



Intellectual
Capital for
Communities
In the
Knowledge
Economy



Artificial intelligence and the next generation of competencies :

*How Digital - and Artificial Intelligence-
will impact jobs and professional qualifications?*

The World Conference on Intellectual Capital for Communities

15th Edition

Organised by

The European Chair on Intellectual Capital, the University Paris-Sud
And UNESCO's Intergovernmental Information for All Programme (IFAP)

With a country focus: **RUSSIAN FEDERATION**

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Venue: UNESCO

125 Avenue de Suffren, 75007 Paris
Room IV

PRESENTATION

The central theme of the 15th Edition of the World Intellectual Capital (IC) Conference is “**Artificial intelligence and the next generation of competencies: How will Digital – and Artificial – Intelligence impact jobs and professional qualifications?**” The future of jobs and the accompanying competencies are ever important questions as digital technologies have become ubiquitous and part of everyday life in a continuously changing society. This dynamic context requires new business models and other profound organizational transformations as digital intelligence is driving transformation via its sources, scope (now global), scale and speed (the 4s noted in Bharadwaj et al. 2013).

The debate on the impact of digital transformation on societies and the vulnerability of societies as we know it, is at the forefront of work by economists and international institutions (OECD, World Bank, UNESCO, ITO and WEF). Economists, such as Robert Gordon, consider that humanity is entering a period of slow growth where the impact of (digital) technology will be weak, while others consider that it will have a fundamental role in the transformation of jobs and productivity in general¹. Despite the lack of studies on the impact of robotics on employment, there is growing policy interest with regards to the impact of digital technology – especially artificial intelligence – on jobs and needed qualifications for the workplace of tomorrow.

The starting point: the impact of digitization on employment

The study by Frey and Osborne (2013)² paved the way for questions about the impact of robots on jobs. This was one of the first studies to systematically examine the impact of automation on jobs in the USA. It analyzed the probability of the computerization of 702 jobs in the USA and concluded that 47% were at risk. The level of risk varied depending on the type of job and the level of qualification. The sensitivity factor (risk) of various employment profile ranged from 99% for telemarketers to 0.28% for recreational therapists.

In France, a study by the *Conseil d’Orientation pour l’Emploi* (2017), provides an in-depth approach to job sensitivity. It begins with an investigation of working conditions (in 2013 mainly) and is based on the calculation of an Automation Index, which varies between zero and one. The distribution of the index is not homogeneous and it reaches its maximum over 0.7) for less than 10% of the labour force, while only 10% of jobs are likely to be entirely lost. However, almost 50% are likely to change.

In Japan, a study by the Nomura Research Institute concluded that 49% of industrial jobs are sensitive to automation, compared with 35% in Great Britain and 47% in the USA. The potentially high rate of automation in Japan is justified by the fact that many of the tasks that are already automated in Great Britain or the USA are still performed manually in Japan.

More recently (March 2017), Daron Acemoglu and Pascual Restrepo published a study that showed the considerable negative impact robotics have already had on jobs in the USA. Between 1990 and 2007, up to 670 000 jobs were lost in the manufacturing industry. According to the authors’ calculations, the introduction of a robot can replace 1000 jobs, which reduces the employment rate from 0.18 to 0.34%, and wages from 0.25 to 0.5%. For the whole OECD area, the study conducted by ZEW researchers Arntz et al. (2016) clearly shows that around 9% of jobs are automated and that this figure can be

¹ MIT economists, Erik Brynjolfsson and Andrew McAfee in particular

² Carl Benedikt Frey and Michael A. Osborne n The Future of Employment: How Susceptible are jobs to Computerisation ? September 17, 2013, available at : https://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf

differentiated by job type – the least skilled and therefore the least educated are most affected. The study concludes that one can see an evolution rather than a revolution; there is no scarcity of jobs, but rather a change in their structure. The World Bank also indicated recently that such an impact is also concerning emerging and developing countries.

Change in work content and conditions

Historically, technology has removed jobs in some sectors, while creating jobs in others. In the 1920s, the automobile destroyed jobs in equestrian transport, but led to the creation of motels in the hotel industry. Today, technology is changing the nature of work, not only by changing the boundaries of companies, but also by reshaping skills and reducing industrial employment, although the impact might have been exaggerated (World Bank, 2018).

It is therefore to be expected that the labour market will continue to be transformed by the ongoing digital revolution. There are a number of notable trends (OECD 2017):

- jobs in production will disappear globally, with possible redeployment between regions;
- new forms of work will emerge;
- the rapid growth of transactions on online platforms – in particular in housing and mobility – has resulted in the creation of a set of often precarious, flexible and temporary jobs;
- growth in self-employment, which is already observable in several OECD countries.

Given current developments, there is therefore a need for a systemic vision of the structuring of the labour market in relation to emerging value spaces. The differentiation between salary and non-salary jobs is a key aspect in understanding work forms – closely followed by the differentiation between formal and informal jobs.

From a long-term perspective, the question posed here is how employment is structured at regional or country level, and what are its main determining factors. This question should also be considered with regards to innovation in the workplace and the contribution of higher education institutions.

Artificial intelligence and the wetware³ landscape

Artificial intelligence (AI), driven by machine learning, offers a set of skills that can surpass human capacities in specific cognitive domains. AI deployment should also be considered from the standpoint of knowledge, creativity and social interaction. It is already present in formalized /programmable knowledge and is currently spreading to interactions with tacit knowledge. What will happen next? Will social interaction and wetware combine with programmable knowledge, taking advantage of deep learning? The stakes for societies are high, especially those related to investment in competences, and technology rent generation (IPRs).

Another issue is the issue of human–AI interaction (and substitution), especially with respect to literacy and numerical competences (Elliott, 2017). In other words, will the shift in jobs and skills change in the future, compared to what has been observed in the past, as a result of AI taking over existing and future competences?

This question raises the issue of aligning education with emerging needs. More generally, beyond the technological revolution, AI raises societal and ethical issues that need to be addressed globally

³ The wetware refers especially to the human mind and its capacity of ideas generation and combination. It often used as a concept complementary to hardware and software.

(UNESCO, 2018). It also raises the issue of AI knowledge distribution among nations – and therefore of the AI divide and challenges exist in terms of infrastructure, skills, knowledge gaps, research capacities and availability of local data, which need to be overcome to fully harness the deployment of AI.

Changing competencies: challenges

Competency Profile Analysis is an important way to determine job profiles. A recent report (McKinsey, 2018), indicates three trends:

- 1) A decrease in physical and manual skills over the period 2002–2030 (from 33% to 26%);
- 2) A decrease in the share of basic cognitive skills (from 20% to 15%, respectively);
- 3) No significant change in higher cognitive skills (around 22%); and
- 4) An increase in the respective shares of social and emotional, and technological skills.

The latter finding suggests the relative importance of technological, and complementary emotional and social interaction competences will grow. Furthermore, demand for the following specific skills is expected to grow (by 2022): analytical thinking and innovation; active learning and learning strategies; creativity, originality and initiative; technology design and programming; critical thinking and analysis; complex problem-solving; leadership and social influence; emotional intelligence; reasoning, problem-solving and ideation; and systems analysis and evaluation. At the same time, demand for the following skills is expected to decline: manual dexterity, endurance and precision; memory, verbal, auditory and spatial abilities; management of financial and material resources; technology installation and maintenance; reading, writing, mathematics and active listening; management of personnel; quality control and safety awareness; Coordination and time management; Visual, auditory and speech abilities; and technology use, monitoring and control (WEF, 2018). These lists indicate that besides technology, the future will see demand increase for competencies related to emotion, social interaction and creativity, while physical tasks and those requiring reading and writing skills are expected to decrease.

Beyond these lists, it is also important to develop a systematic view of how human–AI interactions will operate, and how they will impact competencies and job profiles and how higher education institutions and learning institutions prepare people by offering opportunities to acquire these competencies. Earlier editions of the *IC for Communities* conference series have discussed some of these issues. However, it will be explored in more depth in the 15th Edition of the World Conference on Intellectual Capital for Communities. The conference will look at these competencies from different angles: geographical (Asia, Europe, North and South America, and Africa), institutional (large companies, large international institutions, small companies), and professional (scholars, policy and private sector decision-makers). The following themes will be addressed during the conference:

1)-Foresight for next generation jobs and competency profiles

o ***Foresight exercises for next-generation jobs and competence profiles.*** Although several studies have addressed the issue of job profiles and competencies are often divergent. Key scholars and experts will be invited to present their methodological framework, content and conclusions, in order to arrive to a consensus on policy recommendations on the next generation jobs and competency profiles.

o ***Modelling future production systems:*** How will value (of any innovative offer) be created in the medium term? What is the role of digital and AI technologies? What are the characteristics of the 2030 enterprise? What will be the role of real-time decision-making, and what employment profiles and competencies will be required?

o ***Intangibility, digital, and future production systems.*** The question here relates to the type of exchange instruments used by people, especially in a context where acceleration – e.g. the accelerated production of links, becomes a major production system. The multiplicity of spaces for value creation

and the ubiquity of digitality means that one can expect exchange and social interaction to become organized along intangibles such as brands, data, and reputation.

o ***The role of digital data in productivity systems, and the impact on human capital.*** How will digital and human capital and, more generally, intangibles (intellectual capital) impact productivity growth? What new measures can be proposed, given emerging value production system(s)?

o ***Analyzing platforms and hybrid organizations.*** The hybridation of resources is being accelerated by theoretical role of data. This is clear in the case of digital platforms (“GAFA” and others) that have market power around which innovations are concentrated and organized. One also needs to look at hybrid organizations with a mix of private and public resources, or market- and non-market-oriented organizations. Beyond establishing typologies, it is important to document governance structures and processes in detail, examine the impact of innovation capabilities and the sustainability of ecosystems on society in general, and understand the impact of such an organisational form on job profiles and competence development.

2)- AI and the digital divide

o ***The AI technological and societal divide among nations.*** How will investment in AI affect the distribution of technological and scientific power among nations? How, specifically, will developing and emerging nations contribute to, and benefit from, the AI revolution? What is role of their scientific and technological capabilities?

3) The role of education in a world of AI

o ***Education and institutional challenges.*** The emergence of AI poses important challenges for education and innovation systems and the societies in general. Such challenges need to be addressed from different angles (funding, programmes, animation, and competences changes).

4) Responsible development and implementation of AI for learning

o ***AI and ethics.*** The massive use of data, together with human interfaces, means that AI raises important ethical issues. How should this dimension be addressed in different contexts? What is role of international coordination? How can AI contribute to a safe and ethical cyberspace? Several issues are then posed, including those related to the status of agent⁴.

5) Competencies for AI: Entry points and new orientations

o ***Key competencies for real-time management.*** The generalization of real-time data poses important questions for decision-making: What competences needed for the real-time management, and what impact such a management will have on organizational performance. As at former World Intellectual Capital (IC) Conferences these questions are addressed at various levels: country, regional and local, cities, companies and networks.

The conference will also address various recurrent topics from previous World Intellectual Capital (IC) Conferences, such as intangibles and productivity growth, innovation policy, information sharing, knowledge transfer, measurement, valuation and reporting, as well as the future research and policy agenda for intangibles and intellectual capital.

This year, following the success of IC8 (South Korea), IC9 (The Mediterranean), IC10 (Brazil), IC11 (China), IC12 (Africa), IC13 (Japan), IC14 (France), we will focus on Russia.

⁴ See the reports of COMEST / UNESCO. For instance the report of Robotics ethics. UNESCO, World Commission on the Ethics of Science Knowledge and Technology (COMEST). Report of COMEST on Robotics Ethics. 14 September 2017.

We will also dedicated a special session to the forthcoming special issue of Journal of Intellectual Capital on **Intellectual Capital, Firms' Innovation Growth and Emerging Value Spaces**.
http://emeraldgrouppublishing.com/products/journals/call_for_papers.htm?id=8559

ORGANISATION

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Agenda

Day 1 – Thursday July 11, 2019

8.15 – 8.45 am: Registration

8.50-9.10 am Welcome address:

Etienne Augé, Vice-president, Université Paris-Sud, Université Paris-Saclay

Session 1

ARTIFICIAL INTELLIGENCE, COMPETENCES OF TOMORROW : THE POLICY AGENDA

Moderator: **Dorothy Gordon**, IFAP Chair, UNESCO

9.10-11.00

- **Doreen Bogdan Martin**, Director, Telecommunication Development Bureau of the International Telecommunication Union (ITU), Switzerland (Video message)
- **Dominique Guellec**, Head of Division, OECD Directorate for Science, Technology and Innovation, Organization for Economic Co-operation and Development (OECD)
- **Bertrand Pailhès**, Coordinator, French National Strategy for AI, France
- **Takao Nitta**, Director, Bureau of Science, Technology and Innovation Policy, Cabinet Office, Japan
- **Maxim Fedorov**, Professor, Director, Skoltech Center for Computational and Data-Intensive Science and Engineering, Russian Federation

Health Break – Networking: 11.00 – 11.30

Session 2

Moderator: **Ahmed Bounfour**, Université Paris-Sud, Université Paris-Saclay

11.30-12.00

KEY NOTE SPEECH: LEONARD NAKAMURA, Emeritus Economist, Federal Reserve Bank of Philadelphia, United States of America, “Economic Growth Too Slow or Too fast: Measuring the Value of Intangibles and AI”

Session 3

FORESIGHT FOR NEXT GENERATION JOBS AND COMPETENCY PROFILES

Moderator: **Frédéric Caillaud**, INPI

12.00-13.15

- **Valerio Dilda**, “AI and the future competences”, partner, McKinsey, France
- **Ekkehard Ernst**, “Human vs machine intelligence – what’s at stake really?”, Chief Macroeconomic Policy Unit, International Labour Organization (ILO), Switzerland
- **Nicolas Sabouret**, “What AI can do and what it cannot do”, Université Paris-Sud, Université Paris-Saclay, France
- **Wolfgang Baer, Mustafa Canan, Raymond Jones, Ben Carlton, Johnathan Mun and Thomas Housel**: “Challenge for Acquisition of AI: An Econophysics Approach”, Naval Postgraduate School (NPS), United States

Lunch break 13.15 – 14.15

Session 4

EDUCATION AND JOBS IN A WORLD OF AI

Moderator: **Helena Tenorio Veiga de Almeida**, BNDES

14.15-15.30

- **Jerome Morrese**, Chief Executive Officer, Global eSchools & Communities Initiatives (GESCI), Kenya
- **Federica Saliola**, “The Changing Nature of Work”, Director, the World Development Report 2019, World bank report on next jobs, The World Bank (online)
- **Stefan Güldenber**, University of Liechtenstein, Liechtenstein, **Klaus North**, Wiesbaden Business School, Germany : “Tomorrow@Work: The Great Work Shift and What it Means for Our Lives”
- **Ilmi Salminen**, “Elements of AI”, Business Designer at Reaktor, Finland

Session 5

AI AND THE DIGITAL DIVIDE

Moderator: **Jaco Du Toit**, UNESCO

15.30-16.45

- **Irene Kitsara**, “AI and the digital divide”, Industrial Property Information Officer, World Intellectual Property Organization (WIPO), Switzerland (online)
- **Frédéric Caillaud**, “Business models of the owners of core AI patents”, Director of innovation, National Institute of Industrial Property INPI), France
- **Ahmed Bounfour** “Platforms and investment in IP for AI”, and colleagues; Professor, European Chair on Intangibles, Université Paris-Sud, Université Paris-Saclay
- **Mark West**, “I’d Blush if I Could: Closing the Digital Skills Gender Divide with Education and training”, UNESCO Consultant, France

Health Break – Networking: 16.45-17.00

Session 6

RESPONSIBLE DEVELOPMENT AND IMPLEMENTATION OF AI FOR LEARNING

Moderator: **Raffaele Trapasso**, OECD

17.00-18.30

- **Nathalie Smuha**, "Ensuring Trustworthy AI - a fundamental rights-based perspective to AI governance" Assistant Lecturer and Researcher at KULeuven, Faculty of Law & EC High-Level Expert Group on AI (Video message)
- **Bernd Stahl**, “When AI, Big Data and Ethics converge”, Director of the Centre for Computing and Social Responsibility, De Montfort University, United Kingdom
- **Thomas Baudel**, “Ethics of AI, for researchers and practitioners “, Director of research, International Business Machines Corporation (IBM), France
- **Irina Zoubenko-Laplante** “Technical and legal aspects relating to the desirability of a standard-setting instrument on the ethics of AI”, Section, Bioethics and Ethics of Science, Sector for Social and Human, UNESCO

18.30 Reception organized by the Permanent Delegation of the Russian Federation

Day 2 – Friday July 12, 2019

9.00-9.10 am Welcome address:

Moez Chakchouk, Assistant Director-General Communication and Information Sector, UNESCO

Session 7

COMPETENCIES FOR AI : ENTRY POINTS AND NEW ORIENTATIONS

Moderator: **Thomas J. Housel**, NPS

9.10-10.45

- **Cécile Wendling**, “Future of work and upskilling”, Group Head of Foresight at AXA, France
- **Omar El Sawy**, Kenneth King Stonier endowed Chair in Business Administration and Professor of Information Systems in the Data Sciences & Operations Department of the Marshall School of Business at the University of Southern California; **Pernille Rydén**, Associate professor, Technical University of Denmark, Denmark, “Real-Time Management: When AI goes Fast & Flow”
- **Catarina Midoes**, “Robots, ICT and their impact on EU labour markets”, Bruegel
- **Colin de la Higuera**, “Key digital and information literacy competencies for AI”, UNESCO Chair for training of teachers through OERs, University of Nantes, France
- **Fengchun Miao**, Beijing Consensus on Artificial Intelligence and Education, Chief, Unit for ICT in Education. Education Sector, UNESCO

Health Break – Networking: 10.45 – 11.00

Session 8

ON THE WAY TO THE SOCIETY OF DIGITAL EQUALITY: CHALLENGES AND PERSPECTIVES

Moderator: **Boyan Radoykov**, UNESCO

11.00-12.45

- **Mikhail Nasibulin**, 'National programme 'Digital Economy of the Russian Federation': how Russia Works with Knowledge and Information', Director of the Department of Digital Economy Projects Coordination and Implementation, Russian Federation
- **Ivan Lobanov**, 'Formulation of Future Competences through Educational Programmes', Rector of the State University of Management, PhD, Russian Federation
- **Pavel Terelyansky**, 'The Trap of Intellectual Capital Reproduction', Advisor to the rectorate, professor of the Department of Information Systems of the Institute of Information Systems of the State University of Management, Russian Federation
- **Svetlana Malkarova**, 'Overcoming Digital Inequality: Perspectives of Digital Volunteering Development', Vice rector of the State University of Management, executive director of the UNESCO Chair 'Societal, Legal and Ethical Frameworking of Knowledge Societies', PhD, Russian Federation

Lunch: 12.45– 14.00

Session 9

INTANGIBLES CAPITAL AGENDA : AN UPDATE

Moderator: **Leif Edvinsson**

14.00-15.30

- **Yann Menière**, "Patents and the Fourth Industrial Revolution: the inventions behind digital transformation ", Chief Economist, European Patent Office (EPO)
- **Helena Tenorio Veiga de Almeida**, " the Brazilian agenda on intangibles", Banco Nacional de Desenvolvimento Econômico e Social (BNDES)
- **Noboru Konno**, "Knowledge ecology and new organizational practices", President at Japan Innovation Network, Japan
- **Carolyn Lin**, "Digital Competences: Comparing Advanced Countries with Developing Countries", The New Club of Paris & National Chengshi University

Health Break – Networking: 15.30 – 15.45

Session 10

INTANGIBLES, PRODUCTIVITY AND INNOVATION GROWTH

MODERATOR: **Marianne Paasi**, TU Berlin

15.45-17.30

This session will be dedicated to the forthcoming special issue of Journal of Intellectual Capital, to be issued around the H2020 Global Into project

- **Hannu Piekkola**, "Intangibles and labor-augmenting technical change", University of Vaasa,
- **Felix Roth**, "Intangible Capital and Labour Productivity Growth: Panel Evidence for the EU from 1995-2015", University of Hamburg
- **Keung Oui Kim et al.**, Université Paris-Sud, Université Paris-Saclay, "The contribution of ICT on productivity focusing on intangibles and interior/exterior ICT externalities"
- **Alberto Nonnis et al.**, Université Paris-Sud, Université Paris-Saclay, "Analyzing the productivity contribution of intangible assets and participation in global value chains"
- **Francesco Baldi**, University of Turin, **Lenos Trigeorgis**, King's College, "Valuing Human Capital Career Development: A Real Options Methodology"

17.30

Concluding Remarks

End of the conference