International perspectives and research on the 'Future of Work'.

2019 – This book is an anthology made by Frauenhofer Institute for Industrial Engineering, IAO in Stutgart, Germany and is based on the contributions to a conference on the 'Future of Work' in December 2018 and a scientific symposium in July 2019. The conference was accompanied by a 'Virtual World Tour', a 24-hour trip around the world connecting with 12 renowned institutes.

These events took place in the frame of a priority research program 'Work in a digitalized world', that was funded by the German Federal Ministry of Education and Research (BMBF) and the European Social Fund (ESF).

The book consists of three main parts:

- Future of work (general)
- Artificial Intelligence and work
- Skills and competences.

Future of work

The first article *'Work, competencies and their development in a digitalized world',* is written by four colleagues from Frauenhofer Institute. The authors state that digitalization distributes work and decision making between humans and technology in new ways and describe the skill development, competence development, work design, transformation process and the future of work in Germany, on the basis of literature and research.

'The diversity in platform work: impact on working conditions' is the title of the second contribution to this part and written by an author working at Eurofound. 'Platformwork' refers to the matching of supply and demand for paid work through an online platform. The dynamic development of new platforms in the last decade has resulted in diverse working conditions, some are advantageous others are not. To design and implement effective approaches a more nuanced discussion should take place on the type of platform work and the accompanying working conditions, employment status, algorithms and representation.

From Australia's QUT Business School came a contribution with the title: *'Human after all: The evolution of work in the digital age'.* The article explores the vast opportunities emerging in the future of work and the growing opportunities for human contribution: the future of work being human after all.

Authors based at the Simon Fraser University, RWTH-Aacken, ISSIP and IBM, all in Germany contributed with*: 'The future of work: digital workers helping to get people get things done.'* They seek a way between the 'dystopian' camp stating that in the future machines will perform most of the jobs making humans irrelevant and the 'utopians' who argue that machines will be performing all the grunt work, leaving the creative work to humans. In the chapter they reflect on the appropriate new policies to grow trust in business and societal institutions, such as management, networks and regions.

'How to tackle the future of work?' is the title of the fifth article in this part. The aim of the authors, from Mondragon University in Spain, is to introduce the principal challenges faced by the global labour market and the strategies enforced in terms of the future of work with a special focus on the local perspectives of enterprises in the Basque enterprises. Of these enterprises case studies were made in 2018. These enterprises are not the frontrunners in digitalization but they have a competitive advantage in their long tradition of organizing conform a cooperative or participative model.

Two authors, one from Brazil, Federal University of Parana and one of TH-Köln in Germany wrote the following chapter in this part: *'The future of work with project management.'* A steady trend seems to be that work is organized through projects. Therefore the authors studied Project Management of the Future (PMF). They introduce a conceptual model for PMF, focusing on the project business and present recommendations about qualification of project managers, professional competences, courses by universities and independent training courses.

The last article in this part is: '*The use of hybrid meeting formats to increase international collaboration.'* Examples of hybrid meetings illustrate how digitalization is changing the way in which scientific conferences and similar events are run. The article ends with the question how best to combine analog and digital forms of interaction.

Artificial Intelligence and work

'Smart AIwork – designing a brighter narrative of the future of work' is the title of the first chapter in this part. It was written by colleagues from Frauenhofer. In the Frauenhofer project SmartAIwork a framework model for AI in clerk work-processes was developed and applied in pilot projects in three companies. The following aspects appeared to be especially important for the implementation of AI. Firstly, developing a joint understanding of AI; secondly, analyzing work processes closely for a performance increasing mutual adaptation with AI technology; and thirdly analyzing AI induced changes of job profiles and developing competencies. Thus an integrated design of work processes, AI technology and job profiles can be facilitated.

In the second article two researchers from Frauenhofer present the Future Work Lab2.0. The title of the piece is: *'Future Work Lab 2.0: Artificial Intelligence for manufacturing work of the future'.* The goal is to establish an innovation laboratory for work, people and technology at the Stuttgart location of Frauenhofer. 50 Demonstrators showcasing manufacturing work of tomorrow make new possibilities of digitalization and automation in the core areas of industrial work, transparent. A learning world serves to raise awareness, qualification and social dialogue. The lab also provides a platform for national and international advanced research and academic discussion about changes in industrial work.

In the article *'Artificial Intelligence in education and work',* researchers from the Birkbeck Knowledge Lab in London expose what their Lab contributes to the development of educational programs and interdisciplinary research that will offer opportunities to individuals and organisations to be continually re- and upskilled so that they can contribute and benefit from data- and AI driven opportunities.

The last piece in this part has the title: *'Collaboration between Human Intelligence and Artificial Intelligence: digital transformation in Taiwan'* by researchers from Taiwan. This paper illustrates the digital transformation by exploring recent studies of future human work evolution in new patterns. It discusses the great potential for empowering human workers with human-machine collaboration by combining Human Intelligence with Artificial Intelligence, which will transform working patterns instead of replacing jobs outright. Furthermore the concept of 'digital twins' is introduced and two use cases provided of how digital twins solutions are integrated for selected industries, such as manufacturing and farming.

Skills and competences

'Managing workforce disruption, upskilling and hybrid teams in the AI-driven future of work' is the title of the first paper in this part, written by an author of Boston College. The author focuses on three developments that will require rethinking of today's workforce management vision and strategies.

1. disruptive changes in the composition of the workforce;
2. dramatically accelerating need for upskilling, retraining and multiskilling strategies;
3. emergence of hybrid teams in which full- and part-time employees work directly with robots and with remote, freelance and other categories of human workers.

Follows an article by two colleagues from MIT with the title: *'Making online education work'*. The authors introduce the popular MIT's massive open online course (MOOC) named 'Shaping Work of the Future'. And they argue that many of the potential draw-backs of computer and web-assisted learning can be overcome through a deliberate focus on student engagement and community building. On the basis of research and discussion within a interdisciplinary Task Force they concluded how the next iteration of the online course seek to incorporate student feedback, while continuing to stress the engagement with emerging technologies needs to go hand in hand with a dialogue about broader social goals and values.

A group of researchers from the University of Leuven in Belgium and TNO in the Netherlands contributed with a paper with the title: *'Dominant technology and organization: impacts of digital technologies on skills'*. The authors describe a new approach to investigating , unraveling and explaining the implications of digital technologies for skills. This requires a more precise way to assess technology in a company, building on three main arguments. Firstly, not all technologies are equal, secondly the focus should be on how technology investment decisions of companies are actually taken and thirdly, the organizational context should be considered. In the last part of the paper the framework is applied to two professions in Dutch industry: that of middle managers and of packaging.

'Technology, automation and skills demand for the future of work', is the title of the paper delivered by two colleagues who work at Cedefop. This paper reviews the available evidence on the impact of technology on jobs and skills. Drawing on data from the Cedefop European skills and jobs survey (ESIS) the authors state that 14% of the EU jobs are at high risk of substitution by machine learning algorithms., while about 5% of EU adult workers are affected by skill-displacing technology that can facilitate job loss. But primarily, they argue is the recognition that technology is a source of job-task transition and skill development which require modernization of EU vocational educational and training systems.

Reference

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