Intellectual Capital for Communities In the Knowledge Economy

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Artificial intelligence and the next generation of competences :

How Digital - and Artificial Intelligence- will impact jobs and competences profiles?

The World Conference on Intellectual Capital for Communities

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PRESENTATION

The central theme of the 15th Edition of the World Intellectual Capital (IC) Conference is **"*Artificial intelligence and the next generation of competences: How will Digital – and Artificial – Intelligence impact jobs and competence profiles?*** Due, in particular, to digital ubiquity, societies and organizations are undergoing an in-depth transformation. Acceleration has become the new matrix for the functioning of our societies. The emergence of new business models is another testament to profound organizational transformation. 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 has recently been relaunched following work by economists and international institutions (the OECD, the World Bank, UNESCO, the ITO, the WEF); notably there are big questions about vulnerability. Economists such as Robert Gordon consider that we are 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 general (MIT economists, Erik Brynjolfsson and Andrew McAfee in particular). Despite the lack of studies of the impact of robotics on employment, there is a growing policy interest with regards to the impact of digital technology – especially artificial intelligence – on jobs and competence creation and transformation.

The starting point: the impact of digitization on employment

The study by Frey and Osborne (2013) 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 analysed 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, 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 US. The potentially high rate of automation in Japan is justified by the fact that many of the tasks that are already automated in 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 United States. 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 differentiated by job type – the least skilled and therefore the least educated are most affected. The study concludes that we are seeing 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 the firm, 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 salaried and non-salaried 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 wetware 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 formalised /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 our 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 (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 competences: 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, math 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, we also need to develop a systematic view of how human–AI interactions will operate, and how they will impact competences 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, they are the focus of IC 15, which looks at them from different angles: geographical (Asia, Europe, North and South America, and Africa), institutional (large companies, large international institutions, small firms), and professional (scholars, policy and private sector decision-makers).

1) We propose a set of themes that we consider highly relevant for decision-making:

1)-Foresight for next generation jobs and competency profiles

- ***Foresight exercises for next-generation jobs and competence profiles***. Although several recent studies have addressed the issue of job profiles and competences, their main findings are sometimes consistent, but 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 what advice should be given to policymakers, given the state of the art.
- ***Modelling future production systems*****:** How will value be created in the medium term? What is the role of digital and AI technologies? What are the characteristics of the 2040 enterprise? What will be the role of real-time decision-making, and what employment profiles and competences will be required?
- ***Intangibility, digitality, and future production systems*****.** The question here relates to the type of exchange instruments used by people, especially in a context where acceluction becomes a major production system. The multiplicity of spaces for value creation and the ubiquity of digitality means that we can expect exchange and social interaction to become organised along intangibles such as brands, data, and reputation.
- ***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)?
- ***Analysing platforms and hybrid organizations.*** The hybridation of resources is being accelerated by the critical 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. But this is also the case for hybrid organizations with a mix of private and public resources, or market- and non-market-oriented organizations. Beyond establishing typologies, we need to document their 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

- ***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**
   - ***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
   - ***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?

5) **Competencies for AI : Entry points and new orientations**
   - ***Key competences for real*****-time management. The generalisation 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 organisational performance?

As at former IC conferences, these questions are addressed at various levels: country, regional and local, cities, firms and networks.

We will also address various recurrent topics from other IC conferences series, 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.

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".

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