Future of Work Working Group Report

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Please note that this report was developed by experts of the Global Partnership on Artificial Intelligence's Working Group on the Future of Work. The report reflects the personal opinions of GPAI experts and does not necessarily reflect the views of the experts' organizations, GPAI, the OECD or their respective members.

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Co-Chairs Foreword



Dr. Wilhelm Bauer, Executive director of the Fraunhofer Institute for Industrial Engineering (IAO)



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Dr. Matthias Peissner Director, Head of Research Area Human-Technology Interaction

The Global Partnership on Artificial Intelligence (GPAI) was created as an international and multistakeholder initiative with the mandate of guiding the responsible development and use of AI in a way that is grounded in human rights, inclusion, diversity and innovation, and shared democratic values, as reflected in the <u>OECD Principles on Artificial Intelligence</u>.

In order to carry out this mission, GPAI has brought together experts from diverse sectors into four specific Working Groups: Responsible AI with a subgroup on AI and pandemics, Data governance, Future of Work, and Commercialization and Innovation.

The term of the Working Group (WG) on the Future of Work is in line with GPAI's global mission centered around human rights, inclusion and diversity. The WG is mandated to conduct analysis on how the deployment of AI can affect the working environments and the workers as well as how workers and employers can better design the future of work in such a way to preserve or even improve job quality, inclusiveness, and health and safety at the workplace.

Following the GPAI spirit of bridging the gap between theory and practice, Future of Work took a step-by-step approach of first observing AI in the workplace, then analyzing its impact with a specific focus on specificities across sectors, gender, and geographies, and lastly experimenting solutions and producing guidelines for a fair work with AI.

Exploring future use of AI at the workplace requires involving the future generation and engaging with them about their own Future of Work with AI. A community of students, the GPAI Junior investigators, has been onboarded with the working group. These GPAI Junior investigators conducted interviews in companies and helped to analyze insights from this work. A passing the torch process from one generation to the next one will make it possible to materialize the community as a whole. This community will be a major strength of GPAI to conduct projects and to prepare our societies for the future.

Our vision for the Future of Work Working Group is to explore the frontiers of possible futures and to design a factory of ideas. For this purpose, we have started to design and develop a virtual living lab open to participants from academia, industry, civil society and government. We should design the transition management and processes from today's reality to a better and more inclusive future.

We, as co-chairs of the Working Group, warmly thank all the experts for their commitment to this collective adventure and providing their time, knowledge and expertise to realize the projects. We would like to make specific mention of the leaders of our ongoing projects: Yann Ferguson for the "Observation Platform on AI at the workplace" and Mark Graham for the "Fair Work with AI" project.

Wilhelm Bauer

Yuko Harayama

Matthias Peissner



Working Group Overview and Experts

The GPAI Future of Work (FoW) Working Group's mandate and scope are to:

- conduct critical technical analysis on how the deployment of AI can affect workers and working environments as well as how workers and employers can better design the future of work.
- address how AI can be used in the workplace to empower workers, how employers and workers can prepare for the future of work, and how job quality, inclusiveness, and health & safety can be preserved or even improved.

The FoW Working Group is comprised of 34 experts and 1 OECD observer who contribute to the two projects conducted in the GPAI 2021 workplan. As a community, FoW is diverse in terms of stakeholders: 25 experts come from science, 7 from industry, 1 from government and 1 from a trade union. All GPAI members nominated 1 or 2 experts in the working group, thus ensuring the geographical diversity. Finally, gender representation is achieved with approximately 40% female experts and 60% male experts.

The wide spectrum of expertise of the participants in the Working Group has made it possible to form Committees on major themes regarding the future of work:

- Committee on Training, led by Michela Milano; it aims at assessing and developing AI-based methods to train workers and increase their skills, including for jobs of the future (immersive learning, MOOCs, adaptive learning...).
- Committee on Human-Machine Collaboration, led by Laurence Devillers and SeongWon Park; it focusses on analyzing techniques for human-machine collaboration, co-evolution and automated decision delegation, and their impact and the organization and on workers (including physical and mental health).
- Committee on Bias Management, led by Marianne Wanamaker; it provides insight on biases and inequalities generated through AI together with political, ethical and technical guidelines on how to correct them.
- Committee on Work Conditions, led by Mark Graham and Anne-Marie Imafidon; it conducts analysis on how decent and positive work conditions can be operationally fostered in situations characterized by the increasing use of AI solutions.

and two umbrella committees for developing the following projects, described in the remaining of this report:

- Committee on An Observation Platform on Al in the Workplace, led by Yann Ferguson.
- Committee on A Virtual Living Lab, led by Uday B. Desai.

Future of Work experts

Wilhelm Bauer; Executive director of the Fraunhofer Institute for Industrial Engineering (IAO); Germany

Rodrigo Castañeda Miranda; Former Vice President of Innovation, Science, and Technology Development; Mexico's National Chamber of Transformation Industries (CANACINTRA); Mexico Manuel Cebrián; Max Planck Research Group Leader (W2), Spain

Uday B. Desai; Former Director and Emeritus Professor; The Indian Institute of Technology Hyderabad; India

Laurence Devillers; Professor of Computer Science and Artificial Intelligence; University of Paris-Sorbonne/CNRS-LIMSI; France

Arisa Ema; Project Assistant Professor at the University of Tokyo; Visiting Researcher at the RIKEN Center of Advanced Intelligence; University of Tokyo; Japan

Olivia Erdelyi; Lecturer at University of Canterbury, College of Business and Law; New Zealand

Yann Ferguson; Sociologist at Institut Catholique d'Arts et Métiers; The Toulouse Institute of Technology; France



Tiago Figueiredo Vieira; UFAL - Federal University of Alagoas; Brazil

Carl Benedikt Frey; Director of Future of Work; Oxford Martin School, Oxford University; European Union

Mark Graham; Professor of Internet Geography; Oxford Internet Institute; UK

Yuko Harayama; Executive Director in charge of international affairs at RIKEN; Japan

John Hepburn; CEO and Scientific Director of Mitacs; Former Vice-President of Research and Partnerships at CIFAR; Canada

Sean Hinton; Founder and CEO of SkyHive; Co-Chair of the Canadian American Business Council's Entrepreneurs Circle; Canada

Elanor Huntington; Dean College of Engineering and Computer Science; Australian National University; Australia

Anne-Marie Imafidon; Founder and CEO of Stemettes; Trustee at the Institute for the Future of Work; UK

Rina Joosten; entrepreneur, board member and publicist, Seedlink Technologies; Netherlands Bogumił Kamiński; Warsaw School of Economics; Poland

Palmer Luckey; Founder of Anduril Industries; Founder of Oculus VR. United States

Michela Milano; Director of the Centro Interdipartimentale Alma Mater Research Institute for Human-Centered Artificial Intelligence; The University of Bologna; Italy

SeongWon Park; Director, Innovative Growth Research Group; National Assembly Futures Institute, Seoul; Korea

Matthias Peissner; Director, Head of Research Area Human-Technology Interaction; Fraunhofer IAO; Germany

KingWang Poon; Director of the Lee Kuan Yew Centre for Innovative Cities; Senior Director for Strategic Planning at the Singapore University of Technology and Design; Singapore

Alexandre Reeberg de Mello; Al Leader at SENAI Innovation Institute for Embedded Systems; Brazil

Paola Ricaurte Quijano; Associate Professor of Media and Digital Culture at Tecnológico de Monterrey; Faculty Associate at the Berkman Klein Center for Internet & Society, Harvard University; Mexico

Lorenzo Rosasco; Full Professor at the University of Genova; Visiting professor at the MIT; External collaboratore Istituto Italiano di Tecnologia; Italy

Ajay Shah; Professor; India's National Insitute of Public Finance and Policy; India

Lilijana Šprah; Head of the Sociomedical Institute; The Slovenian Academy of Sciences and Arts' Scientific Research Center; Slovenia

Borys Stokalski; Seed investor of VersaBox; Co-founder and partner at RETHINK; Poland

Oliver Suchy; Head of the Department on Digital Workplace and Workplace Reporting; The German Trade Union Confederation; Germany

Lay Lim Teo; Senior Managing Director (ASEAN) at Accenture; Member of Singapore's Future Economy Committee; Singapore

Lucía Velasco; Chief of Staff of the Secretary of State for Digitalization and Artificial Intelligence - Spanish Government; Spain

Marianne Wanamaker; Associate Professor of Economics at the University of Tennessee; Research Fellow at the Institute of Labor Economics (IZA); University of Tennessee; United States

Petra Weingerl; Assistant Professor of Law; University of Maribor; Slovenia

OECD observer

Stijn Broecke; Senior Economist (Future of Work) at the OECD

Progress Report

Following the guidance of the Steering Committee, FoW experts collectively decided to carry out two concrete projects in 2021: "Observation platform of AI in the workplace", and "AI for fair work".

The first project aims to design a transversal platform for collecting information on the impact of AI in companies and on workers and to implement an extended catalog of use cases. This information will be the basis to further conduct in-depth studies.

The second project is a concrete application of the GPAI mission to bridge the gap between theory and practice, since from an in-depth knowledge of the current reality, the objective is to propose recommendations to decision makers on how to implement AI for fair work. The challenge is to help organizations to implement decent conditions for worker with an inclusive process across geographies, ethnicities, gender, disabilities...

Observation platform of AI in the workplace

To build a better future for workers collaborating with AI, to be more inclusive on various criteria such as disability, gender, ethnicity... a mandatory initial step is observation. The aim is to capture what is happening in the real context of workplaces: observe AI in the workplace, gather use cases that are as diverse as possible, conduct qualitative analyses of its impact in different situations, geographies, sectors, users.

The collection of use cases by GPAI ensures it will be neutral and trustworthy. These two last criteria are central as the Observation platform will allow the experts to conduct further research and, for example, analyze the reality of AI in companies through: (1) the impact of cultural specificities in the way AI is implemented in the workplace based on a large number of use cases across geographies and cultural contexts, and (2) the possible changes in the way in which AI systems are implemented from ongoing observations. This will provide insights for establishing improved approaches toward human-centered AI in the workplace and will enlighten decision-makers, whether they are politicians or in the private sector.

In 2021, the project has undertaken three main actions:

- Improving the questionnaire by integrating the objectives defined by committees of the WG focusing on training, biases and human machine interactions. This resulted in making the survey more usable by experts for further research analysis. It was decided to introduce changes in the survey on a step-by-step basis to ensure consistency of the approach and to measure the informative value of each question. As a result, the questionnaire allows exploring the use of AI in the workplace to be explored around five dimensions: (i) Motivation for implementing an AI-system; (ii) Participation of workers in designing and developing the AI-system; (iii) Role of Human-Machine Interaction in the implementation; (iv) Considerations regarding ethics and inclusiveness; (v) Impact on workers, employment, processes, organization.
- Creating the students' community together with the status of GPAI Junior investigator given to each student. Students collect use cases at workplace in their respective countries, by means of interviews. The experts of FoW oversee the students, helping them to find use cases and analyze the interviews. An additional activity of the students is to collect information for the next generation of students so that the community can expand in time and include more countries. The first generation of the students' community included 5 students, each responsible for conducting 8 interviews in their own country, Canada, France, Italy and Spain. This allowed the catalogue of use cases to be increased from 54 in 2020 to 84 in 2021.
- Organizing the survey material around a constructive AI taxonomy¹. This map of AI solutions is intended to facilitate the establishment of a better interviewing strategy and a better structuring of the knowledge produced. This taxonomy is based on two dimensions that allow the classification of AI-systems.



¹ Borys Stokalski, Bogumił Kamiński, Robert Kroplewski: Design Patterns for AI Solutions: Towards a Constructive Approach to Smart System Design and Implementation, SGH Warsaw School of Economics Working Papers, 2021

The first dimension describes what type of behavior is expected from the AI-system.

The two extremes are:

- Autonomy the system is expected to act autonomously, without the need for human collaboration or supervision.
- Insight the system is expected to provide information, supporting an autonomous agent (human or non-human).

The second dimension designates the immediate beneficiary/user of the AI-system, which may be a machine, another system or a human. The two extremes are:

- Enhanced Human the system delivers information, a service or a product to a human being.
- Smart Digital Ecosystems the system provides value to a technological system.

As of the date of publication of this report, the 2020 catalog has been analyzed and initial findings are visualized in Figures 1 through 3 below.



Figure 1 shows the distribution of use cases per region.

Figure 2 shows the distribution of use cases according to business categories. Seventeen categories were considered.



Use cases business category

Lastly, Figure 3 shows a classification of use cases according to the taxonomy described above. This map offers an easy understanding of artificial intelligence techniques and tools described in the catalogue. From the 54 use cases of the 2020 catalogue, 48 have been classified and 6 have not, due to a lack of reliable information. The size of the blue circles is proportional to the number of use cases of classes.

Five classes are considered along the two axes

- Servant Proxies solutions that replace the cognitive work of people in service relationships with other people, machines or infrastructure (e.g. Smart Home hubs, autonomous vehicles, digital assistants in the areas of sales and customer service, care robots, concierge robots)
- **Digital Coworkers** solutions that expand / support people's cognitive work by providing knowledge and information supporting decision-making, solving non-trivial problems, ...
- Autonomous Operations Platforms autonomous cyber-physical platforms offering technological and business services (automated factories and warehouses, autonomous transport systems).
- Virtualization and Management of Assets & Processes solutions enabling the creation of digital images/simulations (digital twins) of various assets (tangible - buildings, machines, cities - and intangible - processes, systems, ...) in order to perform various types of operations on them (event prediction, configuration optimization, ...)
- Common Tools & Platforms horizontal tools and platforms facilitating the creation of solutions from other application classes (ML components, low-code environments focused AI solutions, ...).



Findings and Recommendations

In addition, qualitative findings were drawn from use cases described in the 30 interviews conducted in 2021 by the students' community.

1. Most of the experiments are successful but are not continued

Most of these use cases are Proof of Concept (PoC). They address fairly consensual issues: security, improvement of available information, production of new knowledge, reduction of the drudgery of tasks, improvement of quality... The results are often satisfactory. However, most PoCs do not lead to production. Performance is a necessary but not sufficient condition, because AI systems challenge organizations:

- Reorganize: AI systems imply rethinking the organization of the activity.
- Socialize: Al systems destabilize the value system associated with the activity.
- Practice: Al systems transform, generate or destroy professional practices.

2. Beyond success or failure, experiments enrich organizations

- A PoC is an obligatory step to apprehend the properties and potentialities of AI systems and develop a shared culture.
- The realization process of a POC produces an organizational learning effect because it engages a formalization process of the knowledge and know-how of an organization.

3. Good practices and recommendations for:

The success of a use case

- Establishing methodological principles of a PoC beyond the performance of the Al system: Integration issues in organizations are not sufficiently considered, which limits the conversion of these POCs into products.
 - Reorganize: AI systems imply rethinking the organization of the activity. e.g.: a nuclear power



plant incident analysis application adds an unmanageable cognitive load for the technician.

- Socialize: Al systems destabilize the value system associated with the activity. e.g.: the integration of an Al in the detection of bacteria in a dairy product makes the distribution of responsibilities in case of contamination too complex.
- **Practice:** Al systems transform, generate or destroy professional practices. *e.g.: the time* saved by the using a voice assistant reduces the opportunities for exchanges between colleagues and increases the time spent in a noisy room.
- Encourage and improve the integration of academic research: These collaborations are essential but project management can be lacking. Researchers need to integrate business constraints. e.g.: a research team had to develop a linguistic solution to help a customer-supplier relationship chatbot to capture the ambiguities of the word "thank you" in a conversation. The collaboration was stopped because the researchers could not commit to a deadline and proposed a "black box".

Empowering the worker

- Define the right trade-offs between usability and user involvement: HMIs must consider a good level of "cognitive tension" for the user. Ease of use is appreciated but can breed passivity and docility. e.g.: instead of giving a result, an application organizes a skin disease diagnosis interaction between the system and the doctor.
- Build a situated explainability of an Al system: The explainability of a system must be related to real work situations for Al systems to be accepted and understood. e.g.: an application for managing citizens' complaints does not communicate to technicians the elements that allow them to make their own judgement. "What was different compared to other tools is that we know more or less how it works, whereas here, there was a real lack of clarity about the results, how the tool obtained a result".
- Develop a general Al training independent of a particular application: Training in Al by designers of the use-case does not promote worker independence and makes them less effective co-designers of the Al system. e.g.: a company engaged in upstream Al training and experimentation workshops by academics prior to any deployment.

Fair AI:

- Accompany use-cases with an independent ethics committee: Public authorities have a role to play as this is not always a market requirement or in the budgets allocated to AI system development. e.g.: A video surveillance image analysis company has all its new projects assessed by an independent ethics committee.
- Diversify design teams to reduce bias in data: Diverse teams make it easier to incorporate a variety of perspectives and can complement pure statistical approaches. e.g.: a recruitment system developer ensures the social, cultural and gender diversity of its design teams to reduce the biases contained in the algorithms.

Fair work for AI

Many studies have been carried out on the ethics of work involving AI, as for instance by the OECD, the European parliament, Microsoft, the Vatican, and by most GPAI members. The main issue with existing initiatives to shape AI applications is that they are high-level, which can make them unenforceable, and hence that organizations are largely left to interpret and enact such ethics themselves. The focus on ethics can even be used as a way of getting around regulation, especially when technology companies opt for voluntary codes of practice that they have shaped themselves. The main way that AI ethics have been operationalized is in the context of privacy concerns, transparency and governance, yet questions around job quality, well-being and working conditions more generally have not received sufficient attention.

At the time of drawing up this report, all existing AI ethics guidelines are non-binding. This has left workers exposed to potential risks and abuse from AI technologies.

Despite the proliferation of high-level principles for AI ethics, there are no agreed-upon specific standards for fair, decent, or just work outcomes in workplaces in which humans work in tandem with

Al. There is a need, which the project is intended to fill, to understand how Al systems are already shaping working conditions and ensure that Al is used to foster decent and fairer work.

Building on existing benchmarks (such as the OECD's AI principles), the project aims are to determine AI best practices with regard to working conditions. This will result in a set of AI fair work principles and operationalizable processes through which such principles can be applied, measured, and evaluated in any workplace. Such principles and processes will be applicable to all AI use-cases and the experts will be engaging with partners to embed them in their technologies and business models.

Experts contributing to the project, together with a post-doctoral researcher funded by GPAI and hired by Oxford University in September 2021, are currently conducting a review and synthesis of existing just/ethical/fair AI principles, policies, and benchmarks.

Forward Look

In 2022, the Working Group will continue and strengthen its efforts in the two current projects "Observation platform of AI in the work place" and "Fair work for AI". Moreover, a third project will be started to design and set up a Living Lab on AI at work. This new project will complement the working group's mission and vision by adding a future perspective and manifold experimentation opportunities. This section summarizes the envisaged working program for 2022 and beyond.

Observation platform of AI in the work place

At short and medium-term, the experts of the WG will be continuing the project on five main tracks:

- developing the prototype of the Observation Platform. This platform will be directly integrated into the virtual living lab, the new project proposed by the WG for the GPAI 2022 workplan. A user of that living lab will consequently be able to not only experiment but also to gain a richer experience by having access to existing use cases.
- disseminating the Observation Platform. From the beginning of the project, the WG has been in dialog with the OECD so that the project will be complementary to their activities on Al at work. Indeed, the OECD is undertaking a sectoral survey (finance and manufacturing), focusing on large companies in Canada, Germany, Japan, USA, Austria, United Kingdom, Ireland and France. The Montreal Summit showed a strong interest from several Working Groups for the building of an accessible catalog of applied Al use cases at work. The catalog included in the observation platform would then serve as a basis for future collaborations between Working Groups. Additionally, the dissemination of the Observation Platform to the GPAI community and, more broadly, the community of researchers interested in the impact of Al at work and organizations will support new partnerships.
- **defining a more accomplished use case selection strategy**, based on representativeness criteria and on the taxonomy proposed by B. Stokalski et al.²
- **developing the students' community** with new generations of students from Japan, Brazil, India, New Zealand, ...
- **conducting further research** and analyzing the reality of AI in companies and the impact of cultural specificities in the way AI is implemented in the workplace.

Fair work for AI

The review and synthesis of existing just/ethical/fair AI principles, policies, and benchmarks conducted in 2021 will result in a document of the existing AI Fair Work principles together with their deployment strategy.



² Borys Stokalski, Bogumił Kamiński, Robert Kroplewski: Design Patterns for Al Solutions: Towards a Constructive Approach to Smart System Design and Implementation, SGH Warsaw School of Economics Working Papers, 2021

In the short term, at the beginning of 2022, the WG will assemble an international advisory group that will offer feedback on the previous document and allow the experts of Future of Work to produce a report on the principles and processes that balance meaningful standards of fair work with effective implementability.

Sharing this report to a broader audience of 200 worldwide thought leaders representing industry, labor unions and government will result in a first public draft of both principles and deployment strategy.

This report being translated in a least four languages for a maximum global impact, a virtual launch event will be organized to connect the release of key figures to industry, the labor movement, and government. Impact case studies of the adoption of the principles by organizations will also be conducted.

Living Lab

There are many definitions of *living labs* in the literature. Westerlund and Leminen (2011) describe them as "experimentation environments: (they) are physical regions or virtual realities where stakeholders form public-private-people partnerships (4Ps) of firms, public agencies, universities, institutes, and users all collaborating for creating, prototyping, validating, and testing new technologies, services, products, and systems in real-life contexts". They put forth that living labs are "co-creation ecosystems for human-centric research and innovation".

The proposed Living Lab of GPAI will be a virtual place, connecting a network of national physical Living Labs. It will allow the sharing of applied experiments to assess the impact of AI **at both individual and company levels.** Moreover, the project, since it will build a network on the virtual platform, will also help create new experimentation facilities for workers.

At the individual level, the Living Lab will allow workers to experience AI, share their experience on AI at work, and connect with similar AI communities and individuals.

At the company level, when companies connect to the virtual living lab, they will: find information for effective deployment of AI, be able to conduct virtual experiments for assessing impact, find experts for conducting experiments they already planned, and find a catalog of guidelines for using AI in their company and/or results of experiments conducted in the workplace in similar companies.

A key challenge of the project would be the monitoring of experiments over time and across countries and cultures, with an emphasis on how to make AI more human-centered in the workplace and more inclusive regarding gender, ethnicity, disability, linguistic diversity. It is envisaged that the platform will be an umbrella for the experimental work of the Committee on Training on the training processes and technology transfers between academia and industry and the Committee on Human-Machine Interaction on the evaluation of human-machine co-evolution for instance.

GPAI is aiming to "bridge the gap between theory and practice in AI by supporting cutting-edge research and applied activities on AI-related priorities". A Living Lab created by the GPAI would meet this objective and foster innovation through multi-actor and network-based collaboration on the subject of AI at work.

Engagement of external partners will concern:

• Sharing and connecting with people and communities in the broad domain of AI, Industry 4.0, and more specifically, in the domain of the future of work. The Living Lab is expected to have a big impact among the community in industry as well as academia, as it will build a global network for AI-enabled workspaces and innovation labs. These workspaces and labs will constitute a community dedicated to exchanging on applied experiments, at both the individual and company levels.

• Attracting people from different backgrounds to use the Living Lab for its guidelines on AI use in different sectors and countries. For example, Germany has developed some guidelines on their national AI-platform. Similarly, Singapore has also launched a "Job Redesign Guide in the Age of AI" at the GPAI Council Meeting in Dec. 2020 that is industry agnostic.

In the first phase, in 2022, the Living Lab will be built as a website that can be accessed via both mobile devices and laptops. It will include the following contents together with a search functionality:

- Actual case studies (or links to them) of the Observation Platform of AI in the Workplace.
- Additional use cases of specific identified areas e.g. chatbots, library of videos, and learning/skilling resources. Preliminary implementation of Augmented Reality/ Virtual Reality (AR/VR); in display only capacity; will make it possible to have functionalities identical to those of the future interactive platform;
- Seminal national reports/publications/living lab initiatives related to the future of work from participating member countries of GPAI.

Student experts will be engaged to contribute to this phase, thus strengthening the Students' community of the Working Group.

From late 2022 to mid-2023, the project will include the design and development of a prototype of an interactive platform including interactive resources that anyone in the world can experiment in order to develop their own AI strategies - these could be related to chatbots, AR/VR, skills/learning, and tasks/skills/job redesign that have the potential for international impact.

During the second half of 2023, a collaborative platform will be built on top of the previous interactive platform and it will include:

- Features that allow for the exchange of ideas and/or for communities of interest/practice and to form AI communities.
- Online spaces for collaborations on projects (these projects could possibly be curated before approval).