Arts, Research, Innovation and Society

Gerald Bast
Elias G. Carayannis
David F. J. Campbell *Editors*

The Future of Education and Labor

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Series Foreword

Creativity in general and the Arts in particular are increasingly recognized as drivers of cultural, economic, political, social, and scientific innovation and development. In Art and Research (see Bast 2013; Ritterman et al. 2011), some of the principal questions to be explored by the **ARIS** project (**Arts, Research, Innovation, and Society**) are outlined (Bast et al. 2015, 2018; Carayannis et al. 2017):

1. Could and should Artists be Researchers?
2. How are the systems of the Arts and the Sciences connected and/or disconnected?
3. What is the position and status of the arts in defining the terms "progress" and "development"?

Other key questions that the **ARIS** project aims to focus on are (these are clearly indicative and not all-inclusive or exclusive of additional issues, themes, and questions that may arise in the context of the **ARIS** theory, policy and practice discourse):

1. What is the impact of the Arts in societal development?
2. How are the Arts interrelated with the mechanisms of generating social, scientific and economic innovation?
3. What is, could be and should be the nature, dynamics and role of the Arts in shaping the Research and Innovation theories, policies and practices such as the New Growth Theory?
4. In the same context, what could and should be a new understanding of the support for funding of the Arts as a stand-alone pillar with its own merit, value and potential along with Research and Innovation of smart, sustainable and inclusive growth that is socially-embedded and cohesive development and progress?
5. What are the socio-economic, socio-political, socio-technical implications for Society from the answers to any and all of these questions?

    5.1. For instance, what are the particular implications for sectors such as Politics, Education, Health, Manufacturing and others?
    5.2. How can the New Growth Theory be understood in the context of Creative Economies, Societies and Democracies?

5.3. Are there limits to growth in the traditional economy and what is the role of artistic research and arts-based innovations in re-defining growth, development and progress?
5.4. What are the role, inter-dependencies and dynamics of Arts versus Research versus Innovation versus Society as catalysts, drivers and accelerators of smart, sustainable and inclusive growth?
5.5. What is the relationship of Arts to "quality of democracy" in theory and practice?

In particular and based on this context, Creativity, Invention, Innovation and Entrepreneurship (CI2E, see also the Springer Encyclopedia of CI2E, edited by Carayannis 2013) are key drivers of smart, sustainable and inclusive growth that are both enhanced and constrained by financial as well as social and environmental considerations and trade-offs. In this context, **Arts, Research, Innovation and Society** (**ARIS**) are four vantage points from which one could derive and develop insights as to how best to drive cultural, economic, political, social, and scientific development and progress.

The Springer **ARIS** series explores (at the macro, meso and micro levels and in terms of qualitative as well as quantitative studies) theories, policies and practices about the contributions of artistic research and innovations towards defining new forms of knowledge, knowledge production (see Mode 3 Knowledge Production Systems by Carayannis and Campbell 2006, 2009, 2012) as well as knowledge diffusion, absorption and use (Pirzadeh 2016). Artistic research, artistic innovations and arts-based innovations have been major transformers as well as disruptors of the ways in which societies, economies, and political systems perform. Ramifications here refer to the epistemic socio-economic, socio-political and socio-technical base and aesthetic considerations on the one hand, as well as to strategies, policies, and practices on the other, including sustainable enterprise excellence considerations in the context of knowledge economies, societies and democracies (see also Quadruple and Quintuple Helix innovation systems concepts by Carayannis and Campbell 2009, 2010, 2014; furthermore, see Campbell 2019).

The series features research monographs, edited volumes, proceedings, Briefs, and textbooks, and may also include handbooks and reference works, and in-print as well on-line rich media encapsulations of ideas and insights, representing cutting-edge research and the synthesis of a body of work in the field.

Please contact ALL three editors at the emails provided for further information and proposals submission guidance.

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ARIS book series: http://www.springer.com/series/11902

Until now and recently, the following three volumes already have been published in the **ARIS** book series:

Bast, Gerald / Elias G. Carayannis / David F. J. Campbell (eds.) (2015). Arts, Research, Innovation and Society. New York, NY: Springer (http://www.springer.com/business+%26+management/technology+management/book/978-3-319-09908-8 and http://www.springer.com/de/book/9783319099088).

Pirzadeh, Ali (2016). Iran Revisited. Exploring the Historical Roots of Culture, Economics, and Society. New York, NY: Springer (https://link.springer.com/content/pdf/bfm%3A978-3-319-30485-4%2F1.pdf and http://www.springer.com/de/book/9783319304830).

Bast, Gerald / Elias G. Carayannis / David F. J. Campbell (eds.) (2018). The Future of Museums. New York, NY: Springer (https://www.springer.com/de/book/9783319939544).

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References

Bast G (2013) Preparing a "creative revolution" – arts and universities of the arts in the creative knowledge economy. In: Carayannis EG (Editor-in-Chief), Dubina IN, Seel N, Campbell DFJ, Uzunidis D (Associate Editors) (eds) Encyclopedia of creativity, invention, innovation and entrepreneurship. Springer, New York, pp 1471–1476. http://link.springer.com/referenceworkentry/10.1007/978-1-4614-3858-8_442 and http://www.springerreference.com/docs/html/chapterdbid/378818.html

Bast G, Carayannis EG (2018) In: Campbell DFJ (ed) The future of museums. Springer, New York. https://www.springer.com/de/book/9783319939544

Bast G, Carayannis EG, Campbell DFJ (eds) (2015) Arts, research, innovation and society. Springer, New York. http://www.springer.com/business+%26+management/technology+management/book/978-3-319-09908-8

Campbell DFJ (2019) Global quality of democracy as innovation enabler. Measuring democracy for success. Palgrave Macmillan, New York. https://link.springer.com/book/10.1007/978-3-319-72529-1 and https://www.palgrave.com/de/book/9783319725284

Carayannis EG, Campbell DFJ (2006) "Mode 3": meaning and implications from a knowledge systems perspective. In: Carayannis EG, Campbell DFJ (eds) Knowledge creation, diffusion, and use in innovation networks and knowledge clusters. A comparative systems approach across the United States, Europe and Asia. Praeger, Westport, pp 1–25

Carayannis EG, Campbell DFJ (2009) "Mode 3" and "Quadruple Helix": toward a 21st century fractal innovation ecosystem. Int J Technol Manag 46(3/4):201–234. http://www.inderscience.com/browse/index.php?journalID=27&year=2009&vol=46&issue=3/4 and http://www.inderscience.com/search/index.php?action=record&rec_id=23374&prevQuery=&ps=10&m=or

Carayannis EG, Campbell DFJ (2010) Triple Helix, Quadruple Helix and Quintuple Helix and how do knowledge, innovation and the environment relate to each other? A proposed framework for a trans-disciplinary analysis of sustainable development and social ecology. Int J Soc Ecol Sustain Dev 1(1):41–69. http://www.igi-global.com/free-content/41959 and http://www.igi-global.com/article/triple-helix-quadruple-helix-quintuple/41959

Carayannis EG, Campbell DFJ (2012) Mode 3 knowledge production in Quadruple Helix innovation systems. 21st-century democracy, innovation, and entrepreneurship for development. SpringerBriefs in business. Springer, New York. http://www.springer.com/business+%26+management/book/978-1-4614-2061-3

Carayannis EG, Campbell DFJ (2014) Developed democracies versus emerging autocracies: arts, democracy, and innovation in Quadruple Helix innovation systems. J Innov Entrepreneurship 3:12. http://www.innovation-entrepreneurship.com/content/3/1/12

Carayannis EG (Editor-in-Chief), Dubina IN, Seel N, Campbell DFJ, Uzunidis D (Associate Editors) (eds) (2013) Encyclopedia of creativity, invention, innovation and entrepreneurship (CI2E). Springer, New York. http://link.springer.com/referenceworkentry/10.1007%2F978-1-4614-3858-8_509# and http://www.springerreference.com/docs/html/chapterdbid/378878.html

Carayannis EG, Bast G, Campbell DFJ (2017) Arts, research, innovation, and society: ARIS. In: Carayannis EG (Editor-in-Chief), Dubina IN, Seel N, Campbell DFJ, Uzunidis D (Associate Editors) (eds) Encyclopedia of creativity, invention, innovation and entrepreneurship. Springer, New York, pp 1–5. https://link.springer.com/referenceworkentry/10.1007/978-1-4614-6616-1_200024-1

Pirzadeh A (2016) Iran revisited. Exploring the historical roots of culture, economics, and society. Springer, New York. https://link.springer.com/content/pdf/bfm%3A978-3-319-30485-4%2F1.pdf

Ritterman J, Bast G, Mittelstraß J (eds) (2011) Art and Research: Can Artists be Researchers? Kunst und Forschung: Können Künstler Forscher sein? Edition Angewandte. Springer, Vienna. http://link.springer.com/bookseries/7882 and http://link.springer.com/book/10.1007/978-3-7091-0753-9

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Chapter 1
Introduction to the Future of Education and Labor

Gerald Bast, Elias G. Carayannis, and David F. J. Campbell

Abstract Due to an increased and increasing automatization (robotic manufacturing) and digitalization and a more widespread and increased use of AI (artificial intelligence and logarithms), the character of labor and work in more general will change dramatically in the near future. While the significant transition from an agricultural society toward an industrial society took almost a century and was limited to certain regional parts of the globe, the speed of implementing robots and artificial intelligence is tremendously high and spreads all over the globe. There are estimations that about half of the present employment in the United States is at risk, and the situation in other countries is comparable. The way social and economic processes are working has become significantly complex. Combining knowledge in a creative way is at least as necessary as the increasing and collecting of knowledge. The educational system does not reflect this sufficiently. Cross-disciplinary (interdisciplinary and transdisciplinary) thinking and learning is not in the main focus of our educational systems. Educational systems must change now – when the risk of economic and societal collapse should be avoided.

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Keywords Artificial intelligence · Automatization · Digitalization · Education · Fourth industrial revolution · Labor · The future of education and labor

The message is radical.

A recent study indicates that "about 47 percent of total US employment is at risk" due to computerization and other changes in the labor markets (Frey and Osborne 2013, p. 1). Furthermore, the authors (Frey and Osborne 2013, p. 44) assert: "While computerization has been historically confined to routine tasks involving explicit rule-based activities …, algorithms for big data are now rapidly entering domains reliant upon pattern recognition and can readily substitute for labor in a wide range of non-routine cognitive tasks …. In addition, advanced robots are gaining enhanced senses and dexterity, allowing them to perform a broader scope of manual tasks …. This is likely to change the nature of work across industries and occupations."

While the significant transition from an agricultural society toward an industrial society took almost a century and was limited to certain regional parts of the globe, the speed of implementing robots and artificial intelligence is tremendously high and spreads all over the globe. So the transition process caused by the recent technological revolution will affect much more people within a much shorter time than any other industrial revolution before.

Due to an increased and increasing automatization (robotic manufacturing) and digitalization and a more widespread and increased use of AI (artificial intelligence and logarithms), the character of labor and work in more general will change dramatically in the near future. This will be the case not only in the western countries but also in the larger emerging economies in Asia, for example, China and India. According to recent studies, almost half of the current workplaces in the United States may disappear within the next one or two decades. Future labor will be creative, will take the social context more into account, and will be more interdisciplinary (bringing together different competences and skills). Knowledge society, knowledge economy, and knowledge democracy require changes and innovations in our educational systems.

If, at all, the technological revolution will create new jobs similar to the amount of jobs it will destroy, it could be an extremely painful and dangerous process. It is no secret that dramatically and quickly rising unemployment has significant negative impact on society, being clearly correlated with poverty, crimes, physical and mental diseases, as well as political radicalism.

Given the foreseeable changes in society and the economy, which will result from technological developments, that seems all too logical. Automatable work, manual as well as mental, will be taken over by machines within a few years. Fields of work that cannot be automated, whether they already exist or are newly developed, will require higher education – but one that is significantly different from what is currently offered.

The way social and economic processes are working has become significantly complex. Combining knowledge in a creative way is at least as necessary as the increasing and collecting of knowledge. The educational system does not reflect this sufficiently. Cross-disciplinary (interdisciplinary and transdisciplinary) thinking and learning is not in the main focus of our educational systems. Consequently, the systems of academic research follow and apply disciplinary or even subdisciplinary strategies, avoiding cross-disciplinary research approaches, and are not supporting interdisciplinary academic career models.

Along the fourth industrial revolution, fueled by the recent technological revolution, we need an educational revolution. This revolution has to be a revolution driven by creativity and social intelligence. This revolution has to implement holistic approaches into our system of teaching, learning, and research. This revolution will provide experts in synthesizing knowledge and in bridging the towers of knowledge (University of Applied Arts Vienna and Gerald Bast 2018).

Educational systems must change now – when we want to avoid the risk of economic and societal collapse.

The current systems of education and research are rooting in the age of industrialization. Nowadays, there is still this focus on producing industry, service economy, perhaps also bureaucracy. While societal environments, economy and the character of labor are increasingly in a process of dramatic changes, the educational systems and the leading principles of research about labor and employment do not change adequately.

Big research projects like the Human Brain Project have to provide their own preparatory programs in order to make university graduates able to participate in these types of necessarily multidisciplinary and cross-disciplinary research projects.

The future of education and labor is essential, and the future of labor is also dependent and depending on the future of education.

1.1 The Organization of Contributions to This Book

After the introduction, the book is organized in two main sections. In Part One, the future of education and labor is discussed from the perspective of *The Economy Does Matter, the How and Why*. In Part Two, the future of education and labor are being discussed and rediscussed and reassessed from the perspective of *The Arts Do Matter, the How and Why*.

Altogether, there are 12 main contributions to this book (without the introduction and conclusion), written by a diversity and plurality of authors. In the following, we provide an overview and preview of short summaries of the chapter contributions (see also the abstracts directly to the chapters later in the book).

1.2 Part I: The Future of Education and Labor – The Economy Does Matter, the How and Why

1. *Gerald Bast* introduces into the theme of the future of education and labor. He emphasizes that there is a need for driving a revolution in creativity, social intelligence, but also in educational system reform. Cross-connecting in interdisciplinarity and transdisciplinarity is key. He is envisioning a contemporary version of the ancient Greek society, where the (normal or routine) work could be carried out (to a further extent) by machines, computers, robots, and artificial intelligence while the definition of human labor has changed fundamentally - towards contributing to societal development mainly with the means of social and creative intelligence.
2. In the contribution of the *OECD* (Organisation for Economic Co-operation and Development), reference is being made to an important OECD project: "The Future of Education and Skills: Education 2030." The project is multiyear in design, and the contribution summarizes the thinking so far. It considers the challenges that young people will face; suggests the importance of the concept of a learner agency; proposes an overarching learning framework with a number of new transformative competencies; reviews the nature of the knowledge, skills, attitudes, and values that young people will need; and ends with possible curriculum design principles.
3. *Robert Helmrich, Enzo Weber, Marc Ingo Wolter, and Gerd Zika* focus on the consequences of Industry 4.0 for the labor market and education. Their study focuses on the economic effects of the phenomenon of "Industry 4.0," the digitalization of the production processes. These developments involve considerable challenges for companies as well as on a political level. The results show that Industry 4.0 will accelerate the structural change toward more services. In the process, labor force movements between sectors and occupations are significantly greater than the change of the number of employees overall. However, that also means that, given a delayed implementation, the assumptions are turning against the business location Germany: there possibly then will be less exports and demands for more "new" goods from abroad.
4. The changes that have affected academic institutions and scientific work in the last twenty years can be explained by the evolution of organization and strategy of the firms. As *Blandine Laperche and Dimitri Uzunidis* assert, the current network firm represents the fourth stage in the organization of production, characterized by the importance of networks, linking salaried people from the firm and from many other institutions like universities and research centers, with the aim to increase the innovation capacity. The constitution of the enterprise knowledge capital largely involves academics institutions and scholars themselves, who are urged to commercialize their research and develop narrow partnerships with companies. The rules of the markets are now dominating the production of

knowledge, and this may explain the increasing flexibility and agility that increasingly applies to academic institutions and work.

5. What are innovative approaches to and for the "creativity economy"? This question is being raised by *Igor N. Dubina, David F. J. Campbell, and Elias G. Carayannis*. An underlying model would have to interrelate creativity, knowledge, and innovation economies and reflect on the role and place of creativity and labor in a progressing economy. Without sufficient creativity, the further development and evolution of innovation may be constrained. Therefore, creativity and innovation play together in a mutually reinforcing and beneficial way, referring to scenarios for the "new" economy. Here also patterns of a coevolution of creativity and labor are working with each other in an interactive manner and also in an intersectoral and interdisciplinary (and transdisciplinary) sense and setting. Creativity serves as a crucial input for innovation that again acts as a driver for development and progress in knowledge economy, knowledge society and knowledge democracy.
6. *Gerald Bartels, Igor N. Dubina, David F. J. Campbell, Jerrold McGrath, and Elias G. Carayannis* focus their analysis on creativity (in the frame of this chapter contribution). It is being argued for the pedagogical importance of a nuanced understanding of creativity as a communicative and collaborative phenomenon in the field of university education. Especially training undergraduate students to work in interdisciplinary groups is vital as many of those will have to develop into "young leaders" and solve the major global environmental and social problems challenging our planet. Also a literature review is being carried out that emphasizes specifically the social and interactive elements of creativity.
7. Into which direction (directions) is professional economic education developing in Russia? *Igor N. Dubina, Elena G. Limanova, and Gagik M. Mkrtchyan* discuss major trends in the development of modern economic education in Russia on the levels of high school, university, academia, and professional society. As a special case, also statistical data are being provided and discussed that are characterizing the situation with economic education in the Novosibirsk region of Russia. The authors also hypothesize about the future of economic education in Russia and in the world.
8. Whereas a "higher education for all" rationale has dominated the OECD (Organisation for Economic Co-operation and Development) policies until the beginnings of the twenty-first century, recent initiatives and publications point into the direction of a "skills for all" approach. This shift can be regarded as an acknowledgement of the diversity of the educational systems of the OECD member countries, as it is being asserted by *Laura C. Sturzeis*, with skills equally stemming from vocational education and training and general (higher) education becoming the focus of policy formulation.

1.3 Part II: The Future of Education and Labor – The Arts Do Matter, the How and Why

9. In her contribution, *Ruth Mateus-Berr* addresses "Artists as Translators in Societal Turns." Artists will be consulted as translators of different fields, because they govern divergent thinking, inherit entrepreneurial spirit, and are used to collaborate with other disciplines. The artistic approach inherits an empathic understanding of the human and of the material, which is creatively applied in artistic works. Interdisciplinary teamwork is the crucial expertise of current and future work. Education on these interdependent skills must be implemented in school and higher education institutions and must also be provided for lifelong learning.
10. What are possible creative technologies in an art education? As *Richard Jochum* emphasizes, the ubiquity of digital technology has been a major driver of change in art education and has forced art programs across the United States to recalibrate their curricula. A particular focus will be placed on six principles that guided the expansion and reorganization of a graduate-level art and art education program. The analysis explores the relationship between art, technology, and education as a critical trifecta.
11. *Arno Böhler* raises the question, how a transdisciplinary cooperation of heterogeneous research practices could be organized in the future? He argues that such a cooperation would be about the construction of transdisciplinary milieus allowing for the untimely self-transgression of the various disciplines, knowledge cultures, and research practices. In the presented case study, the self-transgression (transcendere) of philosophy started with having declared philosophy as a kind of artistic research. This was a way of proceeding, which finally forced to create an arts-based image of thought in the context, of which the sensual rooting of thought in sensory processes was recognized, materially presented, and bodily exposed firsthand by way of lectures, interventions, lecture-performances, and morning and evening readings.
12. With QUERKRAFT, *Barbara Putz-Plecko* is indicating that transformative and visionary force necessitates creativity, but a creativity that has to be freed from its straitjacket. It is a force that requires something artists possess in great measure: the ability to change perspectives, to question traditions, to break with routines and taboos, to see dichotomies as processes, and to draw creatively on the antinomies of chaos and order, fantasy and reality, and improvisation and perfection. Embedded in this system, art education sees its task as being to identify the specific (defining) peculiarities of education by means of art and culture and to make them productive in the educational process. Art schools maintain spaces that are consciously structured to ensure that encounter and debate regularly take place (for example, in the form of art classes). The goal is to create within the study framework a space for learning and development that provides impulses.

In the conclusion, again the whole thematic spectrum of the book is being reflected. *The Future of Education and Labor* expresses the amount and degree of change that is currently transforming society, economy, and democracy.

The message is radical and the change will be even more so radical.

References

Frey Benedikt Carl and Michael A. Osborne (2013) The future of employment: how susceptible are jobs to computerization? http://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf

University of Applied Arts Vienna/Gerald Bast (eds) (2018) Digitale Transformationen. Gesellschaft, Bildung und Arbeit im Umbruch. Vienna: Brandstätter Verlag https://www.dieangewandte.at/digitale_transformationen

Chapter 2
The Future of Education and Labor

Gerald Bast

Abstract Along the fourth industrial revolution, fueled by the recent technological revolution, we need an educational revolution. This revolution has to be a revolution driven by creativity and social intelligence. This revolution has to implement holistic approaches into our system of teaching, learning and research. This revolution will provide experts in synthesizing knowledge and in bridging the towers of knowledge. If we do not follow this path, we will lose the race either against the machines or against the big data companies, which already identified education as the most important business of the twenty-first century and are about to take over the educational sector following shareholder interests instead of societal interests in a democratic society of free men and women. In the ancient Greek society – which many western politicians often refer to – the free (at that time only male) citizens spent their time with thinking, debating, writing, deciding on societal issues, exercising or perceiving arts and sports, and caring for people beyond base and servile work. The base and servile work was done by slaves. In our times, we in fact could think about having a society of free women and free men who dedicate their lives to shaping their private and sociopolitical as well as the socioeconomic sphere and to actively participating in jointly developing the cultural, political, and economic environment where they are living in. In the modern free version of the ancient Greek society, more of the (boring) work could be carried out by machines, computers, robots, and artificial intelligence, while people could focus more on the interesting work.

Keywords Ancient Greek society · Fourth industrial revolution · Future of education · Future or labor · University of the future

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The human history is a race between education and catastrophe. (H.G. Wells)

Something dramatic is going to happen within the next 30 years.

There will be manufacturing but no manufacturers.

There will be sale. But no salespersons.

There will be mobility. But no drivers.

There will be banking. But no banks.

There will be public administration. But no civil servants.

The implications of this fourth industrial revolution will for the first time reach deep into the supposedly well-educated middle classes.

Medical professions will be affected, as artificial intelligence systems are quicker, better, and more precise in diagnosis and medication, because the computers compare millions of patient histories and x-ray pictures by using image reading and pattern recognition.

Legal professions will be affected as algorithms only in a few hours can read and analyze hundred thousands of document pages, which masses of lawyers needed months for reading and analyzing.

Teachers will be affected as schools and universities will be totally different to educational institutions at all levels we know now.

Wherever work, or parts of working processes, can be standardized or determined by algorithms, humans will be replaced by machines. Computers and robots are faster, more flexible, more precise, and above all cheaper than human labor.

Serious studies estimate that 40–50% of current jobs will disappear within the next 20 years (Frey and Osborne 2013).

In 2017, the Harvard Business Review reported that according to McKinsey (2017) "1.2 billion full-time equivalents and $14.6 trillion in wages are associated with activities that are automatable with current technology. This automation potential differs among countries, ranging from 40% to 55% (Harvard Business Review 2017)."

As once in the nineteenth century the Silesian weavers were unable to stop the first industrial revolution, neither can we halt the current changes in our working world caused by digitalization and automation. And the coming changes that will be brought about by biotechnology and quantum physics are even more difficult to comprehend. The remarkable rates of automation in China and India already show the dimensions of the coming job losses on a global scale.

It does not take much imagination to recognize the enormous social and politically explosive potential if half of what we now understand as human work is about to collapse in less than a single generation.

These developments are impossible to stop. One can demonize them, ignore them, play them down, or one can face up to them. At the present, they are generally being ignored or played down, by political leadership as there are no simple answers to this situation. A common argumentation is that there were industrial revolutions driven by new technologies before and each time we had even more jobs after a period of adaption. But the recent technological revolution that has already started will massively change our ways of working and living, our entire culture. It is not

comparable to earlier technological revolutions because it is faster and further reaching than any previous one. The current technologies, from artificial intelligence and robotics to genetic engineering and nanotechnology will, within a few years, affect practically every aspect of life and have serious effects on human life and the effects will take place globally. Even if certain technologies are not immediately and directly available to everyone on a global scale, their use by even a part of humankind will have effects on the others. This time it is totally different to the times when the power of horses was replaced by the horsepower of machines, different to the times when farm workers moved to industrial assembly-lines and different to the times when assembly-line workers could move to a cash desk in a supermarket.

Robotics and artificial intelligence will at first destroy middle-skilled jobs. Jobs that demand low or almost no skills will survive for a longer time just for economic reasons and jobs with very high specialized, cross-disciplinary and social skills will hardly be affected by automation. So transition will be painful for the masses of middle-skilled people as they won't be able to move into new jobs that demand higher or different skills without significant education and training. While the significant transition from an agricultural society toward an industrial society took almost a century and was limited to certain regional parts of the globe, the speed of implementing robots and artificial intelligence is tremendously high and spread all over the globe. So the transition process caused by the recent technological revolution will affect much more people within a much shorter time than any other industrial revolution before.

If at all the technological revolution will create new jobs similar to the amount of jobs it will destroy, it could be an extremely painful and dangerous process. It's no secret that dramatically and quickly rising unemployment has significant negative impact on society, being clearly correlated with poverty, crimes, physical and mental diseases, as well as political radicalism.

The so-called end of work may create a new kind of economy. According to Harvard economist Lawrence Katz, "it's possible that information technology and robots [will] eliminate traditional jobs and make possible a new artisanal economy ... an economy geared around self-expression, where people would do artistic things with their time."[1]

From his standpoint, this transition would move the world from one of consumption to creativity. In a world shaped by artificial intelligence, digitalization and robotics, humans will only be able to attain social and economic effectiveness through creative thought processes. That is, through processes that create connections which had not previously been thought of, or that had been considered unthinkable among known, and thus increasingly automated, areas of knowledge and action. For the first time in the history of civilization, machines are replacing not only the power of human muscles but also complex collections of human thoughts. Self-learning machines are entering into a directly competitive relationship to humans as autonomous shapers of the course of the world.

[1] Quoted in Thompson (2015).

People's power to make things happen will no longer express itself as much through putting their thoughts into material form, but will instead manifest itself in linking intellectual, intuitive, social, and emotional processes. Machines cannot do that or at least not yet. Machines can recognize patterns from a multitude of processes that have already taken place and systematize these for a particular purpose. Intuition and emotion remain (for now) the domain of humans, even if machines can recognize emotions and even simulate them with emotional patterns that are already stored. As paradoxical as it sounds, it is precisely a far-reaching technological revolution that will lead to a renaissance of reflection about the evolution of humanity beyond virtuality, to reflection about civilization as a cultural process. The dichotomy constructed by Aristotle between vita activa and vita contemplativa, which depended on dividing people into citizens and slaves, could be interpreted in completely new ways in the age of digital machines.

In the ancient Greek society – which many western politicians often refer to – the free (at that time only male) citizens spent their time with thinking, debating, writing, deciding on societal issues, exercising or perceiving arts and sports, and caring for people beyond base and servile work. The base and servile work was done by slaves.

In our times we in fact could think about having a society of free men and women (!) who dedicate their lives to shaping their private and sociopolitical as well as the socioeconomic sphere and to actively participating in jointly developing the cultural, political, and economic environment where they are living in. In times of shifting the paradigms of what is the mission of humankind on the globe, in times when technology will be taking over large parts of what is known as human labor, in times when the meaning of human labor in its philosophical, political and economic context needs to be redefined. What is the alternative to turning our societies toward a new kind of the ancient Greek society:

- A society of free men and women supported by robots and self-learning machines?
- A society which is getting its identity from a new definition of human labor?
- A society which is based on a definition of citizenship and societal involvement which rather refers to the ancient Greek society than to the society shaped by the needs and mechanisms of the last three industrial revolutions?

What is, in the digital age, the peaceful alternative to a society where mankind can concentrate on education, research, arts and politics, and acting into human relationships?

In this context it is obvious that a new definition of the concept of human work – or, as Ralf Dahrendorf puts it in a visionary phrase, "meaningful activity" (Dahrendorf 1982) – is urgent. But the concept of human work always was and still is linked with education. Changes in the mechanisms and ways of human work at any time had effects on changing the principles and the content of education and vice versa. Since we need a new definition of human labor and employment, the principles and contents of education, not least tertiary education, will have to redefined as well.

In 2009, the European Research Area Board had already called for a paradigm change in thinking and in the role of science. A new "holistic thinking" would be necessary; science and research should pay more attention to systemic effects than on narrow goals. The report's remarkable title was "Preparing Europe for a New Renaissance (European Commission 2009)."

And the reality?

Our current systems of education still largely function according to the principles of the industrial age of the nineteenth century: acquisition and production of knowledge driven by division of intellectual labor. The speed of fragmentation within the systems of education and research has rapidly advanced in recent decades.

In parallel, our societies have grown constantly more complex, and the parameters for having effects on society have shrunk correspondingly. Everything is connected. We live in a world that is characterized by change, uncertainty, insecurity and ambiguity. By contrast, our educational institutions – at least outside of the art universities – are dominated by a culture of clarity: yes or no, true or false, and correct or incorrect. Almost a century after Heisenberg formulated the uncertainty principle and his theory of quantum mechanics has broken the paradigms of physics – and even philosophy – we are still accustomed to arguing and acting largely along linear causality patterns within insulated boxes of fragmented sciences.

Just as the first industrial revolution compelled even paradigm-breaking changes in the educational system, it is now necessary to have structural and content-related renewal of the educational system that measures up to the radicalism of these upcoming and partly even ongoing technological, economic, and societal revolutions. Compulsory education for all children, introduced in the eighteenth century in societies which were highly dominated by agriculture, was indeed a revolution in educational standards. It was the precondition for the raise of industrialization and the professionalization of public administration in Europe.

At the end of the twentieth century, the classical canon of cultural skills – speaking, reading, writing, and arithmetic – was extended to include the ability to communicate and articulate oneself digitally. People who did not master this skill were punished with social marginalization as digital illiterates and suffered significant disadvantages in the labor market.

In the twenty-first century, this canon of cultural skills must be extended again. Creative abilities will be some of the most important skills for managing life. These include:

- Handling multiple meanings and uncertainty
- Imaginative and associative abilities
- Intuitive ability
- Thinking in the form of alternatives
- Questioning existing structures and appearances
- Establishing unconventional contexts
- Questioning the status quo
- Seeking new perspectives
- Recognizing that there are forms of communication other than verbal

While educated citizens still complain about the downfall of a long-lost ideal of encyclopedic education, and the main actors in education policy – from government to universities – pursue a policy of cosmetic repairs of the symptoms, our education system continues to speed further down the dead-end road formed by the ways of thinking in the pre-digital age.

Education and research shape themselves around a paradigm of progress in knowledge, which is primarily defined within disciplines or sub-disciplinary niches, and measured by quantitative bibliometric indicators. That complex mechanisms of effect increasingly cross the borders of academic disciplines is largely ignored in our system of education and research.

Education, which once carried the hopes for solving the problems of human society and its environment, is now in danger of becoming a part of the problem itself, if it holds on to disciplinary specialization as the foremost guiding principle for the qualitative development of the system of research.

Never before in history humans have produced so much knowledge. At present, there are 34,550 peer-reviewed scientific journals around the world. Every year, 2.5 million academic papers are published; every 12 seconds a scholarly article appears in a journal (STM Report 2015). Given this explosion of knowledge, an encyclopedic approach to education seems an absurd claim. Since we have had access to the technology to save unlimited amounts of knowledge and to be able to retrieve it at previously unknown speeds in every desirable degree of detail, the preparation and connection of knowledge should have been made more of a topic than in the past. That is all the more important because mono-discipline knowledge without some sort of interdisciplinary connection can no longer fulfill what both the national authority for laws on universities and the European Union have declared to be the top priority for universities: "responsible for contributing to the solution of the problems of humanity, as well as to the successful development of society and the natural environment" (Austrian Universities Act, § 1) and to make graduates employable (European Commission 2014a).

The acquisition of knowledge about the potential for connections between the disciplines and about the synergistic potential of connected specialist knowledge is a type of expertise that, as a supplement to expertise in highly specialized areas of knowledge, is indispensable. The speed of progress in scientific and technological knowledge as well as the increasingly urgent need for solutions to global challenges such as aging societies, climate change, migration, and human-machine merging make it seem irresponsible to do without systematic acquisition of expertise in cross-discipline, analytical approaches to seeking synergistic potential to solve complex challenges.

"We are all surely in agreement that the task of education … was, is, and probably will remain preparing young people for life. If this is in fact the case, then education (including university education) is now in the deepest and most radical crisis of its crisis-rich history," declared Zygmunt Bauman in a lecture at the University of Padua (Bauman 2011). He was referring to his theory of "liquid modernity," which he described as follows: "The forms of modern life can be differentiated in various

ways, but what ties all of them together is their fragility, temporality, vulnerability, and tendency toward constant change (Bauman 2000)."

According to the World Economic Forum[2] in 2020, the following skills will be the most important for the requirements of the fourth industrial revolution, in order:

1. Complex problem-solving
2. Critical thinking
3. Creativity
4. People management
5. Coordinating with others
6. Emotional intelligence
7. Judgment and decision-making
8. Service orientation
9. Negotiation
10. Cognitive flexibility

Do our universities see these skills as the most important competencies to be provided for their graduates?

The dramatically progressing specialization in the scholarly landscape and the attendant increasing tendency of scholars to exhaust themselves in detailed analyses are facts. The history of universities is a history of fragmentation. The innovative, *integrative* work on ideas for solutions to the great challenges of the twenty-first century is getting lost along the way. Curricula and academic careers are constructed in increasingly narrow channels of knowledge. One can, however, only partly reproach the scholars who are active in the system because in recent decades politics and industry have pushed the universities to produce graduates who are prepared and usable for the current realities of work as quickly as possible. The scholarly journals that are relevant for careers have concentrated on increasingly narrow disciplines, and the pressure to publish quickly and as numerously as possible has systematically repressed labor-intensive and time-consuming publications such as monographs or cross-discipline papers. Shaped by political powers and the relative simplicity of the culture of rankings, universities have in the meantime largely internalized the primacy of quantitative measurement of research. In light of the efficiency monitoring that is supposed to guide the development of universities' performance with quantitative targets and annual milestones, but which is increasingly designed around short-term effects.

The change in the structures of economy and the world of work is thus well underway. "Liquid times" (Bauman 2000), in the truest sense of the phrase, have begun. Work is changing, and work as it is currently known will partly disappear. That means that the term "employability," on the one hand, has to be adapted to the changed structures and requirements, and on the other has to include the ability to adapt to new forms of work. Education, particularly university education can no

[2] World Economic Forum: The 10 Skills you need to thrive in the fourth industrial revolution; https://www.weforum.org/agenda/2016/01/the-10-skills-you-need-to-thrive-in-the-fourth-industrial-revolution/

longer limit itself, as in the past had increasingly been the case, to producing employability for *existing* professional fields. 65% of children entering primary schools today will ultimately work in new job types and functions that currently don't yet exist (The Future of Jobs Report 2016).

University education – and research! – must actively contribute to the development of completely new fields of human work. Further, they must contribute to the new definition of the term "work" and on the conceptual formation of the social framework that will be necessary for it. That means the universities are facing entirely new challenges. If the social and economic realities rapidly follow a completely new logic in their structure and contents, thanks to the technological revolution, that will not take place without significant consequences for universities' self-understanding, for established approaches to education, and for the social position of universities.

The EU and the OECD have proclaimed the goal for modern societies of having the largest possible share of the population complete tertiary education. At least 40% of the population aged between 30 and 34 should have completed tertiary education (European Commission 2014b).

Given the foreseeable changes in society and the economy that will result from technological developments, that seems all too logical - albeit not enough. Automatable work, manual as well as mental, will be taken over by machines within a few years. Fields of work that cannot be automated, whether they already exist or are newly developed, will require higher education – but one that is significantly different from what is currently offered. Furthermore, the fact that in the future humans will be in competition with "intelligent" robots, for which the recognition of basic rights and admission to suffrage are already being seriously discussed, makes clear how important education will be for the question of human self-image. In a situation of competition with artificial intelligence and synthetic biology, humanity will not over the long term be able to afford allowing education (or art) to be a method of social distinction, much less actively instrumentalizing it in that way. Education, including university education, in the "industrialized countries" will (have to) become even more essentially a good that is used by broad swathes of the population. It will, however, largely be a different kind of education, not least in the universities. But so-called mass education on tertiary level, which will be the consequence of meeting the target of at least 40% - and beyond - of the population aged between 30 and 34, does not fit together with specialization.

"Mass universities" and almost exclusively specialized curricula do not go together, either for labor policy or for social policy. And even more critical for a knowledge-based society, this constellation will also not last much longer because it is insufficiently accepted by society. The appropriate consequence, however, cannot be a reduction in the number of students because that would contradict the well-known arguments for the long-term necessity of a generally high level of education in the population as a whole. The rebirth of educational politics supporting academic elitism will meet neither the economic challenges of the twenty-first century