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Lifelong Learning, A Necessity in the Knowledge Society

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Abstract

In a knowledge based society, Lifelong Learning is an imperative necessity for the labor force. Indeed the complexity with which the present societies are evolving calls for continuous knowledge transfer facilities. LLL contributes to provide solutions or, at least, answers to new problems the society of the future will encounter. The fast increase in technological and scientific knowledge; the emergence of robotics and AI in all the domains of society replacing large parts of labor force; the higher retirement age and a larger share of elderly persons in the labor force, all necessitate a continuous actualization of the knowledge level of the labor force. Training sessions can have different forms: physical facilities in universities and higher education institutes as well as vocational schools; the application of technological instruments, inspired by MOOCs, allowing an easier participation in the training sessions. The availability of qualified 'teachers' with the ability to provide these updates may be a major difficulty in the introduction of LLL programs. Cost/benefit considerations are important, LLL has to be considered as an investment, because high knowledge profiles are a win-win situation for the individual and the entire society. In the past some authors spoke about a utopia of lifelong education, however the necessity for synchronizing technological evolution with the labor force leads to an obligation to overcome these Utopian attitudes.

1. Towards a Lifelong Learning System

Lifelong education has been addressed by international organizations for almost half a century. Initially, attention was focused on the broad concept of general knowledge and literacy with the objective of improving life quality of the citizens. UNESCO mandated two commissions to reflect on lifelong education: the first one known as the Faure[1] report, known as *Learning to be*, 1972, and the Delors[2,3] report *Learning: the treasure within*, in 1996. These innovative reports were followed by *The Hamburg Declaration*.[4] *The agenda for the future*, in 1997, established at the Fifth Conference on Adult Education on the initiative of UNESCO Institute for education (UIE).

The *Hamburg Declaration* reflected on the role of education in the face of the tension which characterized the world on the eve of the new millennium, exacerbated by globalization, such as the tension between the universal and the individual, tradition and modernity and the spiritual and the material (*Delors et al*., 1996). It also paid a great deal of attention to the role of the new technologies in education and the need for continuous training for job-related purposes. While it stressed the possibilities of these new technologies for the democratization of knowledge, it also cautioned against their potential to further aggravate social inequalities. Both reports[5] were permeated with a desire for a more just society, 'guided by the *Utopian* aim of steering the world towards greater sense of responsibility and greater solidarity'.

2. Concept, Mission & Structure of LLL

Learning is no longer limited to specific life periods and age groups, but needs to be seen as a 'continuum' (*Delors et al*.). Learning throughout life encompasses the necessity to adapt to learning requirements as a 'response to an economic demand', as well as the ability of human beings 'to retain mastery of their own destinies'. Learning throughout life needs to be guaranteed through 'flexible types of education' that provide equality of opportunity to all learners, a point which is stressed as a necessary premise of democracy.

Knowledge accumulation is increasing at a very high speed at an exponential pace. In particular the increase is made visible through the lifetime of manufactured products, which are getting much shorter than in the past, at least for some industrial sectors. Further, the interaction between humans and machines will become, according to some authors,[6,7] a new issue for the labor force and their representatives. Indeed, this new relation will be increasingly based on the use of knowledge, which means that the professional skills have to be adapted consequently.

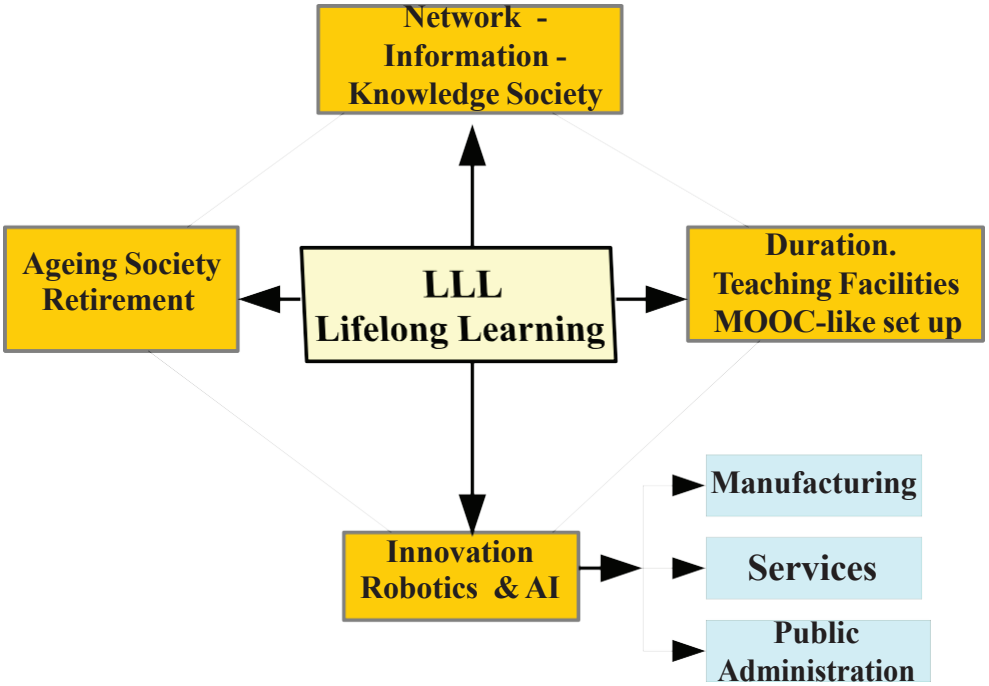
The concept of labor, on which the industrial society is based, has its origins in the 19th century with the emergence of the industrial production processes. Essentially this concept has not changed since the length of the working week has been reduced substantially in the 20th century, but the dramatic change with the emergence of Robotics and AI has not yet taken place. In fact, given the profound change of society, a new thinking about the place and the value of labor has to be formulated anew, by sociologists, philosophers and politicians as well.

Looking for answers in the profoundly changing society, a solution will appear in the *lifelong learning* structure. This concept is not new and has been proposed by several authors and institutions, however the formulation of a *structure* remains to be elaborated, which will be drafted here.

Industrial societies and the emerging knowledge societies are inherently complex structures. Almost all domains of society will have to cope with transitions to new ways of working, shorter work time per week, retirement at higher ages, a more

sophisticated relationship between humans and machines… In order to face this complexity, the labor force has to be prepared to adapt to these new situations which occur during an entire work lifetime.

Figure 1: Lifelong Learning



2.1. Duration of the Learning Process

The LLL process should be spread over the professional lifetime of individuals. As a work hypothesis, the structure could have the following composition for a lifetime:

- two or three periods of knowledge actualization;
- starting age around 45 to 50 years. This age corresponds also to the difficulty of finding another job for the unemployed. The difficulty resides in the high salary costs and the a priori negative image of aged individuals;
- length of the actualization period could have different profiles:
  - either on a weekly basis, allowing the continuity of the job of the individual in the company;
  - or periods of one to three months, eventually with one or two interruptions of work.

2.2. Training Facilities

The location for lecturing can either be within the companies, or in the usual teaching facilities.

In the first place, higher education facilities such as universities, higher professional and technical institutions can be considered as appropriate facilities for LLL. The question arises as to whether these institutions are ready today to face this challenge.

In the second place, vocational institutions need to focus on specific industrial branches. Many of the jobs will be replaced by robots, but still the knowledge and the human-machinery interaction remain to be actualized.

A major question arises as to how small enterprises cope with the training periods of their personnel. Somehow, either the market offers well trained individuals or these enterprises organize themselves into groups, allowing the participation of their personnel to specific training sessions.

2.3. MOOC[8,9] as Inspiration

The use of media technologies allowing indoor learning or the training sessions should be encouraged. The experience with MOOC (Massive Open Online Course) could be a guide for designing professional training in LLL.

A MOOC is an online course aimed at unlimited participation and open access via the web. In addition to traditional course materials many MOOCs provide interactive user forums to encourage community interactions among students, and professors. MOOCs are a recent and widely researched development in distance education, which were first introduced in 2006 and emerged as a popular mode of learning in 2012. Basically MOOCs rely on university course content and address a student audience. MOOCs show, in the short period of their existence, a large participation, however, the limited percentage of successful completion of the course is a concern.

Lifelong Learning has quite a different objective, it addresses professional individuals who need to actualize their professional skills to be used in the company they are working in, or to be better prepared to change professional careers, the latter by choice or by necessity. In a similar way, the 'teachers and professors' need to have sufficient industrial expertise and awareness of the technological evolution, in order to transmit the required knowledge to the participants. The latter seems to be a real challenge.

3. From the Network[10] to the Information[11] to the Knowledge Society[12,13,14]

Half a century ago, several new names have been proposed for the evolution of the industrial societies such as: network society, information society, knowledge society, postmodern society, postindustrial society, etc. Two important new elements have to be added: the domain of Robotics and Artificial Intelligence. There are more to be expected, and could be in line with fast developments in biological and genetic sciences.

Network society. At the end of the twentieth century, the concept of the network society gained importance. For Manuel Castells[10], network logic is besides information, pervasiveness, flexibility, and convergence a central feature of the information technology paradigm. As an historical trend, dominant functions and processes in the Information Age are increasingly organized around networks. The network society is the result of *informationalism*, a new technological paradigm.

Information society. The global information society is meaningful only if it favors the development of knowledge societies and sets the goal of "tending towards human development based on human rights". This objective is all the more vital since the Third Industrial Revolution, the revolution of new technologies, and the new phase of globalization that accompanies it, has swept away many familiar landmarks and accentuated the division between the rich and poor, and between industrialized and developing countries, as well as within national communities. For UNESCO, the construction of knowledge societies "opens the way to humanization of the process of globalization."

Knowledge society. A knowledge society differs from an information society in that the former serves to transform information into resources that allow society to take effective action, while the latter only creates and disseminates the raw data. The capacity to gather and analyze information has existed throughout human history. However, the idea of the present-day knowledge society is based on the vast increase in data creation and information dissemination that results from the innovation of information technologies.

One of the essential pillars of the knowledge society is education. It is recognized that this platform for the development of the knowledge society is an essential support for building a new social structure based on a new quality of life. Our brains are good at many things, but machines are good at other things. Bringing them together gives us the best of both, with a complementary approach letting humans and machines learn together. The Singularity University[15,16,17] is thinking in that direction and is a source of inspiration.

In the present contribution, LLL has a limited scope compared to the concept of lifelong education and is positioned among the following parameters:

1. The speed of innovation specifically in the field of microelectronics has been well illustrated through the well-known *Moore's Law*[18]. The validity of this correlation has been verified over several decades and obtained the status of the driving force of technological and social change in the late 20th and early 21st centuries;
2. The demographic evolution resulting in a longer professional work time, with the challenge for the labor force of being up to date;
3. The transition from the information society to the knowledge society is taking place right now, and appears to behave as a deterministic change.

Thus LLL has the mission to assist societies in the implementation of the technological innovations based on knowledge, for which fundamental societal modifications have to be adapted.

4. The Emergence of Robotics and Artificial Intelligence

The pervasive implementation of robotic hard- and software engines is getting close to changing society profoundly. The concept of labor has to be adapted to the novel technological environment, perhaps more now than in the late nineteenth and early twentieth century. It is estimated that the impact of Robotics and AI will affect 47% of the labor force. This will have a dramatic effect on the social structure of industrial societies. The value of work in society as well as for the individual, has to be urgently rethought and re-evaluated.

4.1. In the manufacturing industry. The machine-human[10,11] relationship will be different compared to the present state. Indeed, the knowledge relationship between the two actors, namely of the devices driven by Artificial Intelligence algorithms will change the behavior of the human operator of the machinery, for the knowledge content will be more sophisticated than ever before.

Machine learning[19]—sub-field of computer science—has evolved from the study of pattern recognition and computational learning theory in artificial intelligence. In 1959, Arthur Samuel defined machine learning as a "Field of study that gives computers the ability to learn without being explicitly programmed". Machine learning explores the study and construction of algorithms that can learn from and make predictions with data. Such algorithms operate by building a model from a sample

training set of input observations in order to make data-driven predictions or decisions expressed as outputs, rather than following static program instructions strictly.

Several speculations have been formulated in the literature about the dominance of the device to the employer, but one may state that the knowledge intensity of the employer has to match and keep pace with evolution of the technology. More in particular, data-engineering skills will be required from employees and workers previously involved in routine tasks.

In the service sector the robots are also expected to enter the workforce, which in some countries is already happening e.g. Japan and China. Indeed, in Japan, the aging of the population will require more assistance at the individual level and it is expected that robots will be an adequate replacement. In a similar way in the health sector, e.g. hospitals, robots will enter or complement professional labor force, for a lack of skilled personnel is expected.

4.2. In the private and public administration, software robots will take over massive repetitive work which was and is still being done today by civil servants. Frequently claimed simplification of administrative processes appears not to be very successful up until now, however the advent of software robots and the excessive rising costs for personnel support the introduction of robots.

5. The Demographic Frame

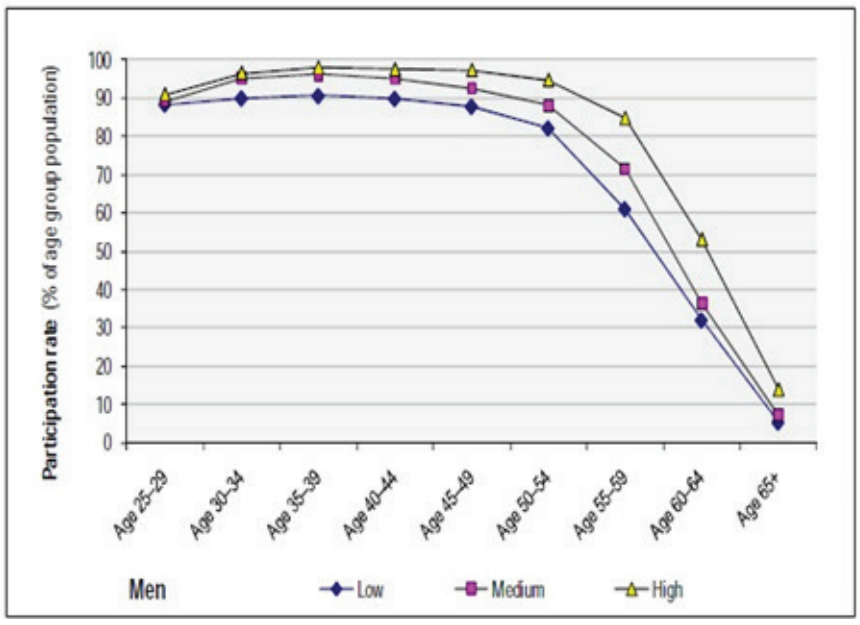
The International Labor Organization ILO[20] analyses the demographic evolution as follows: in pre-modern times, fertility and mortality rates were very high and in balance, leading to slow and constant population growth rates. With industrialization, population dynamics are passing through different stages:

- Population increases due to continuously high birth rates; a decline in mortality rates especially for children can be observed and leads to a higher share of youth in total population;
- Thereafter, declines in fertility lead to lower proportions of children and as the large youth population from phase one moves into working age, there is a higher proportion of working-age adults. This phase is temporary, lasting typically for about 40 to 50 years;
- In the next phase, fertility and mortality decline further and longevity increases. In addition, the large working-age population gets older. All this leads to increasing proportions of older persons— a phenomenon called "population ageing";
- In the final stage, low birth and death rates together with low fertility rates result in constant but very low population growth, or even declining populations.

It is interesting to note that the number of persons under 15 will stabilize over the coming decades after having increased by 30% since 1970. In comparison, the size of the working-age population (aged 15–64 years) will increase by 30%, and the population over age 65 will nearly triple to represent more than 1.5 billion persons by 2050.

On average, adults who spend more time in education or training have a higher probability of being economically active and a lower probability of being unemployed. In the EU-25, skills level is a particularly important factor in the employment of older workers.

Figure 2: Labour Force Participation Rate (%), Men, EU-25, 2006



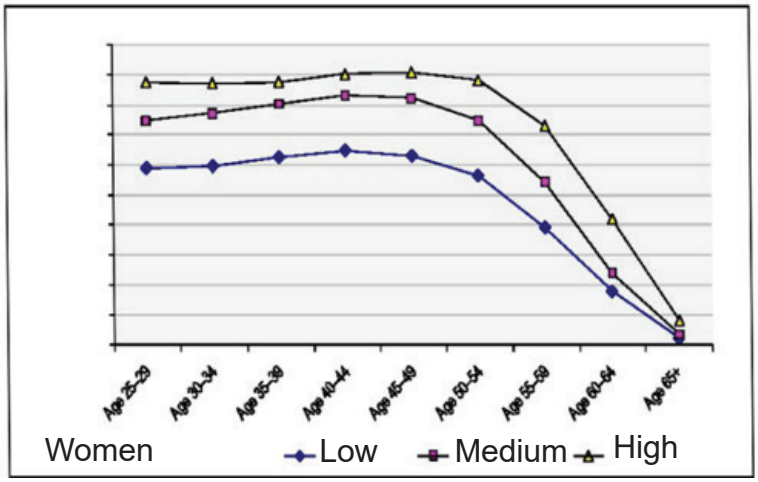
The average retirement age of the population[20] rises as a consequence of the increase in the average age of the population, given the tradition that the earnings of the labor force rises proportionally with the number of employed years. A new problem arises, older unemployed professionals have on average more difficulty to find another job, either because of the lack of knowledge or due to their ambition to earn higher wages. The lack of knowledge is becoming highly problematic. In some industrial countries enterprises do not find the needed skills on the market, even in countries with high rates of unemployment.

Figure 2. represents the participation of the male population in the workforce organized per age group with 5 years of experience, sex and skills level in EU-25, 2006[20]. First of all, with rising age of retirement, the curves will shift to the right, meaning that the population will work longer, and secondly, with investment in LLL the 'plateau' of participation will also shift to higher ages. Thus unemployment of older individuals will or could decrease.

Figure 3. represents the participation of the population in the female workforce organised per age group with 5 years of experience, sex and skills level[20]. At all ages, activity rates are significantly higher among the more educated, with the link between skills level and labor market participation being more pronounced for women than for men. The difference mounts up to 30%. This raises the question whether the participation of women in LLL will be higher than for men, or not. Anyhow the curves will shift to the right, as for men and women, for the entire society becomes older. However, it remains to be seen what the effect of Robotization will be on the average age of working.

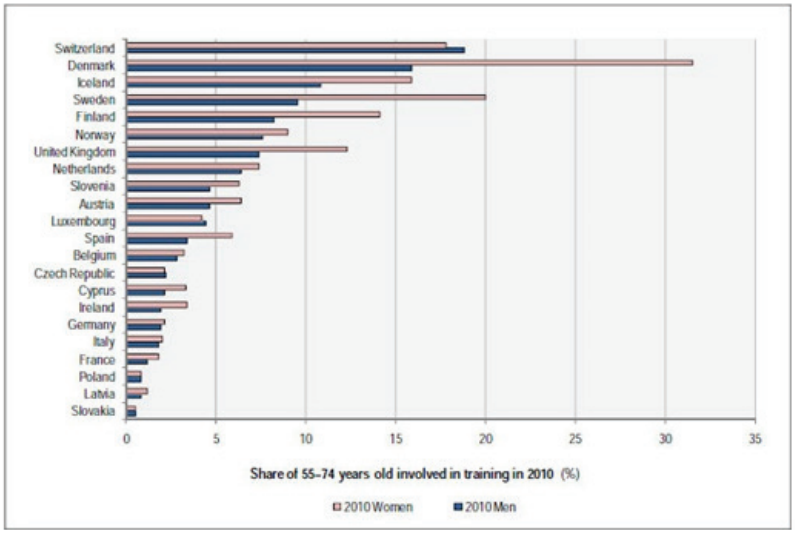
Participation of older workers in learning and training is among the highest in Scandinavian countries where the principle of "lifelong learning" makes up an integral part of national education and labor market policies. A notable feature of education in these countries is that they follow a "life course approach" relying on the constant updating of qualifications throughout an individual's entire working career. The basis for these high training rates is a well-developed social dialogue and the involvement of social partners in providing both the legal framework as well as training opportunities "on-the-job".

Figure 3: Labour Force Participation Rate (%), Women, EU-25, 2006



In contrast, in many European countries, lifelong leaning policies are still in a start-up phase. In these countries, training rates of older workers lie well below those of mid-career workers. The competitive disadvantage of older workers is clearly high, thus fostering the prevalence of stereotypes concerning their qualification profile. It is noteworthy that the figure shows much higher involvement of older women in training compared to men, in most countries.

Fig. 4. Share of 55-74 year olds involved in training in 2010 (%)[20]



The usual age of retirement has been 65 years for many decades. Today there are public debates focusing on the need to increase that limit to 67 years or more[21]. The retirement age and the year of reference for each country are listed in table 1.

Table 1. Age of Retirement in some Countries

Country	Year	Retirement Age
Denmark	2015	65
France	2015	60
Germany	2015	65y3months
Greece	2015	67
Italy	2017	66y1m-66y7m
Japan	-	60
Netherlands	2015	65y3m
Sweden	2014	61-67
Spain	2015	65y3m
UK	2017	65/64
US	2015	66

6. Cost Benefits: A Rough Estimation

Estimating the public expenditure of the future LLL system appears to be for now a difficult task. Indeed, some of the functions of LLL will/could be provided by private institutions or by the enterprises themselves.

Table 2. Education Expenditures

Country	Year	Education Exp./[22] Total Exp. Ratio%	Education Exp./[23] Total GDP Ratio%
France	2013/2012	9.66	5.9
Germany	2014/2012	11.14	5.1
Japan	2014/2012	9.29	3.6
Netherlands	2014./2012	12.0	6
UK	2014.2	13.66	5.6
US	2014	14.55	5.6

Education expenditures related to the total state expenditure and GDP are presented in table 2. Data are from references 22 & 23. It is clear from the table that the countries have different ways of financing their education system.

It is generally accepted that the spending on education has to be considered as a societal investment. The benefits are multiple and considerable, and thus as a first apprehension, the overall result would be positive. If an average increase of state expenditure for education would be estimated to be about ~1.0%, and related to GDP around ~0.5%, the major question is: are governments ready to increase the spending for knowledge training of a large part of the active population?

It should be noted that some countries e.g. Denmark[24] have introduced similar and specific programs to reduce the unemployment rate of their elderly professionals, with success. Even the notion of sabbatical periods is mentioned.

7. Conclusions

LLL is a complex matter for it involves large parts in the labor force of the manufacturing businesses, the public and private administrations. LLL has the mission to actualize the knowledge level of labor force, enabling the professional active population to be on track with knowledge accumulation.

Universities, vocational schools, as well as MOOC inspired methods will play a central role in providing training sessions for enhancing the skills of professionals.

Some major problems are: finding qualified 'teachers' who are able to transmit up-to-date knowledge; the time consuming process of LLL represents a burden for small companies. Estimating the cost/benefits ratio of LLL is, for now, too difficult. However, it is clear that the higher the knowledge level of the labor force, the better the society manages its integration in the knowledge driven society.

The initial reports on lifelong *education* expressed their possible utopian character; in an analogous way, lifelong *learning* as analyzed here could also be labeled as 'Utopian'. The future will appreciate in which degree the complexity of the endeavor can be materialized.

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References

1. FAURE, E. *et al*. (1972) *Learning to Be. The World of Education Today and Tomorrow* (Paris, UNESCO/ Harrap).
2. DELORS, J. et al. (1996) *Learning: the treasure within. Report to UNESCO of the international com-mission on education for the twenty-first century* (Paris, UNESCO).
3. UNESCO. *Learning: The Treasure within*. Delors Report, 1996
4. UNESCO. *Adult Education. The Hamburg Declaration. The Agenda for the Future.* 1997
5. Elfert Maren. *UNESCO, the Faure Report, the Delors Report, and the Political Utopia of Lifelong Learning*. European Journal of Education,Vol. 50, No. 1, 2015
6. Kurzweil Ray. *The Age of Spiritual Machines.* Viking 1999
7. Brynjolfsson Erik, McAfee. *Machine Platform Crowd.* Norton, 2017
8. MOOC. https://en.wikipedia.org/wiki_ Massive_ open _online_course
9. MOOC http://www.investopedia.com/terms/m/mooreslaw. asp#ixzz4sl CeyQNG
10. Castells M. https://en.wikipedia.org/wiki/Network_society
11. Castells M. https://en.wikipedia.org/wiki/Information_society
12. UNESCO (2005). *Towards Knowledge Societies.*
13. Knowledge Society. https://en.wikipedia.org/wiki/Know-ledge_society
14. Naim Hamdija Afgan, Maria G. Carvalho (2010). *The Knowledge Society: A Sustainability Paradigm.* Cadmus Vol I, 2010, 28-41.
15. Singularity University. *Human Learning is About to Change Forever*. Future-of-Learning-SU- White Paper -042417.pdf
16. Kurzweil Ray. *The Singularity is Near.* Penguin Books. 2006
17. Ganascia Jean-Gabriel. *Le mythe de la Singularité*. Seuil 2017
18. Moore Gordon. https://en.wikipedia.org/wiki/Moore%27s_law.
19. Machine Learning. https://en.wikipedia.org/wiki/Outline_of_machine_learning
20. LO. International Labor Conference. *Employment and social protection in the new demo- graphic context.* Report IV. 102nd Session, 2013.
21. Retirement age. https://en.wikipedia.org/wiki/Retirement_age
22. LLL Expenditures Education-Total Exp. http://data.uis.unesco.org/index.aspx?queryid=183
23. LLL Expenditures Education-GDP. https://en.wikipedia.org/wiki/ List_of_count ries_by_spending_on_education_(%25_of_GDP)
24. Per H. Jensen. *Activation of the Unemployed in Denmark since the early 1990s. Welfare or Workfare.* 1999. http://www.ilo.org/wcmsp5/groups/public/---ed_norm/---relconf/documents/ meeting document/ wcms_209717.pdf