most Educated Countries

The World's $12.5 Trillion Underground Economy

ChatGPT's Rising Traffic vs. Other Top Websites



The Energy Demand of U.S. Data Centers (2023-2030P)

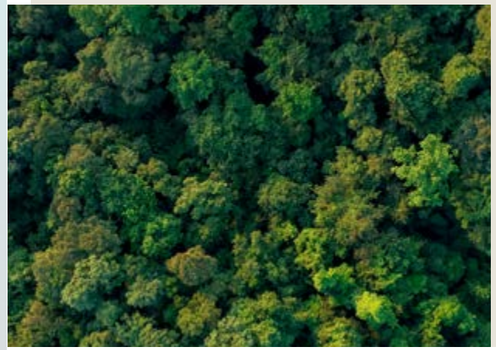


12

Issue No. 12

(July 2025)

FUTURE TRENDS
Report
Issue no. 13 - July 2025



Future Trends Report

Future Trends Report, published in English and Arabic by TRENDS Virtual Office in Montreal, stands out as a distinctive publication dedicated to highlighting:
1. the most important forward-looking studies that aim to identify future trends, analyze various variables that may influence these trends, and determine the best future scenarios.
2. the most important applied studies that explore the application of knowledge, scientific theories, and information to solve current problems and overcome future challenges.
3. the most important illustrative and graphic forms that visually summarize significant studies, helping readers understand the trends and challenges of the future world.

Contents

1 Prospective research

AI-Assisted Scientific Discovery: The Case of Large Language Models

Eger, S., Cao, Y., D'Souza, J., Geiger, A., Greisinger, C., Gross, S., ... & Miller, T. (2025). Transforming Science with Large Language Models: A Survey on AI-assisted Scientific Discovery, Experimentation, Content Generation, and Evaluation. arXiv preprint arXiv:2502.05151.

This paper examines the significant impact that large language models (LLMs) are already having on the scientific research process. The authors maintain that LLMs stand to fundamentally alter nearly every phase of research—spanning literature review, ideation, content production, and even the peer review process. Their integration signals a substantial shift, introducing automated tools for information retrieval, experimental design, drafting scientific text, generating visuals, and facilitating scholarly assessment.

The survey begins by mapping the classic research workflow—problem identification, literature review, hypothesis generation, experimentation, data analysis, and dissemination—and shows how LLMs now enhance each phase. In literature reviews, AI-powered platforms enable semantic search, summarization, and comparison across vast corpora, speeding up information extraction and synthesis.

During ideation and experimental planning, LLMs generate hypotheses, suggest protocols, and, with multi-agent systems, even simulate experiments. Although new benchmarks across disciplines (e.g., chemistry, physics, social sciences) gauge these systems' performance, the authors warn that without careful oversight they can reinforce existing paradigms, produce spurious findings, or pose ethical risks. LLMs also excel at drafting scientific text—titles, abstracts, related-work sections, citations, and full manuscripts—which can particularly aid non-native English speakers. Yet issues of originality, factual accuracy, and plagiarism persist: AI-generated bibliographies often exhibit hallucinations, and expanding AI contributions complicate authorship ethics.

The paper further examines LLM-driven multimodal output—figures, tables, posters, slides—and notes their potential to improve scientific communication. However, generating clear, accurate visuals demands well-curated training data, and current tools still face limitations in contextual appropriateness and technical precision.

Finally, the role of LLMs in peer review is explored: they can help assess manuscripts, verify claims, and draft meta-reviews. Still, their deployment raises questions of bias, transparency, and over-reliance on automation. The authors advocate for human-centered design, robust ethical standards, and full transparency to ensure that AI's integration into research workflows bolsters, rather than undermines, scientific integrity.

AI-enabled tools increase efficiency, allowing researchers to extract and synthesize information more rapidly.

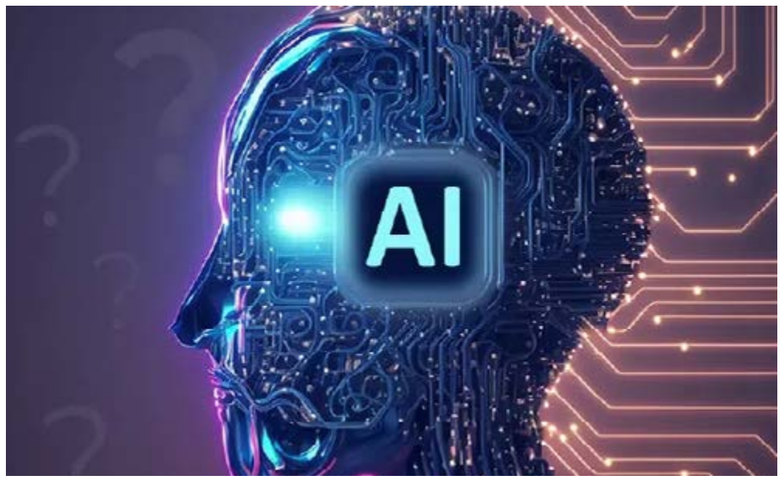
Significant challenges must be addressed to ensure responsible and effective integration of AI tools into research practice.

Prospective research

Agentic AI and Scientific Discovery

Gridach, M., Nanavati, J., Abidine, K. Z. E., Mendes, L., & Mack, C. (2025). Agentic AI for Scientific Discovery: A Survey of Progress, Challenges, and Future Directions. arXiv preprint arXiv:2503.08979.

Agentic AI is transforming scientific research by automating and enhancing core processes such as hypothesis generation, literature review, experiment design, data analysis, and manuscript writing. Powered by advanced language models, these systems are streamlining workflows, accelerating research productivity, and making scientific tools more accessible.



Two main classes of agentic AI systems have emerged. Single-agent models operate independently in structured, feedback-light settings, using large language models to reason and execute tasks. Multi-agent systems assign specialized roles to different agents, simulating collaborative research teams; they excel at interdisciplinary problems but require sophisticated coordination.

These systems also differ in autonomy. Fully autonomous frameworks (e.g., Co-Scientist, ChemCrow) manage end-to-end scientific workflows—from experiment planning to execution—especially in chemistry and materials science. Specialized variants such as ProtAgents (protein modeling) and LLaMP (materials prediction) perform reliably in routine contexts but struggle with novel challenges. Human-AI collaborative models (e.g., Virtual Lab, BioPlanner, CALMS, Agent Laboratory) strike a balance: they offer insights and procedural guidance while researchers retain control over critical decisions.

Automating literature review remains one of the toughest tasks. Tools like SciLitLLM, LitSearch, ResearchArena, and CiteME aim to classify, retrieve, and cite vast publication corpora yet falter in domains demanding deep expertise or interpretive nuance. For example, Agent Laboratory handles experiment execution effectively but underperforms at synthesizing complex literature.

Agentic AI now supports every stage of the research pipeline. In chemistry, platforms such as LLM-RDF and Organa automate experimental protocols; in biology, systems like BIA and CellAgent streamline genomic and single-cell analyses. Bioinformatics and synthetic biology advance via tools like TAIS and CRISPR-GPT, enhancing data interpretation and planning. Underpinning this ecosystem are development frameworks (AutoGen, MetaGPT, Letta) and domain-specific benchmarks (LAB-Bench, MoleculeNet, MatSci-NLP, AlphaFold). Yet, the absence of universal metrics for reliability, interpretability, and user satisfaction remains a barrier.

Despite progress, significant challenges persist. Trustworthiness and calibration are critical to ensure systems behave reliably and generalize beyond training data. Ethical concerns—bias, hallucinations, transparency—are acute in high-stakes fields such as healthcare. Other risks include error compounding, coordination breakdowns, and misalignment with research goals.

In sum, agentic AI offers transformative potential for scientific discovery by automating routine tasks and amplifying human expertise to make research more efficient and accessible. Realizing this potential requires improved literature-review capabilities, robust ethical and evaluative standards, and deeper collaboration between AI systems and human researchers.

Agentic AI is revolutionizing scientific research from hypothesis generation and literature review, to experimental design, data analysis, and manuscript writing.

Systems like TAIS and CRISPR-GPT are advancing bioinformatics and synthetic biology, enhancing data interpretation and experimental planning.

Prospective research

Threats in Sub-Saharan Africa by 2040

Fondation pour la Recherche Stratégique (FRS) (Feb 2025), "Threats in Sub-Saharan Africa by 2040 – A Prospective Analysis"

Sub-Saharan Africa will be confronted by 2040 with a more complicated and volatile strategic landscape, fueled by a cluster of converging drivers that include climate change, population expansion, structural governance problems, the proliferation of extremist networks, and rising global competition. The several crises playing out in the Sahel, Central Africa, and the Horn of Africa are likely to deepen as regional vulnerabilities compound with international power rivalries.

Climate change will serve as a primary threat multiplier—increasing food and water insecurity, fueling resource-based conflicts, and creating large-scale internal displacement. These are most severe in vulnerable areas like the Sahel, where deteriorating living conditions have already contributed to increased terrorist recruitment. The region's population—likely to double by 2050—will place additional stress on institutions. Lack of corresponding progress in employment, infrastructure, and social services means that rising youth unemployment and urbanization are likely to intensify poverty and social unrest.

The fragility of good governance remains at the center of challenges. This environment has created new challenges for extremist groups, especially Al-Qaeda- and ISIS-linked ones, which exploit local grievances and capitalize on increased freedom of action in uncontrolled territory. New bases of extremism are conceivable by 2040 in specific locations such as northern Mali, while insurgencies will remain prevalent in Nigeria and the Lake Chad Basin.

Simultaneously, international strategic competition is intensifying. China's Belt and Road Initiative, Russian military alignments, and the sending in of private security companies, and Turkey's increasing regional leadership are all resisting Western influence. France's traditional dominance, especially in West Africa, has diminished in the face of recent unilateral pullouts from Mali, Burkina Faso, and Niger. ECOWAS fragmentation—exacerbated by the withdrawal of regime-led armies—has weakened regional cooperation forums.

New and emerging threats also promise to reshape the security environment. The proliferation of drones, cyber capabilities, and AI is reshaping the character of conflict, and environmental shocks threaten critical infrastructure—such as undersea cables along the coast of East Africa. Water issues, such as the Nile, have the potential to escalate to inter-state war. Besides, external actors and non-state actors can increasingly employ hybrid tactics, economic pressure, and information warfare, particularly in strategic regions such as the Horn of Africa.

For France and Europe, this imposes the requirement for a general strategic rebalancing. France is shifting towards military de-escalation and emphasizing locally initiated, cooperative partnerships. Yet over-disengagement carries the risk of abandoning influence to competitors such as Russia and China. It needs to be a subtle, multi-faceted approach—one that ties civil-military programs, soft power, foreign direct investment from the private sector, and more cooperation with regional and African actors together. Finally, the future roles of France and Europe in Africa will depend on their ability to be adaptable and evolve with changing realities in support of African-led solutions to security and development issues.

The crises unfolding in the Sahel, Central Africa, and the Horn of Africa are expected to intensify as regional vulnerabilities are exacerbated by growing international power rivalries.

Rebuilding of trust will require respect for sovereignty, genuine dialogue with civil society, and a conscious move away from condescending attitudes

Prospective research

Five Security Scenarios on Russian War in Ukraine for 2024–2025

Osmolovska, I., Havrylov, V., Maksak, H. (2024), "Five Security Scenarios on Russian War in Ukraine for 2024–2025" GLOBSEC. https://www.globsec.org/what-we-do/publications/five-security-scenarios-russian-war-ukraine-2024-2025?utm_source=chatgpt.com

The GLOBSEC report stipulates five scenarios through which the Russia-Ukraine conflict might progress through 2024 and 2025, with each scenario depending on changing realities on the battlefield, political maneuvering, and the evolving posture of the international community.

Scenario one envisions a prolonged stalemate in which neither Russia nor Ukraine secures a decisive breakthrough. Frontlines harden into attritional trenches, inflicting heavy military and civilian casualties. Ukraine's ability to resist depends on sustained Western military aid, financial backing, and munitions supplies, while Russia exploits its larger manpower and stockpiles to wear down defenses. Over time, donor fatigue or shifting political priorities in Europe and the United States could erode Kyiv's support network, aggravating its humanitarian crisis, overwhelming hospitals, and triggering mass displacement.

The second scenario posits a successful Ukrainian counteroffensive. As Ukrainian forces reclaim territory—perhaps portions of Donbas or even Crimea—morale and diplomatic leverage would surge. Such gains might prompt Western capitals to deepen assistance, but could also provoke Moscow to intensify assaults on civilian infrastructure, deploy new waves of hybrid tactics (including cyberattacks and disinformation), and risk igniting a wider conflagration threatening neighboring states.

In contrast, a third scenario sees Russia mounting a robust resurgence. Through nationwide mobilization, accelerated arms production, and refined tactics, Russian forces could breach Ukrainian lines, reclaim lost ground, and erode Ukraine's military cohesion. As battlefield momentum shifts, Western public opinion might sour amid rising casualty counts and economic pressures—potentially fracturing NATO and EU unity and forcing some to reconsider further engagement.

A fourth outcome envisions a negotiated settlement born of mutual exhaustion or intensified diplomacy. A ceasefire would halt active hostilities but depend on complex territorial concessions—likely dividing Donbas or formalizing control over annexed regions. Such an agreement would remain fragile, prone to renewed clashes if either side retains significant combat capabilities or if backers dispute enforcement mechanisms and accountability for wartime crimes.

The most severe contingency contemplates direct NATO involvement. A miscalculated missile strike on alliance territory or a large-scale cyberattack traced to Russia could trigger Article 5, transforming the conflict into a full-scale Russia–NATO war. The resulting clash would imperil global security, disrupt supply chains, and raise the specter of nuclear escalation with catastrophic humanitarian and economic fallout.

These scenarios illustrate the profound uncertainty facing Ukraine, Russia, and the international community. The report concludes that only continuous Western support, flexible diplomacy, robust deterrence measures, and close international coordination can manage these risks, defend Ukrainian sovereignty, and pursue a lasting resolution.

International cooperation is essential to adequately manage risks, defend Ukrainian sovereignty, and pursue a sustainable resolution that benefits long-term peace and security.

TEXT

Prospective research

Racialized Minorities and Elections: The Case of Canada

Liang, B., & Harell, A. (2025). Understanding the Electoral Participation Gap: A Study of Racialized Minorities in Canada. Politics and Governance, 13.

Referencing their 2025 publication in Politics and Governance, Jiaqi Liang, Joseph A. Hamm, and Kimberly Gross refer to the ever-erratic difference in voting between racially minoritized and White groups in the U.S. This article brings together research from political science, psychology, and public administration to analyze the effect of subjective perceptions of procedural justice—i.e., whether voters perceive electoral procedures as fair and inclusive—on the turnout and participation of minoritized groups.

The authors contend that while contemporary accounts of the participation gap tend to emphasize structural barriers such as voter suppression, onerous ID laws, and abstract social disparities, or motivational individual concepts such as political efficacy, these frameworks may overlook the role of perceived fairness in democratic institutions. Perceptions of procedural justice offer a critical but neglected vantage point for analyzing gaps in participation. When citizens, particularly from traditionally disenfranchised communities, believe that electoral institutions are hostile to them or unresponsive, their intention to participate, even if they possess the necessary resources and knowledge, significantly declines.

Central to their argument is the point that procedural justice is more than outcome fairness; it entails whether the rules of the democratic process are perceived to be fair and whether others perceive their participation as having an impact. The authors name four central components of procedural justice: voice, neutrality, respect, and trustworthiness. Without, or a perceived lack of, any of these, disengagement will be more likely, especially among U.S. groups with a history of marginalization within politics.

Liang and Harell support their claims through reference to empirical studies that connect perceptions of exclusion, institutional distrust, and decreased participation among Black, Latino, and other minoritized citizens. These are placed within a broader context of historical patterns of disenfranchisement as well as contemporary concerns with restrictive voting policies, gerrymandering, and discriminatory political discourse. The authors argue that these are not mere perceptions or irrational; rather, they are actual experiences of exclusion and discrimination.

The conclusion of the article is that the participation gap must be confronted by something larger than piecemeal policy change. Institutional action must be aimed at regaining trust and symbolically—and substantively, for that matter—representing fairness. This involves developing genuinely inclusive procedures, providing a voice to disadvantaged groups, and rectifying past injustices. The authors recommend follow-up research on how quantitative and qualitative approaches can be brought together to more fully investigate the impacts of perceived procedural justice on the political participation of racial and ethnic minorities.

Overall, Liang and Harell present a detailed and penetrating analysis of the electoral participation gap, with the salience of perceived procedural justice to the structure of political participation being especially emphasized. Their cross-disciplinary analysis not only provides a roadmap for future research but also reconfirms the importance of institutional reforms to promote an inclusive and participatory democracy.

Four central components of procedural justice: voice, neutrality, respect, and trustworthiness.

Institutional action must aim to regain trust and demonstrate both symbolic and substantive fairness.

2 Applied research

Large Language Models and Wargaming

Chen, Y., & Chu, S. (2024). Large language models in wargaming: Methodology application and robustness. In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (pp. 2894-2903).

This paper by Yuwei Chen and Shiyong Chu, in the CVPR 2024 Workshop on Adversarial Machine Learning, explores the possibility of incorporating large language models (LLMs) in wargaming systems to make strategic decisions. The authors believe that the sophisticated natural language capabilities and reasoning of LLMs can significantly contribute to planning and executing intricate strategic simulations. These models can analyze text-based information, identify patterns, and generate rational, understandable courses of action in uncertain or hostile environments, making them suitable for the needs of wargaming environments.

Traditional AI systems in wargaming typically rely on rigid rule sets or narrow domain models and struggle to adapt to the fluid, open-ended nature of virtual conflicts. By contrast, large language models (LLMs) offer a more flexible approach. In a commercial simulation environment, the authors tested LLM–enhanced agents under standard wargaming scenarios. The results demonstrated not only improved overall performance metrics—such as mission success rates and resource utilization—but also richer, more human-like interactions. These features enabled more dynamic strategic play, helping analysts anticipate adversary reactions and craft original countermeasures on the fly.

Despite these strengths, the paper highlights significant vulnerabilities. LLMs are prone to adversarial inputs—carefully crafted prompts that induce misleading or biased outputs. Even minor prompt modifications can distort the model's rationale or produce inappropriate tactical recommendations, eroding trust in the system. In a defense context, such weaknesses could have serious consequences, from suboptimal decision paths to outright strategic miscalculations. To mitigate these risks, the authors emphasize the need for robust defenses. Key strategies include adversarial prompt detection, using anomaly-detection algorithms to flag suspicious inputs; enhanced calibration, aligning model confidence levels with true performance; and stress-testing for consistency, verifying that outputs remain stable under a variety of plausible question framings and operational conditions.

Robustness is particularly critical in wargaming, where credibility depends on accurate information processing and rational response under uncertainty. Without these safeguards, LLMs risk not only being deceived but also amplifying existing cognitive or strategic biases embedded in their training data.

Beyond wargaming, the authors note that LLMs are increasingly integrated into planning, policy analysis, and operational decision support. Consequently, a clear understanding of both their capabilities and limitations is essential. The paper calls for further research into defensive architectures—such as adversarially trained models and real-time integrity monitoring—to ensure AI-enhanced decision making remains reliable and secure in high-stakes environments.

In conclusion, this study positions LLMs as powerful yet vulnerable tools for strategic simulations. Their ability to generate insights and adaptively reason underpins their promise, but their susceptibility to manipulation underscores the imperative for resilient system design and meticulous oversight. Safe, reliable deployment in national security settings will hinge on marrying these models' innovative strengths with rigorous protections against adversarial threats.

LLMs offered a flexible solution that improved performance and simulated human-like activity, enabling more sophisticated strategic play and helping to anticipate adversary reactions.

Successfully deploying LLMs in strategic environments requires ensuring they are used safely and reliably.

Applied research

Financial Consequences of Geopolitical Turmoil and Trade Restrictions

Oliinyk, O., Grytsyshen, D., Romanchenko, Y., Tokarchuk, O., & Sedliakivska, K. (2025). Financial Consequences of Geopolitical Turmoil and Trade Restrictions. African Journal of Applied Research, 11(1), 439455-.

This article explores the multifaceted and dynamic relationship between geopolitical tension and financial impacts on international and domestic economies. The authors specifically address the overlap of sanctions as a tool of modern geopolitical policy and their secondary economic and humanitarian consequences. Using a qualitative approach based on content analysis and grounded theory, the study adopts a constructivist perspective to examine how geopolitical events cascade through economic systems and reconfigure financial geographies.

The paper argues that geopolitical events—though rooted in politics—carry broad economic repercussions far beyond combat zones. Sanctions, designed to punish wrongful conduct or deter aggression, often pit political objectives against the economic interests of both the sender and target. By imposing measures on governments, firms, and individuals, sanctions can trigger unintended side effects that dilute their intended impact. This tension lies at the heart of ongoing geoeconomic and geopolitical transformations in an interconnected world.

Geopolitical instability profoundly affects major economic sectors. Energy markets, in particular, experience price volatility, supply-chain disruptions, and realignments as states navigate sanctions or conflict. Foreign-exchange flows shift as nations reroute exports and imports to bypass closed markets, while stock indices react sharply to heightened uncertainty, reflecting investor anxiety and eroded confidence in economic forecasts. These dynamics underscore the profound interconnectedness of today's economies, where turmoil in one region can ripple across the globe.

Beyond economic costs, the study highlights the humanitarian and moral dimensions of sanctions. Broad measures against entire economies exacerbate social inequality, strain public health systems, and can contravene international humanitarian norms. The authors contend that policymakers must balance geopolitical aims with civilian protection, crafting sanctions that include clear safeguards to mitigate harm to vulnerable populations and adhere to universal legal standards.

For global businesses and financial institutions, these findings carry critical implications. Firms operating in multiple jurisdictions must integrate geopolitical risk into strategic planning, investment decisions, and compliance frameworks. A nuanced understanding of how political shifts affect trade flows, capital markets, and regulatory regimes is essential to maintain resilience and competitive advantage. Meanwhile, policymakers are urged to deploy economic tools like sanctions judiciously, informed by a deep appreciation of their systemic consequences.

Ultimately, this paper enriches the literature on geopolitics and economics by offering a comprehensive analysis of how political tensions and trade restrictions influence financial performance. It calls for a more sophisticated, ethically grounded approach to sanctions and for businesses to cultivate a heightened geopolitical awareness. In doing so, it lays a foundation for more effective policy design and corporate strategies that safeguard both economic stability and humanitarian principles in an increasingly volatile world.

Geopolitical instability impacts large economic activity sectors.

Geopolitical events, although primarily political in nature, have far-reaching economic consequences that extend much beyond the actual theaters of war.

Applied research

Geopolitical Tensions vs. Corporate Investment

Dissanayake, R., Mehrotra, V., & Wu, Y. (2018). Geopolitical risk and corporate investment. SSRN Electronic Journal, 143-.

This article outlines how rising geopolitical tensions impact business investment choices in America. Utilizing the Geopolitical Risk Index (GPR) built by Caldara and Iacoviello (2018), the authors gauge the impact of geopolitical uncertainty on firm-level capital expenditures over a long period from 1985 through 2017. The paper's pivotal hypothesis is that geopolitical risk constitutes a new form of uncertainty with significant implications for firm investment, especially in cases where investments are irreversible or financially costly to reverse.

The empirical study shows that heightened geopolitical risk leads to a marked decline in business investment. For instance, a one-standard-deviation rise in the GPR index cuts average investment by 13.2% over the following five quarters. This impact endures well beyond the initial spike in uncertainty and remains robust after controlling for macroeconomic and policy uncertainty, indicating that geopolitical risk operates through a unique channel.

A key contribution is the paper's distinction between geopolitical threats (GPT)—rising tensions or conflict threats—and geopolitical acts (GPA)—actual conflicts or interventions. The authors find that threats exert a deeper, longer-lasting drag on investment than acts themselves. In other words, firms are more hampered by uncertainty about potential future events than by the events once they occur. The study also identifies which firms are most vulnerable. Capital-intensive companies, with largely irreversible investments, show the smallest responses to rising GPR. In contrast, multinationals with substantial foreign exposure cut investment more sharply than domestically focused firms, reflecting the complexity and cost of adjusting fixed international operations to shifting political risks.

Interestingly, while geopolitical risk depresses investment, it does not materially affect corporate dividend payments. This suggests that firms treat geopolitical shocks as temporary when managing shareholder returns. Rather than reduce dividends—which could signal distress or undermine confidence—managers preferentially scale back investment plans.

Overall, the paper illuminates a crucial but underexplored link between geopolitical risk and firm behavior. It demonstrates that firms actively adjust capital spending in response to international political tensions, especially when risks threaten long-term strategic projects. By highlighting the persistent and asymmetric effects of geopolitical threats, this study enriches both theoretical investment literature under uncertainty and practical understanding of global corporate finance in an era of elevated political volatility.

Geopolitical risk constitutes a new form of uncertainty with significant implications for firm investment.

A one-standard-deviation increase in the GPR index reduces the average investment by 13.2% over the subsequent five quarters.

Applied research

Geopolitics and International Research Cooperation

Bamberger, A., & Huang, T. Y. (2025). From irreversible openness to protectionism: geopolitics and international research cooperation in the European Union. Journal of Education Policy, 40(1), 1943-.

This article discusses the shift in the EU's international research cooperation strategy, marked by rising geopolitical tension. Stepping back from critical geopolitics and the spatial politics of (re)bordering, the authors trace the historical evolution of European science policy from promoting liberal internationalism and open cooperation to a more security-oriented and selective regime around the strategic autonomy of the EU.

From 2012 to 2022, the EU pursued an integrative international research policy grounded in globalization, open science, and cross-border collaboration. Horizon 2020 exemplified this openness by fostering partnerships beyond EU borders, supporting large-scale projects with global reach. However, this one-way model of openness weakened as external threats and internal strains emerged. Bamberger and Huang describe a growing geopolitical consciousness in EU research policy, driven by concerns over espionage, technology leakage, and critical vulnerabilities in open scholarship infrastructure.

Several catalytic events accelerated this shift. Russia's occupation of Crimea in 2014 and its full-scale invasion of Ukraine in 2022 raised immediate security alarms, prompting the EU to reduce dependencies on adversarial states. Simultaneously, high-profile cyber-attacks linked to Chinese actors, illicit technology transfers, and academic freedom challenges in Hungary led EU policymakers to reassess potential research collaborators—regardless of their nominal alignment. These incidents spurred the European Commission to reconceive openness not as an unconditional principle but as contingent upon political and strategic alignment.

Bamberger and Huang argue that the EU has begun to "re-border" its science space, drawing clearer lines between "like-minded" partners and strategic risks. This is evident in the introduction of more rigorous security screening under Horizon Europe, tighter controls on foreign researchers' access to sensitive domains, and the strengthening of links between research programs and industrial competitiveness agendas. Rather than abandoning global cooperation, the EU is adopting a protective paradigm—engaging selectively with international actors while safeguarding its intellectual property, critical technologies, and core academic values.

Importantly, this recalibration does not signify a retreat from genuine collaboration. Instead, it acknowledges the increasingly complex interdependence of science, technology, and geopolitics. As strategic competition intensifies in fields like artificial intelligence, biotechnology, and quantum research, the EU seeks to strike a careful balance between openness and resilience. The authors caution, however, that these protective measures—while bolstering security—risk undermining the foundational ethos of global scientific collaboration and the free flow of knowledge that drives innovation.

Ultimately, Bamberger and Huang's analysis offers a timely examination of the EU's geopolitical realignment in science policy, illustrating its evolution from an ideal of scientific cosmopolitanism toward a more strategic, conditional model of international cooperation that reflects contemporary global uncertainties.

Between 2012 and 2022, the EU adopted an international research policy based on globalization, open science, and cross-border knowledge sharing.

Global uncertainty is pushing a once-open research structures towards more strategic, selective partnerships.

Applied research

Nuclear Energy: Intellectual Property at the Center of Geopolitical Battles

Meyer, T. (2025). Patents for power: Intellectual property and the geopolitics of nuclear energy technologies. Nuclear Engineering and Technology, 103470.

In this paper, Meyer argues that intellectual property (IP) lies at the heart of the geopolitical struggle over civilian nuclear power. Moving beyond traditional analyses of uranium supply chains, proliferation risk, and nuclear alignments, he shows that patents on reactor technologies increasingly dictate which countries may develop, export, or acquire nuclear capabilities—and thus sustain global technological hierarchies.

Drawing on science and technology studies and international relations, Meyer employs Barnett and Duvall's power typology to demonstrate that patents function not merely as legal safeguards for innovation but as instruments of structural and institutional power. Control over essential technological know-how enables patent holders to set access conditions, shape markets, and constrain rivals' freedom in the nuclear arena.

To substantiate this claim, the study builds an unprecedented database of over 35,000 nuclear-energy patents issued worldwide since 2000, categorized by filing country, reactor type, safety systems, fuel-cycle technology, and patent office jurisdiction. Contrary to the perception that Russia dominates the market solely through a state-backed export strategy, Meyer's data reveal that the United States, France, Japan, and the United Kingdom still hold substantial patent portfolios—and that emerging powers such as South Korea and China are rapidly increasing their patent filings.

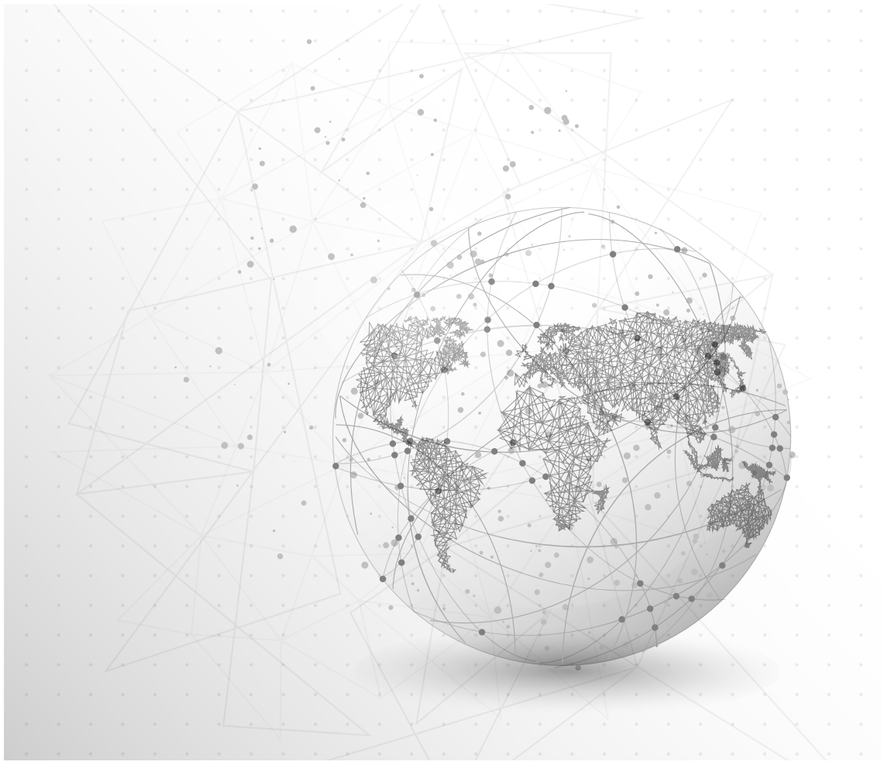
Meyer further examines how exporting states use patents strategically, filing not only in their domestic markets but also in potential client countries. This pre-emptive approach allows suppliers to shape the legal and technological terms of future projects, positioning themselves advantageously in tender processes while limiting recipients' technological autonomy. In this way, the global IP system becomes a contested battlefield in the wider game of energy supremacy. Recipient nations, meanwhile, seek to reclaim agency via indigenization policies. India and China, for example, have bolstered domestic nuclear innovation to reduce reliance on foreign IP and evade licensing constraints. While these efforts appear technical or economic, they are fundamentally political, underscoring the imperative to break geopolitical dependencies and assert sovereign control over energy futures.

Meyer's analysis frames IP as a critical—but often overlooked—vector of geopolitical power in nuclear energy. Patents, he contends, are far from apolitical tools; they advance strategic national interests. This insight calls for a re-examination of existing IP frameworks and greater awareness of the political stakes embedded in technological hegemony and global energy governance.

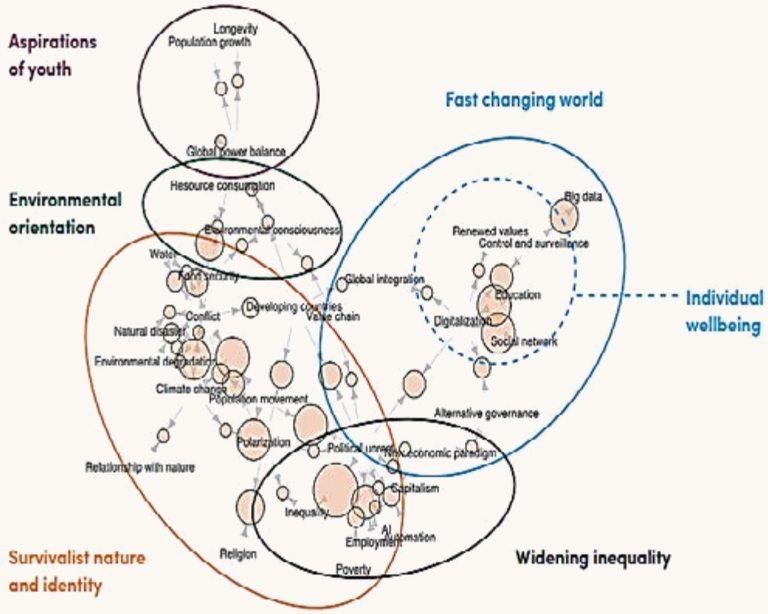
Patents on nuclear reactor technologies determine the conditions under which countries are permitted to develop and sustain global technological power hierarchies.

Control of key technological proficiency allows countries the ability to define access guidelines, decide upon markets, and restrict others' liberty in the nuclear arena.

3 The future in numbers

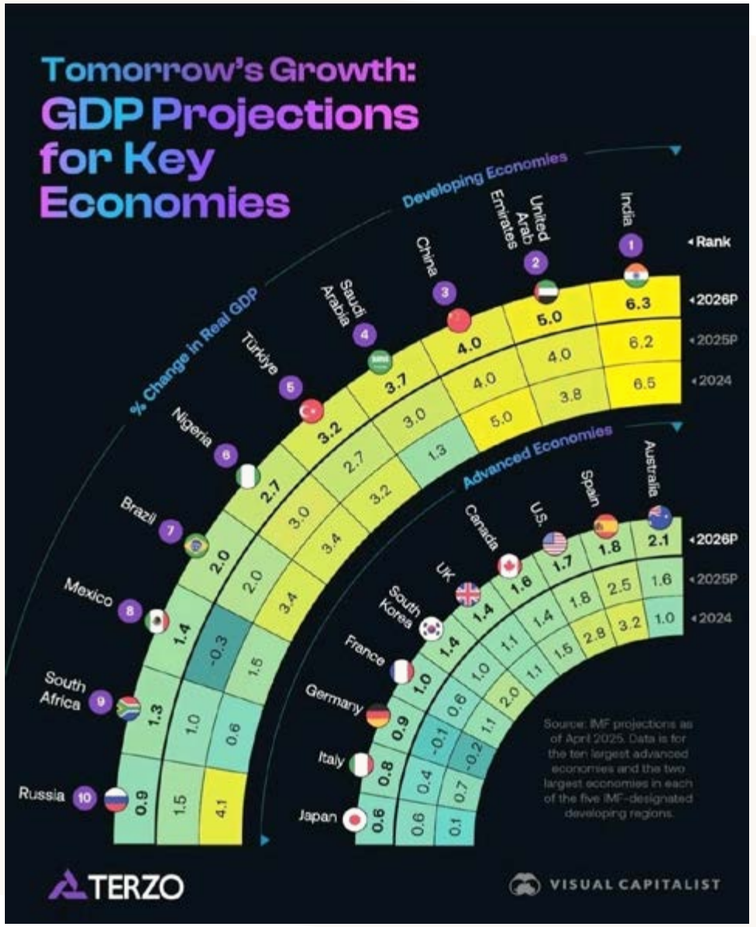


Interlinkages of Changes in Society by 2050: Culture and Governance

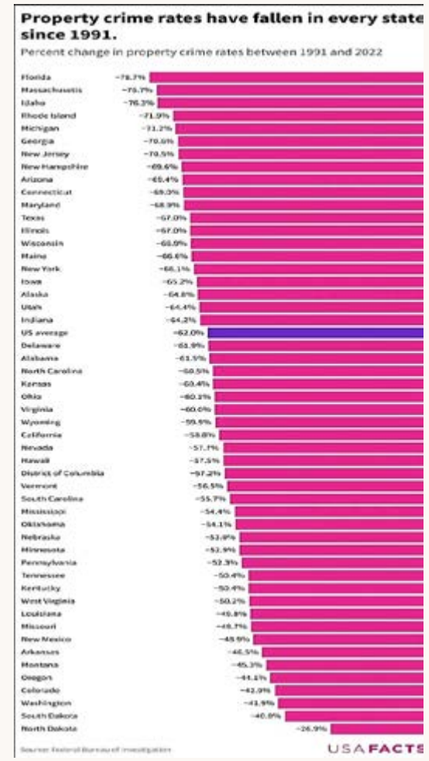


Source: Global Foresight Survey of Potential Changes in Society by 2050.

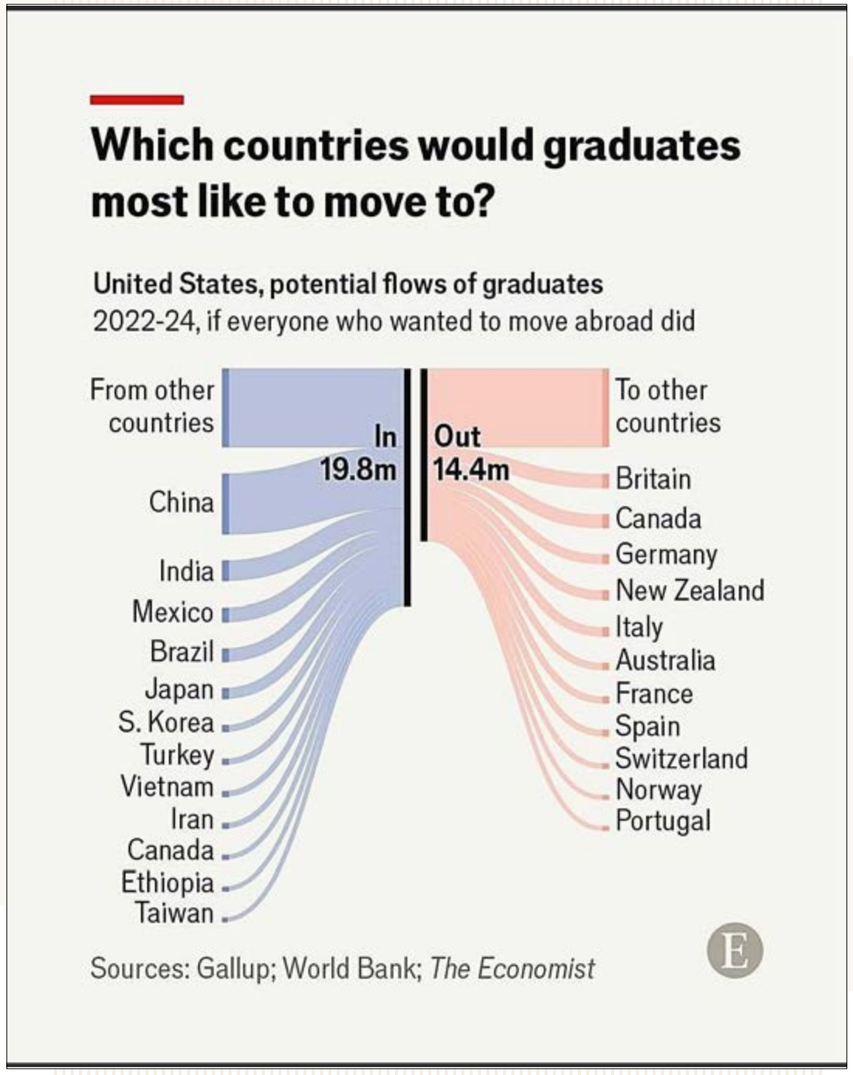
The World's Most Educated Countries



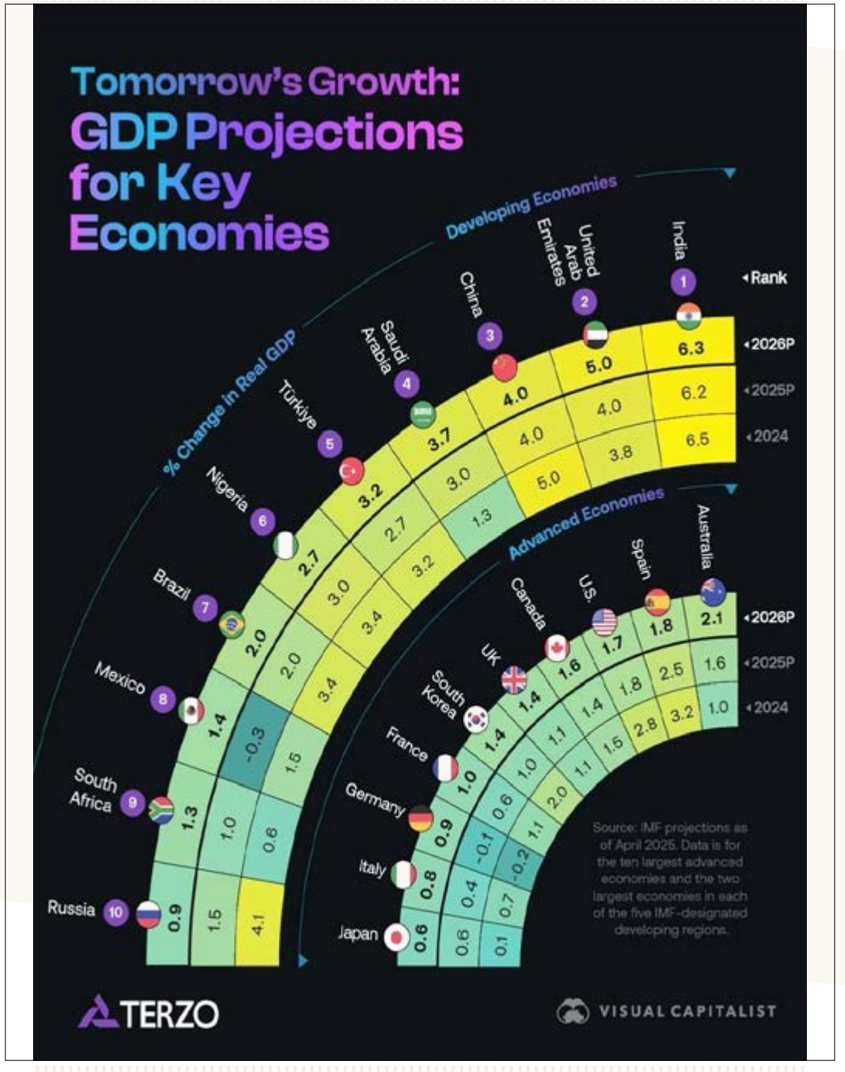
Race and Income Linked to Predictions about the Size of the Social Classes in 2050



The World's Most Educated Countries

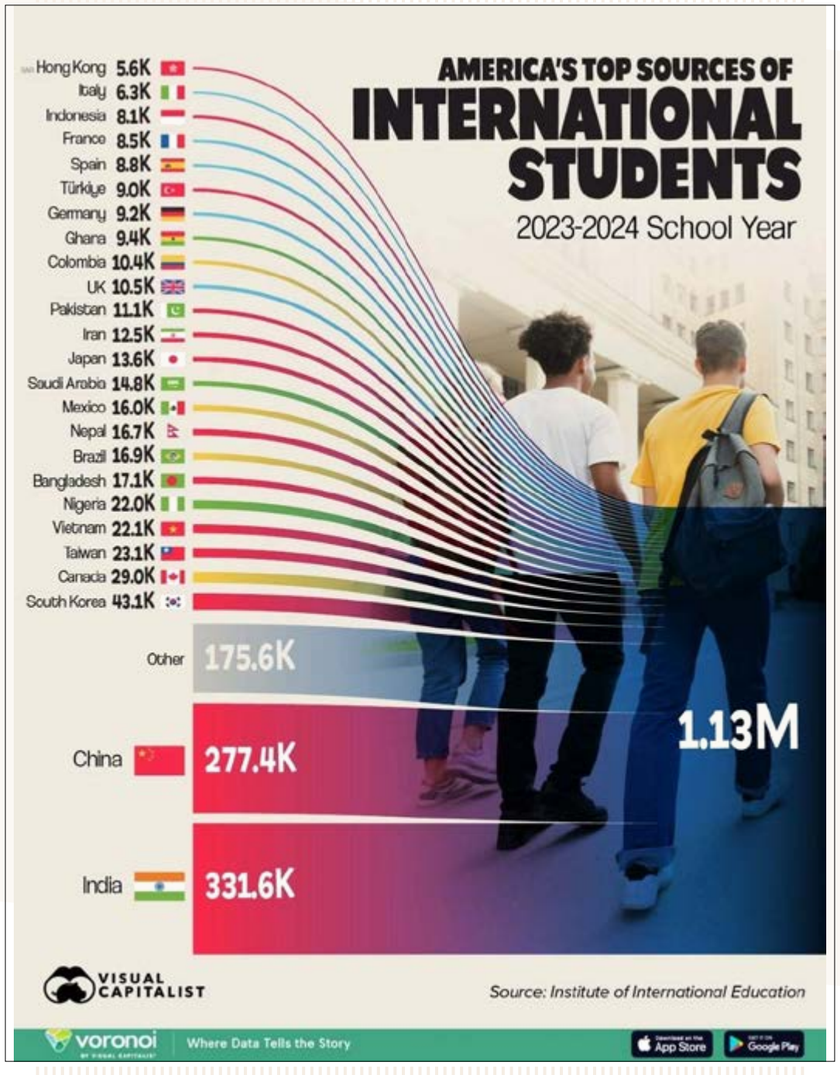


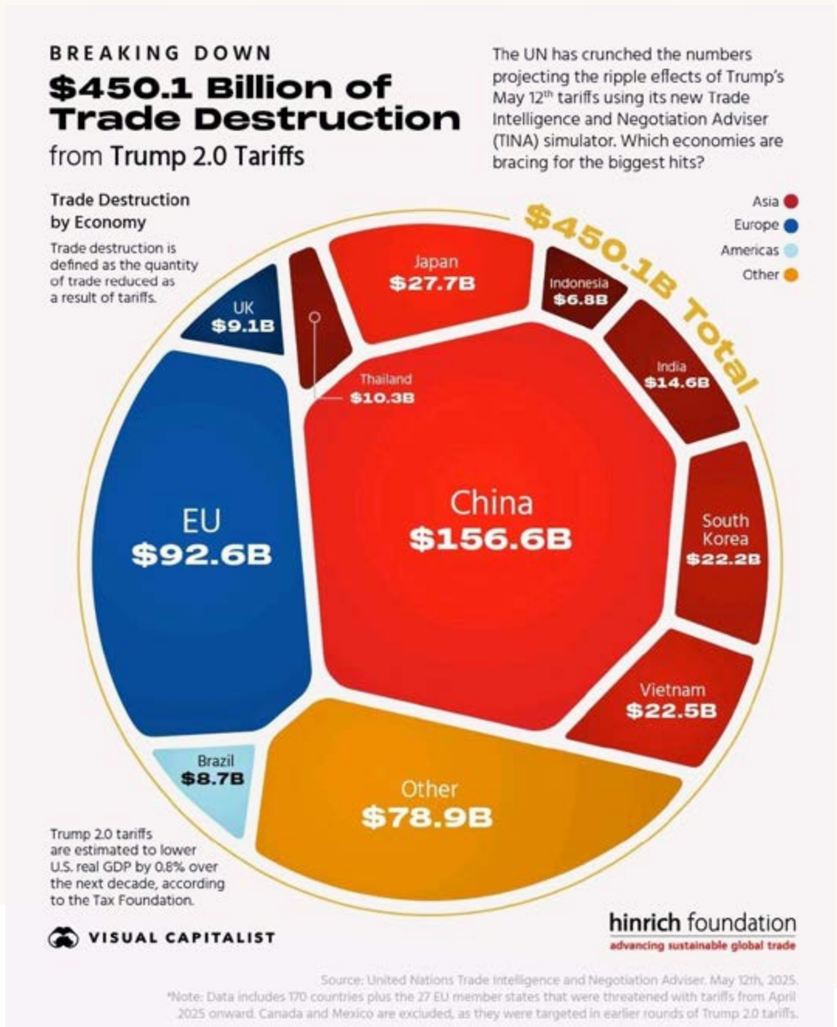
The World’s $12.5 Trillion Underground Economy



ChatGPT's Rising Traffic vs. Other Top Websites

The Energy Demand of U.S. Data Centers (2023-2030P)




BREAKING DOWN
$450.1 Billion of Trade Destruction
from Trump 2.0 Tariffs
The UN has crunched the numbers projecting the ripple effects of Trump's May 12th tariffs using its new Trade Intelligence and Negotiation Adviser (TINA) simulator. Which economies are bracing for the biggest hits?
Trade Destruction by Economy
Trade destruction is defined as the quantity of trade reduced as a result of tariffs.
Asia
Europe
Americas
Other
$450.1B Total
China $156.6B
EU $92.6B
Japan $27.7B
Indonesia $6.8B
India $14.6B
South Korea $22.2B
Vietnam $22.5B
Other $78.9B
Thailand $10.3B
UK $9.1B
Brazil $8.7B
Trump 2.0 tariffs are estimated to lower U.S. real GDP by 0.8% over the next decade, according to the Tax Foundation.
VISUAL CAPITALIST
hinrich foundation
advancing sustainable global trade
Source: United Nations Trade Intelligence and Negotiation Adviser. May 12th, 2025.
*Note: Data includes 170 countries plus the 27 EU member states that were threatened with tariffs from April 2025 onward. Canada and Mexico are excluded, as they were targeted in earlier rounds of Trump 2.0 tariffs.

تريندز للبحوث والاستشارات
TRENDS RESEARCH & ADVISORY

CONTACT US

TRENDS Research & Advisory
TRENDS Research & Advisory
Trends Research & Advisory
TRENDS Research & Advisory
trendsresearch