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LEARNING IN THE DIGITAL AGE: SKILL GAP AND TRAINING METHODS

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Summary

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INTRODUCTION

The technology-driven world in which we leave is full of promises and challenges: cars can now drive themselves, algorithms are able to respond to customers' services inquires and machines can read X-rays. New forms of automations have a great impact on our lives, as they substitute some work activities traditionally performed by humans, sparkling public concern and spreading the general perception of a race between workers and machines (Bughin et al., 2017).

Companies are now focusing on extensive researches and projects on technologies, but there is the need of likewise investments in other components of the Fourth Industrial Revolution: the organization and the work. Indeed, the risk is to rely on *naked technologies*, meaning introducing technologies without changing the organization of work, thus eliminating each type of return on investment (Butera, 2018).

So, it is pertinent that some people worry about this increasingly accelerated technological progress and think about the consequences in their work: which are the knowledge worker categories that risk losing their position? This is a very tricky topic, that now, major organizations such as The World Economic Forum and consulting firms like McKinsey, are trying to address in order to give a deeper understanding of the evolving global economy.

Additionally, changes in the workplace, that have accompanied the Fourth Industrial Revolution, have attracted the interest of lot of researchers that are investigating on the huge impacts on skills required by companies, identifying which are those whose demand is rising (discovered to be technological, social and emotional skills) and which are the ones with a falling request (those skills that are mostly related to physical and manual tasks).

Furthermore, an important finding is that the adoption of innovative technologies entails the creation of Hybrid Jobs, that are blending diverse jobs' skills in only one role, with an important effect on workers, that are now forced to cover their lacks, acquiring new skills and deepen the ones they already own.

According to this scenario, the focus of this research is trying to answer to the question "*which are the best methodologies to adopt in covering workers' skill gap?*", considered

the different influencing aspects that are now changing how workers learn, thus what workers need, to receive an effective training.

Figure 1: Elaboration's Structure
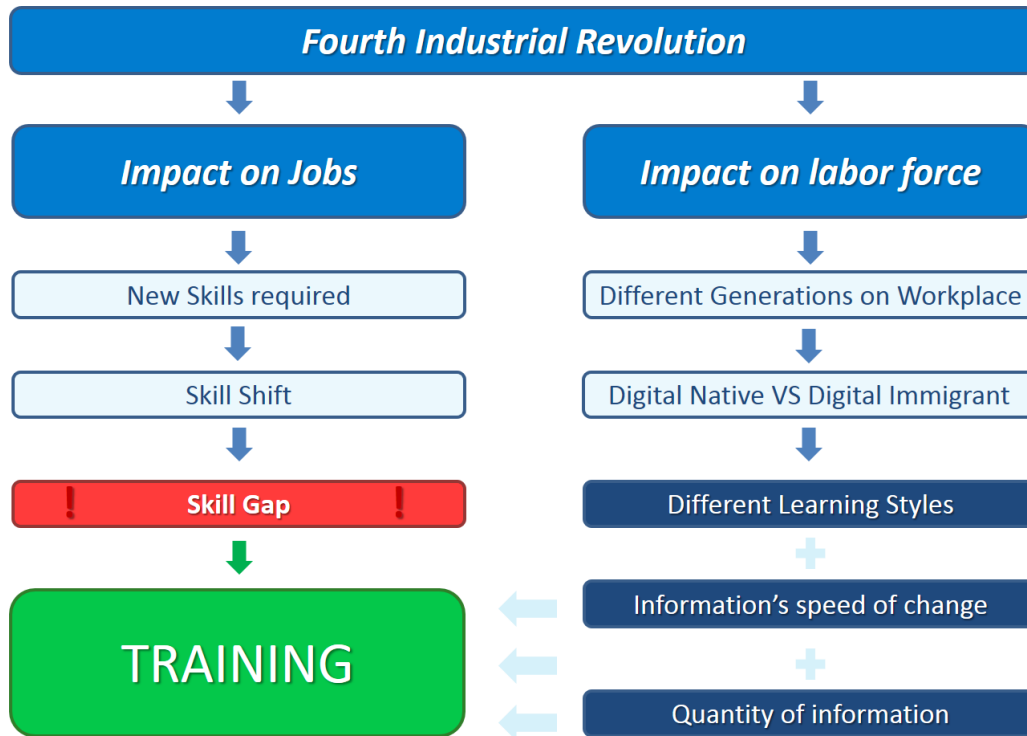
Source: Authors' elaboration

Figure 1 clearly represents how this issue has been addressed and deployed: first, it is evident that the Forth Industrial Revolution has a great impact on Jobs, requiring new skills and creating a Skill Shift, that threatens workers who acknowledge to miss some skills that nowadays are crucial to have, as they find themselves in front of a Skill Gap. Consequently, workers need training to cover their lacks, letting companies to make adapt to modern development remaining competitive in the market. But, on the other hand, the last Industrial Revolution had an impact also on labor force, in terms of differences in the approach to learning between new generations and the older ones. This aspect, alongside the huge amount of information now offered in the market and the rising information's speed of change, are factors considered to be affecting training methods, making traditional training methods (such as frontal lessons, or distributing written materials) not entirely effective anymore; thus, new solutions are necessary.

In Chapter One a brief introduction of what the Industry 4.0 is has been presented, in order to give an idea of what the main technologies implemented by companies are and which are the critical aspects that the Revolution involves. Furthermore, in this section, a focus has been kept: in fact, the last paragraphs show a detailed investigation about the effects on workplace changes and about the skills shifts, highlighting which roles and skills are demanded the most.

Then, the second Chapter stresses the importance of education introducing classical theories about the adult as a learner, letting the reader understand the pillar of learning theories. Then, the topic of different generations in the same workplace has been highlighted, focusing on the differences among them. Consequently, after this analysis, what emerges is the need to figure out the best training methods that better encounter all the considered aspects.

For this reason, in Chapter Three, the innovative and effective training methods are finally identified and exposed: Reverse Mentoring, Video and Virtual Reality. For each one of these tools a further description has been made, in addition to some examples of famous companies' implementation experiences.

To conclude, the last chapter presents two interviews redacted with the scope to understand in deep which are these companies' point of views and what is important for them in doing training.

Considering the results obtained, this thesis permits to improve the knowledge about the relationship between the Fourth Industrial Revolution, workers' skills and training methods. Since results can be interpreted under different perspectives, this thesis can be considered as a starting point to deepen the study concerning the importance of the role of training inside companies.

1. INDUSTRY 4.0: IMPACT ON LABOR MARKET

1.1. A General View of Industry 4.0

The advance digitalization within factories combined with the Internet technologies and technologies with a "smart" orientation is the basis of the new fundamental paradigm in the industrial production: the 4th Industrial Revolution (Lasi et al., 2014).

The definition of Industry 4.0 was born in Germany as a real economic model in which the technology is thought as instrument for the entire industrial economy, since the Internet is used within production processes optimizing the integration and coordination inside the factory and along the entire supply chain - in the relationship with suppliers and especially with consumers -.

According to Lasi et al. (2014) every technological leap has led to an "Industrial Revolution" and they can be summarized in:

- 1st Industrial Revolution, in the field of mechanization, based on the introduction of water and steam power;

- 2nd Industrial Revolution, focused on electrical energy and industrial forms of organization emphasizing the division of labor;

- 3rd Industrial Revolution, of the widespread digitalization, relate primarily to Information and Communication Technologies (ICT). In this context, the third industrial revolution used ICT for automatic control of production machinery.

The four industrial revolutions seen during the centuries are illustrated in the Figure 2 that summarizes them indicating the relative period and the degree of complexity required by each revolution.

Figure 2: The Fourth Industrial Revolution
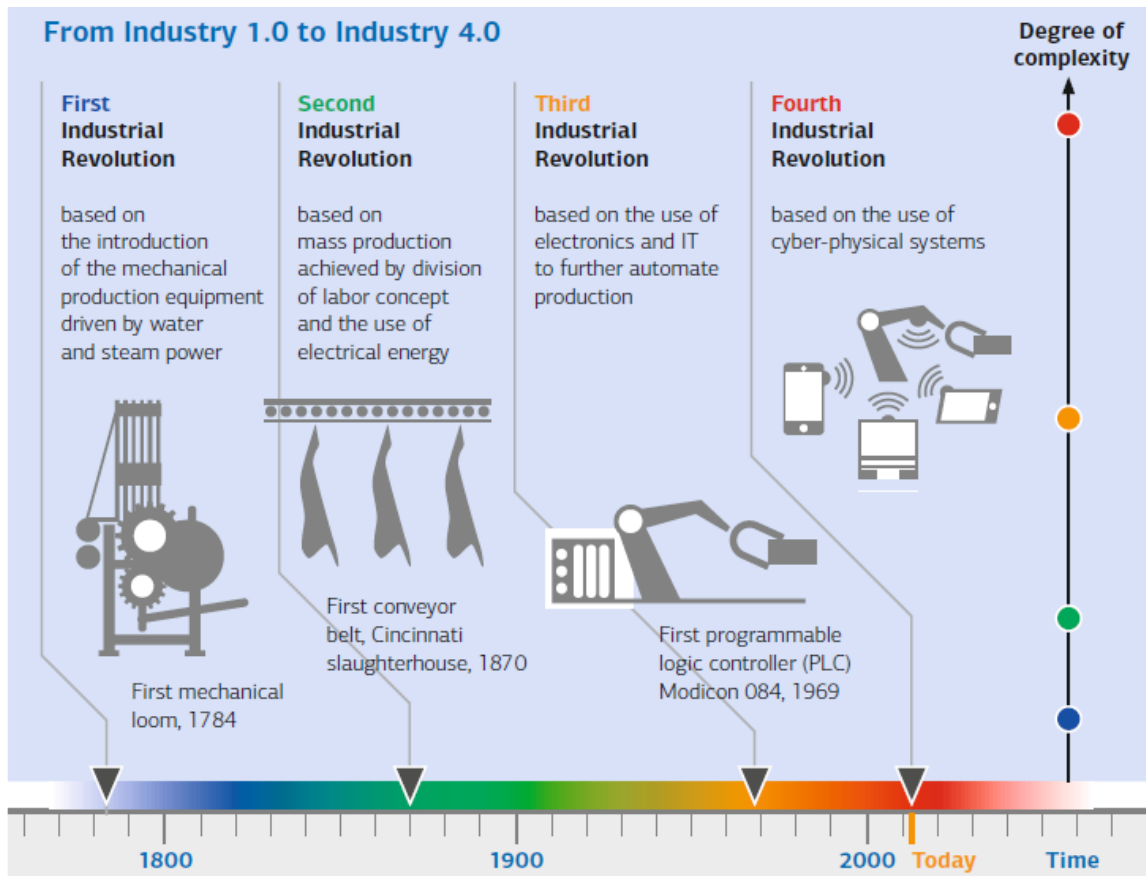
What it is interest to observe is that Industry 4.0 differs from Industry 3.0 because the second focused on the automation of single machines and processes, while the first focuses on end-to-end digitalization of all physical assets and integration into digital ecosystems with value chain parts (Lee et al., 2017).

Furthermore, Butera (2018) claims that the automation seen during Industry 2.0 and Industry 3.0 did not comprehend the substitution of work done by human, but the creation of new production systems. By contrast, Industry 4.0 is founded on the concept of *Smart Factory* that adopts a series of technologies aiming to the substitution of human work. Additionally, the factory is split in modules: CPS (Cyber Physical Systems) that monitor physical processes creating a virtual copy; then through the IoT (Internet of Things), CPS communicates each other and with workers (they will be deeper analyzed later). Thanks to Artificial Intelligence new processes of learning, the so-called *Machine Learning*, are activated constantly optimizing production processes.

The consequently changes in information technology can be examined both as dependent variable, understanding causal factors in our cultures leading changes, and as independent variable studying the social effects related. (Parker, 1973)

According to this, Lasi et al. (2014) in their paper use the term "Industry 4.0" to describe a future project that shaped by two directions: "application pull" and "technology-push". On one hand the "application pull" enhances the need of changes due to the transforming operating framework condition. The triggers are (Lasi et al., 2014):

- Short development periods: in fact, high innovation capability is becoming a critical success factor for many enterprises and "time to market" is crucial;

- Individualization on demand: nowadays buyers impose the trade conditions, so this leads to an increasing personalization of products and in extreme cases to individual products (the so called "batch size one");

- Flexibility: it is necessary a higher flexibility in product development, especially in production;

- Decentralization: faster decision-making procedures required to cope with the specified conditions address to a reduction of organizational hierarchies;

- Resource efficiency: the aim is an economic and ecological increase in efficiency.

On the other hand, the extensive approaches of a "technology-push" involves (Lasi et al., 2014):

- Further increasing mechanization and automation: physical works are more and more supported by technical aids. Moreover, automatic solutions will help the execution of versatile operations;

- Digitalization and networking: the increasing digitalization of all manufacturing and manufacturing-supporting triggers an increasing amount of actor that can support functions of control and analysis. Digital processes evolve because of the increased networking of technical components and adding the increase of the digitalization of produced goods and services the result is a completely digitalized environment.

According to Leopold et al. (2016), the major industry driver of change to business models are divided in Demographic and Socio-Economic ones (such as Changing nature of work, flexible work, Middle class in emerging markets, Geopolitical volatility) and

Technological. The last comprehends Mobile internet, Cloud technology, Processing Power, Big Data, New Energy supplies and technologies, Internet of Things, Sharing economy, crowdsourcing, Robotics, autonomous transport, Artificial intelligence, Advanced manufacturing, 3D printing, Advance materials, biotechnology. To sum up, Industry 4.0 comprehends all the new digital industrial technology triggered by the Fourth Industrial Revolution and the nine fundamental technologies embraced by Industry 4.0 permit the connection of sensors, machines, work pieces and IT systems along the value chain of a single enterprise. These systems (the Cyber Physical Systems) can interact with one another using standard Internet-based protocols and analyze data to predict failure, configure themselves, and adapt to changes (Leopold et al., 2016).

Industry 4.0 involves the nine pillars on which it is based, and they are (Rüßmann et al., 2015):

1. Big Data and Analytics: referring to the collection and comprehensive evaluation of data coming from many different sources and systems as well as enterprise and customer-management systems;

2. Autonomous Robots: robots are evolving becoming more autonomous, flexible, and cooperative and they will interact with one another working by side with humans and learning from them. These robots will cost less and have a greater range of capabilities than those used in manufacturing today;

3. Simulation: they will leverage real-time data to virtually recreate the physical world. In doing so they include machines, products, and humans, allowing operators to test and optimize the machine settings for the next product in line in the virtual world;

4. Horizontal and Vertical System Integration: with Industry 4.0, companies, departments, functions, and capabilities will become much more connected: cross-company and universal data-integration networks will permit the creation of automated value chains;

5. The Industrial Internet of Things: it allows more devices to be enriched with embedded computing and connected using standard technologies. This permits field devices to communicate and interact both with one another and with more centralized controllers, as necessary. It also decentralizes analytics and decision making, enabling real-time responses;

6. Cyber security: the need to protect critical industrial systems and manufacturing lines from threats increases dramatically, so secure, reliable communications, sophisticated identity and access management of machines and users are essential;

7. The Cloud: with Industry 4.0, more production-related undertakings will require increased data sharing across sites and company boundaries and the performance of cloud technologies will improve. As a result, machine data and functionality will increasingly be deployed to the cloud, enabling more data-driven services for production systems. Even systems that monitor and control processes may become cloud based;

8. Additive Manufacturing: with additive-manufacturing methods, like 3-D printing, it is possible to produce small batches of customized products;

9. Augmented Reality: Augmented-reality-based systems support a variety of services, such as selecting parts in a warehouse and sending repair instructions over mobile devices. These systems will be used to provide workers with real-time information to improve decision making and work procedures.

The concept of CSP and IoT deserve a further attention. In fact, because they are embedded in communication networks, CPS can relate to IoT: in this way, they are able to perform processes in perception, cognition, and action which are said to become increasingly closer to human performance. But, beyond CPS, also aspects of Human-Machine-Interaction and Human-Machine-Cooperation, with new forms of industrial organization, and more socio-economic phenomena, cover an important role for a successful implementation of Industry 4.0 (Hartmann and Bovenschulte, 2013).

CPS, through IoT, can build dynamic and flexible processes ready to be adapt to consumers' requests; *big data* produced grant a real monitoring and the optimization of processes; the *robotics* contributes to reduce the effort of workers improving the productivity (*wearable* devices are an example). In this way, it is possible to revolutionize business models and employees' quality of lives (Hartmann and Bovenschulte, 2013).

this new economic model that contributes to the disruption of the traditional productive sectors increasing the opportunities for companies enter new kinds of market offering innovative combination of goods and services and this also makes possible a "mass

customization": a completely customization of good and services with a price that allows sale in a large market (11° Commisione Lavoro, 2017).

Moreover, digitalization contributes in improving performance thanks to the cost savings do to smart manufacturing implantation: in fact, these systems combine data from within company (thanks to the ERP) with information horizontal value chain partners. (Lee, Lee, Chou, 2017).

Very often, the decrease of the transaction costs – due to technological development - is the characteristic that joins all the mutation, and this allows to (11° Commisione Lavoro, 2017):

- an easier meeting between supply and demand of services, with the possibility for workers to offer them directly without and entrepreneur organizing the commercialization and the possibility for consumers to have them ad a lower cost;

- a dismantling of the protection of the traditional jobs and the possibility for workers to re-appropriate their time;

- a faster pace of obsolescence of applied techniques, materials and products that affects the static professionalism of workers making essential efficient training services;

- a more intense competition among workers located in different States and on the other hand, the possibility for employees to search the entrepreneur able to enhance their effort, and consequently more competition among entrepreneurs (from which a more barging power for workers)

The McKinsey Global Institute's research (that will be analyzed later) tries to understand how IoT technology can create real economic value: it is proven that realize the full potential from applications, technology will need to continue to evolve, providing lower costs and more robust data analytics (Manyika et al., 2017).

1.2. What the Digital Workplace is

The study *"The Digital Workplace in the Cognitive Era. Positioning for the future: intelligent it for the anytime, anywhere workforce"* made by Gagnon and Kurata (2016) has been taken as the point of reference for this paragraph, as it helps in understanding which are the repercussions of the digitalization on workplace. What emerge from their work is that there is a structural shift in the working environment: in fact, workers take for granted that they will have the same kind of intuitive and tactile experience offered by smartphones, tables and so on. In this sense, the *"digital workplace"* is the one able to face this need giving workers access to the technology they need, when they need, on whichever device they prefer to use. Employees expect their enterprise systems to be as engaging, exciting and intuitive as their consumer devices.

Through cognitive system all data can be analyzed to learn what employee need to a unique task and unique user. It is clear the this means a huge change in the workplace, which will embrace emerging new cognitive and analytic capabilities. Consequently, there is the opportunity for companies to engage workers more effectively deciding what are the best technologies for each task and so individual: doing so, they could help in attracting and retaining the best talent.

The innovative digital place is not a place at all, it is indeed a virtual space with applications, services and information on demand and it is used to create a corporate culture of autonomy, accessibility, accountability and empowerment. As said before, the consequences for individuals are that they can access technologies that they need, when they need, choosing which device to use.

The critical issue is to dynamically update all the knowledge that will enable the workplace of the future and then identifying which data is most useful to each user.

Cognitive capabilities can help organizations with the enormous task of managing the corpus of knowledge that represents a business and provide a mechanism for personalizing data that will become more expansive, more refined and more responsive.

The emerging key features of the digital workplace are:

- The ability to securely provide the right information to the right people in the right context
- The ability to collaborate more closely with clients, partners and co-workers

- The ability to create a responsive service with a clear user journey
- The ability to establish and maintain an expansive network of synchronized, real-time data
- The ability to leverage structured and unstructured data, including voice, video images and location data

Moreover, the capabilities that will be part of the new working place environment are: "Know me", "Help me", "Deliver insight to me", "How to prepare for the cognitive workplace invest in human talent".

"*Know Me*" ability refers to know what devices workers have to use and how to use; to anticipate needs, identifying different device or lower data plan to better match usage and help reduce costs; to understand workers' preferences in how they want to work; to provide seamless IT support regardless of what channel used. "*Help Me*" ability means offering as much support as possible and so to provide personalized IT support by alerting workers if performance may be degraded and an estimated fix time; to notice if the system is performing poorly (e.g., email application keeps hanging up, battery power is draining rapidly) and automatically take corrective action; to offer service desk chat (live or virtual) if workers are spending more than a few minutes searching for information for a particular problem; to let workers get expert help in natural language via a virtual assistant from any device; then, "*Deliver Insight to Me*" ability is to curate contents that helps workers to be more productive and automatically push that content to devices; to give advice on how workers can get more value from technological tools. Lastly, "*How to Prepare for the Cognitive Workplace Invest in Human Talent*" ability is to investigate in training for both users and the system and bringing expertise for natural language processing and machine learning skill sets.

1.3. Digitalization's Effects on Jobs

The new Industrial Revolution is characterized by technologies destined to evolve with unpredictable contents and rhythm, and the next 10-15 years will be strongly affected by automation and artificial intelligence technology: workplace and people will interact with ever smarter machines, moving to great changes in the workplace environment. As said before, technologies and the interaction between humans and machines will bring different kinds of benefit such as economic growth, improved corporate performance, and new prosperity; but also, they will change workers' skills required (Bughin et al., 2018). This is confirmed by a research conduct by McKinsey Global Institute, that proves that since one of the factor influencing the labor market is the development and deployment of technology, jobs related to this field, such as computer scientists, engineers, and IT administrators, will grow. Then, because overall spending on technology could increase by more than 50 percent between 2015 and 2030, this trend could create 20 to 50 million jobs (Manyika et al., 2017).

"Technological innovations in the fields of digitalization, nanotechnology, 3D printing, genetics and robotics, just to mention a few, are radically altering the labor market landscape", this is what Birgit Eberhard et al. (2017, p. 47) say in their article that explores the role of the Fourth Industrial Revolution in transforming the labor market.

So, in general the impact on labor market seems to be clear: according to many experts and researchers some contemporary and traditional jobs will be not present in the future, and some new others will be created. So, because of automation, most of the jobs known today will disappear or change dramatically, with a consequent requirement of new job profiles and skills that need to be identified (Eberhard et al., 2017).

Talking about the pace of automation, it is important to say that in addition to technical feasibility of automation, that is an essential element of automation, those facts that influence the rhythm at which automation is adopted are: cost of developing and deploying automation solutions that is actually developing integrated solutions for specific use cases; labor market dynamics, including the supply, demand, and cost of human labor; the net benefits of automation, including performance benefits beyond labor substitution, such as higher throughput, raised productivity and improving safety; and regulatory and social acceptance (Manyika et al., 2017).

Labor market dynamics play and important role in national variation in the adoption of automation since wage rates, also for the similar occupation, vary widely across countries. The relative cost of automation compared with the cost of labor will affect adoption: this means that if qualified workers are abundant and are less expensive than automation, this could slow down the automation process. Consequently, in the period to 2030, it is expected that advanced economies, with higher wage levels will adopt automation earlier than many emerging economies, especially if adoption requires expensive hardware solutions (Manyika et al., 2017).

As demonstrated by Frey and Osborne (2013) in *"The future of employment: how susceptible are jobs to computerization?"*, by the year 2033, in US, 47 percent of the jobs in advanced economies are at "high risk" of being automated.

This is disproved by a recent research made by Arntz, Gregory and Zierahn, proving that, in US, only the 9 percent of workers have a job with a high risk of automation and they are the ones with repetitively and manual task, while the ones requiring complex valuations done by more educated workers have less risk. This is caused by the fact that it is presumed that the risk should be calculated on workers' single task and not a production process. So, the approaches differ for two different concepts: automation as the reduction of human intervention within a process and automation as single task's substitution (Scappaticci, 2016).

Again, in contrast with Frey and Osborne that believe that the only jobs characterized by creativity and intrinsic attributes of humans will survive, Spiezia et al. (2016) observe an increase of employment not only in high-skill occupations but also in low-skill ones, with a stagnation of middle-skills occupations (Spiezia et al., 2016).

McKinsey estimates that 400 million and 800 million individuals could be displaced by automation. 75 million to 375 million may need to switch occupational categories and learn new skills, under our midpoint and earliest automation adoption scenarios (Manyika et al., 2017). So, companies need to keep and train employees comfortable with digital environment: there is the necessity that employees are willing to experiment with new technologies and learn innovative operations ways (Lee, Lee, Chou, 2017).

At the question *"will there be enough work in the future?"* McKinsey answers that the degree of with automation impacts depends on four factors (such as wages level, demand

growth and mix of economic sectors and occupations), but in general in the digital age there are more jobs created than destroyed.

This is demonstrated in the Figure 3 below that shows the degree at which technology creates more jobs that it destroys over time: in fact, empirical results show that in US in 2017, 19.263 jobs have been created, compared with 3.508 jobs destroyed. (Manyika et al., 2017)

Figure 3: Technology creates more jobs that it destroys over time
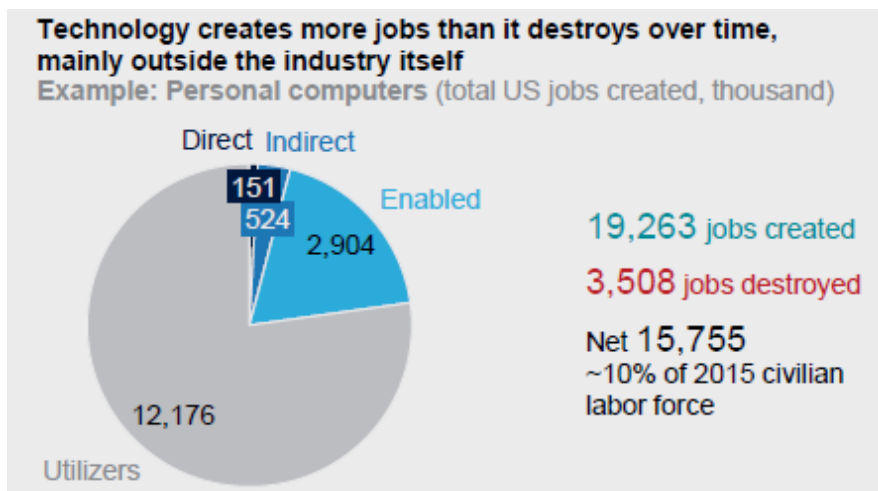
Source: Manyika et al., 2017

It has been demonstrated by different economic theories that the existence of economic forces that can spontaneously compensate for the reduction of employment due to technological progress (Vivarelli, 2014).

In the first half of the nineteenth century economists defined a theory called "compensation theory" by Karl Marx. This theory comprehends all compensations mechanism done by market that can counterbalance the initial labor decreasing caused by technology change.

The different components involved in the theory are (Vivarelli, 2014):

- A compensation mechanism "via new machines": those process innovations that displace workers are also the ones that create new jobs;
- A compensation mechanism "via decrease in prices": the production cost reduction entails a fall in prices, that stimulates the demand for some products with a positive effect in production and employment;

- A compensation mechanism "via new investments": profits, obtained thanks to the gap of time between a cost decrease for technical progress and the subsequent fall in prices generated, can be invested in production and creation of jobs;

- The compensation mechanism "via decrease in wages": the effect in saving labor may be compensated by price adjustment in the labor market;

- The compensation mechanism "via increase in incomes": the increase in demand leads to a rise in employment that can fully compensate the job lost on the process innovations;

- The compensation mechanism "via new products": new products can be designed and sold creating additional job and fields of labor.

1.3.1. The Skill Gap formation

First, it is important to define the concept of "skill", to better understand what this paper is talking about.

In general, three approaches can be found: the behavioral one focus on attributes linked to cognitive ability (self-awareness, social skills), that defines competences as behavior that can be learned and developed; the functional sees competences as skills and know-how required in fulfilling and conducting tasks; holistic/multi-dimensional approach in which individual competences are collection of competences required form an individual and the organizational ones are required from organizational level in meeting results (Prifti et al., 2017).

Referring to workforce "skills" different definitions are used: the US Labor Department's occupational information network (O*NET) defines skills as "developed capacities", to define and track a comprehensive list of 87 attributes that affect a worker's ability to carry out a job (Bughin et all., 2018). McKinsey prefers a business-oriented approach including both "intrinsic abilities" – gross motor skills and strength, creativity, and empathy – and "specific learns skills" - advanced IT and programming, advanced data analysis, and technology design (Manyika et al., 2017).

Despite the various definitions, what is interesting to analyze is which are Digital Revolution's impacts on the labor market in term of new skills required and the consequent workers' preparation needed.

In this regard, it is important to say that new technologies in the workplace accompanying the Industrial revolution have led to the so-called *Skill Shift*, meaning the acceleration in demand of some skills and the fall in the demand of others.

Those skills more required are principally the ones linked to the digital component and transversal competences (soft skills), that allow workers to adapt to these dynamic and complex scenarios (11° Commisione Lavoro, 2017).

For instance, in the McKinsey S*kill Shift Automation and The Future Of The Workforce* researchers have studied the demand for skills used by workforce today and they model how these skills could change due to the adoption of new automation technologies in the workplace: results highlight a significant shifts in workforce skills that will be demanded in an automated future and the biggest change will take place in technological skills, both in advanced and basic digital ones. But also, other skills will also see this trend including various types of social and emotional skills and a shift will take place from basic to higher cognitive skills. By contrast, the demand for physical and manual skills will continue to decrease, although these skills will remain a major component of the workplace of the future (Bughin et al., 2018).

According to other authors, industrial companies should understand that is important to have data analytics capabilities to successfully lead the digital transformation (Ming, Yen, Chou, 2017). Also, Hajkowicz et al. (2016) state that because big data can give benefits to individuals and organizations, data analysts are more and more required.

It is necessary to observe that after the skill shift, workers are now in front of a *Skill Gap*, meaning that they are facing a skills deficit /shortage, with a mismatch of skills they own and the one required by the labor market.

In fact, the results obtained from the survey conducted by McKinsey, that considered more than 3.000 business leaders coming from seven countries, enhance a workers' continuous need of learning, with the necessity change and re-definition of their job. For example, both leadership and Human Resources feel the need to be adapted: in fact, 20 percent of companies state a lack of sufficient knowledge of the executive team to

implement the adoption of automation and artificial intelligence, and one over three firms are concerned that there will be a decreasing in the financial performance due to the lack of the proper skill to adopt automation (Bughin et al., 2018).

Moreover, one of the results from a survey conducted by Deloitte highlights that Millennials feel a lack of confidence and preparation in succeeding in an Industry 4.0 environment due to the shortage of appropriate skill; for this reason, they are looking for business help in covering these skills (including soft ones) that they think will be required. Younger workers interviewed by Deloitte expect a "dramatic impact" in workplace over five years due to Industry 4.0 and only few feel prepared for this change. Furthermore, employers state that they are failing in prepare employers. OECD finds discrepancy in individuals' skills and in the educational credential the hold, but also in what companies are looking for. Diverse countries report a shortage of information technology workers and data scientist, but this skill shortage also engages more basic digital skills. The survey of business leaders conducted for McKinsey confirms this finding: the top three areas identified by respondents as having the largest skill shortages are: data analytics, IT/mobile/web design, and R&D (Parmelee, 2018).

It is observable that this Digital Age is characterized by uncertainty, and for this reason some techniques have been created to analyzed what are the challenges and what can be missed (such as new skills); one of those technique is the Visual Roadmapping. In the paper "Skill Needs Analysis for Industry 4.0 Based on Roadmaps for Smart System" Ernst A. Hartmann and Marc Bovenschulte (2013) propose a methodology for skills needs proposing based on this technology roadmaps (it is only a proposal because it has not yet been applied in practice).

The Visual Roadmapping is a method that allows to figure out complex interactions between technological and societal development/progress in a clear and well-structured way and at the same time produces reliable result thanks its robustness and efficiency. It is particularly adapted to the ex-ante identification of future development, assessment of strategic potentials and deduction of actions needed. In this case, the relevant dimensions analyzed are (Hartmann and Bovenschulte, 2013):

- Socio-economic factors (legal, economic, social conditions),
- Enabling Technologies (scientific and technical progress),

- Development of the topic itself (central aspects and milestones)
- Effects and implications (economic and social effects as well as new products and services)

Figure 4 provides an example of a Visual Roadmap concerning Pervasive Computing: the procedure to implement this method starts with an empty matrix (the four dimensions versus a timeline of approximately 10 years from today). Then, it is asked to some experts (singularly or in a group) to discuss about discuss the topic and to identify key issues of the future development concerning the four dimensions. These aspects are written on event cards and located in the matrix afterwards. In this way, the matrix is filled and at the end of the session prominent connections and dependencies are highlighted by arrows (Hartmann and Bovenschulte, 2013).

Figure 4: A Visual Roadmap for Pervasive Computing

Figure 4: A Visual Roadmap for Pervasive Computing (Gabriel, Bovenschulte, Hartmann et al., 2006)
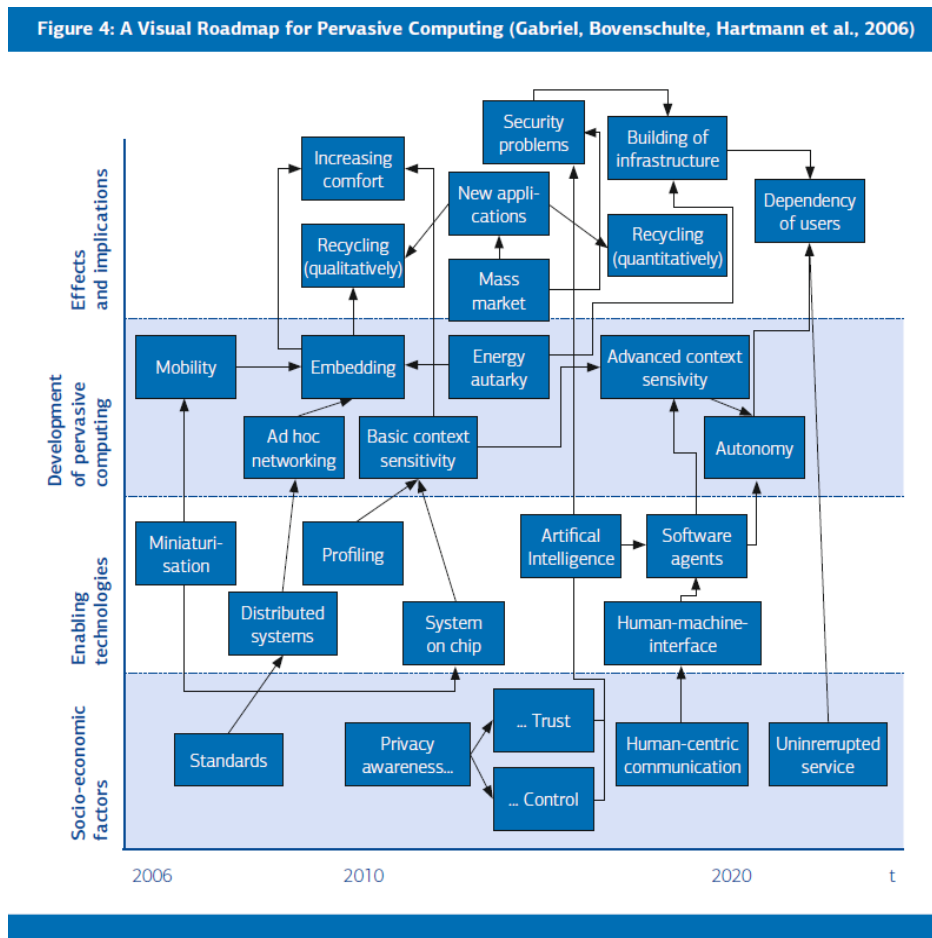
Source: Hartmann and Bovenschulte, 2013

1.3.2 The origin of Hybrid Jobs

In front of the Skill Shift scenario jobs have seen a change in their characteristics, more and more blending skills coming from different jobs. New professions are born: the so-called "hybrid jobs", that are going to be presented in this paragraph.

Butera (2018) has focused his studies on the new roles and professions emerged during the Forth Industrial Revolution, highlighting which are their characteristics. One of them is the category of Architects of new Technological-Organizational Systems: they must be able to create and coordinate together business models, markets, purposes, technologies, processes, organization, works and culture. This category involves members with multidisciplinary high formation. Competences required to be part of this kind of profession are both hard skills (about technology, economy, organizations, etc.) and soft skills (design thinking, problem setting, problem solving, cooperation and communication ability, etc.). another category is the one of Technician and Professional Integrators which comprehends team leaders able to lead the growth of sociotechnical systems, to elaborate, communicate and monitor all IoT technologies. This kind of figures are the *Knowledge Workers*, represented by teachers, researchers, managers, professionals, technicians and today they are the 42 percent in Italy and the 51 percent in UK of workers, and they are supposed to increase of 10 percent in the next 5 years.

If people that will cover those positions will be well trained and the Italian economy will raise, the 50-60 percent of these workers will successfully win the battle with machines.

According to the presence of Hybrid Jobs in the labor market, Bentley University (2016) collaborated with labor market analytics firm Burning Glass. Their research investigated on the actual skills that employers are looking for, considering different sectors, and what this means for the future of several jobs.

The key findings of Bentley research are the following:

1. Employers are looking for multi-faced candidates who possess not only hard and technical skills such as experiences with databases and technology, but also traditional soft skills like communication and collaboration: they are called "hybrid employees", and they are required to own skills that are not traditionally

associated with their role. Moreover, the research showed that 71% of in-demand skill are required across two or more job categories

2. One of the fastest growing area of expertise is data analysis and visualization. Also, big data skills are now required across a range of functions, since now employers need workers able to manage and derive from the big amount of data available.

3. More specifically, employers want their staff to elaborate the most important data, interpret it and then apply it to their role and business at large.

For what concern the most important skills required, it is important to start by saying that present workplace demands employees to be versatile in terms of skills and experience and across nine job functions involved in the Bentley's analysis, three top skills employers are seeking have been identified: business development skills, big data skills and soft skills. Moreover, business development indicates the importance of being able to sell regardless the industry, and in this sense solid strategy, sales and relationship building skills are important in developing business success. Also, the ability to compile, analyze and apply big data to everyday business decisions is driving big changes, but the way in which big data skills are applied depends on different industries, companies and even individual job descriptions. Then, the demand for mathematics skills are increasing in non-math bases roles to better deal with numbers. At the same time, soft skills are rising their demand, in fact employers are looking for people who can think critically, have strong communication skills, but also collaboration, decision making and mentoring. In is also noticeable that that previously traditional jobs have seem a decline as their associated skills become mainstream and integrated into other roles. For example, positions for social media strategies have fallen up to 64 percent in the last five years, even if the "social media strategy" skill has risen to 376 percent in Human Resource jobs and up to 150 percent in sales and up to 117 percent in Marketing and PR jobs.

Important indicators considered in the process of understanding the type of position that employers are trying to fill (and consequently the skills needed to be succeed are): total demand, growth and salary. Indeed, It, Sales and Finance are the largest career areas in form of total demand for jobs; Data scientist, IT security and emerging sectors are growing the fastest; management and operations, IT and research and analysis role get the top salaries.

Bentley University's job market analysis was conducted by Burning Glass drawing from the company's detailed database of online employer demand and this includes over 100 million current and historical job postings collected from close to 40,000 online job sites (in 2016). Using an artificial intelligence engine, Burning Glass extracted information from each unique posting relating to job titles, skill requirements, requested credentials, salary, and the length of time postings remained open. TD was aggregated and analyzed to identify in-demand jobs and skills across key business, IT, and analytics jobs.

Now the nine areas evaluated are described to figure out which are the skill required by them.

IT area. It is no surprising that with the growing amount of data, the top four skills by both salary and percentage growth in the IT industry are related to big data. In fact, collecting, analyzing and acting upon large data sets is critical for business growth and innovation. IT area is the one of wider career industry, and it requires skills like accounting, mathematics and knowledge of big data-related tools. But workers are not required to be able to manage big data, but also to effectively communicate what data means, collaborate and mentor colleagues. It means that the hybrid IT job in this case should deal with large amount of data and understand which tool use to right tools to filter, sort and organize data as efficiently as possible, so requiring technical skills but also artistic skills in identify the best patters to maximize business result (business development skill). An example of skills increasing in demand is the one related to big data, that in the IT area is growing up to 3977 percent.

Marketing and PR area. This area is traditionally associated to soft skills, but now it is now including non-traditional hard skills because of the widespread application. Specifically, employers still want skills such as customer relationship management (102 percent growth), content management (131 percent growth), but they also expect oracle databases (329 percent growth), Google analytics (8232 percent growth) and database language Oracle SQL (58 percent growth). This means that marketing has become technology-powered discipline and so graduates need to know data analysis and possess critical marketing skills, creating connection ability and telling good story ability.

Finance and accounting. The concept is that success is not about numbers, but it is about reading the market and find opportunities. The skills required in this field are not only technical, but also soft like human behavior impact on risks and investments. Employers

want professionals who can think critically and communicate what numbers mean applying them in business decisions. Students need to be trained to raise knowledge about last technologies. They should be able to figure out insights from broad data sets and to effectively communicate findings to drive decisions. Decision making skills is increasing up to 100 percent.

Selling Area. To be profitable in sales, it is necessary be well prepare in all the technical aspects of an industry; moreover, sales professionals must keep pace with industry-specific technology advancement which require knowledge of both technology platform and their application. For example, Business Management's percent of growing is about 2020 percent.

HR Area. Human Resources area is important to attract and retraining talents for the organization. Also, the demand for versatile skills has grown, in fact they are required to have diverse range of skills from onboarding to social media (376 percent raising) to business development. Furthermore, HR is the key driver in creating culture that are a result of programs that create employers' engagement, enhance productivity and reputation.

Research and Analysis Area. Careers in this area of research and analysis are the forefront of the big data skills adoption, with a significant increase in the coding languages skills like Tableau and Python (1581 percent of increasing).

Management and Operations. Because it is a broad career, it includes roles and skills such as contract management (29 percent growth), enterprise resource planning (70 percent growth) and technical support (65 percent growth). Moreover, to be relevant workers in this field must take non-traditional management task, having a solid combination of both soft and hard skills (like Java).

Design and Web Development Area. Traditional design skills, such as Photoshop, are still requires in more than 34000 jobs, but also there are also growing skills associated with new programming languages platform such prototyping that is growing up to 126 percent.

To sum up, these paragraph have presented a framework of what is the impact of technology in labor market; in particular, it has introduced the "Skill Shift" that indicates

the transaction of the preference of some skills and the related fall in the demand of others; in addiction, it has been seen the association with the "Skill Gap" where workers are facing skills deficit /shortage in doing their jobs, with a consequent mismatch of skills they own and the one required by the labor market. The result is the creation of hybrid jobs, where traditional skills associated to a job are combined with new skills.

Next paragraph is going to deepen these concepts, investigating in the features that are worth highlighting regarding the workplace and skills demanded in the market summarizing what main companies and association reported.

1.4. Workplace Changes and Skills Shift: Digging Deeper

Talking about the workplace environment and the skill shift, it is interesting to present which are the recent reports that have faced these topics and why they deserved to be considered.

First, World Economic Forum[1], the International Organization for Public-Private Cooperation engaging the foremost political, business and other leaders of society to shape global, regional and industry agendas, has been chosen as a source for both next two analyses. Indeed, World Economic Forum has started to publish its initial report on the new labor market in January 2016 with "The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution", recognizing an increasing need for tangible evidence and reliable information on Fourth Industrial Revolution impacts. In details, the new edition The Future of Jobs Report (2018) covers the most important dynamics of workforce, analyzing the lasts employment, skills and human capital investments trends, across industries and geographies. Moreover, an important focus has been made on understanding the potential of new technologies in creating new high-quality jobs and improving the job quality and productivity. For these reasons, WEF report has been considered in the creation of the two sums up analysis regarding the workforce environment and the skills' demand. Another source of information has been found in McKinsey Global Institute[2] investigations. In fact, MGI since 1990 has sought

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[1] https://www.weforum.org/
[2] https://www.mckinsey.com/mgi/overview

to develop a deeper understanding of the global economy evolution, aiming to provide leaders in the commercial, public and social section with the facts and insights that could create a base for managerial and political decisions. Moreover, McKinsey current researches focus on productivity ad growth, natural resources, labor market, evolution of global financial markets, economic impact of technology and innovation. Recent reports have addressed the digital economy theme, the impact of Artificial Intelligence and automation on employment. In particular in the next analysis two McKinsey reports will be taken into consideration: "Job Lost, Job Gained: workforce transitions in a time of automation" (2017) has been studied to sum up workforce environment and skills demand, as it focuses on changes of the workforce due to automation, with an extra explanation of the implications for skills and wages; on the other hand "Skill shift: automation and the future of the workforce" (2018) is more concentrated on the transformation of the skills showing which are the major evolution considering different categories of skills, and for this reason it has been considered in the second examination about skills' demand.

1.4.1 Workplace Changes Analysis

In the World Economic Forum report (Leopold et al., 2018), it is agreed that because of the technology progress rapidly shifts tasks performed by humans and tasks performed by machines and algorithm, the global labor markets are going to suffer the major transformations. By 2022, augmentation of existing jobs through technology may free workers for most of data processing and information search activities, but workers will be helped also in the reasoning and decision-making tasks. In the period 2018-2022 specific technological advances that will influence the most - positively affecting the business growth – will be: high-speed mobile internet, artificial intelligence, big data analytics and cloud technology (Leopold et al., 2018).

Specifically, drilling to the degree of adaptation of technologies, by 2022 it is reported that 85 percent of respondent of World Economic Forum are willing to have expended the usage of them, in particularly in the data analysis field. Moreover, large proportion of companies are likely to enlarge the adoption of Internet of Things, app and web-enabled markets and cloud computing (Leopold et al., 2018).

A *complex loop* has risen in the new technologies, jobs and skills process: in fact, new technologies can lead business growth, the creation of new jobs and specialist skills, but there is the risk of displacement of "traditional" roles as some task become automated or obsolete, with the direct creation of a Skill Gap that could create a barrier in the adoption of new technologies, preventing business growth. So, the agile learning mindset is now necessary, including the ability to reinvent routines rearranging workforce for the Forth Industrial Revolution; agility concept has been defined the firm's ability to deal with changes that rise suddenly in the business environment (Lu and Ramamurthy, 2011). In some sense, this is confirmed by Ovanessoff et al. (2018), that in the Accenture Report "It's learning. Just not as we know it" state that there is a kind of race between education and technology. Indeed, systems like Blockchain and Artificial Intelligence guarantee new efficiencies and growth opportunities, but they could generate risks if skills building does not match technological progress (that is why later the importance of education will be highlighted).

According to Manyika et al. (2017) that conducted the McKinsey research *Jobs Lost, Jobs Gained: Workforce Transitions in a time of Automation,* almost half of the activities performed by people technically could be automated using currently technologies and in about 60 percent of occupations require a workplace transformation and changes for workers. Moreover, activities more susceptible to this transformation are the physical ones; while roles involving managing people, applying expertise and social interaction are less vulnerable. Then, McKinsey has projected that by 2030 a number between 400 and 800 million workers in the world could be displaced by automation with the need to find a new job, and specifically of the total displaced, 75 million to 375 million will need to switch occupational categories and learn new skills Manyika et al. (2017).

In the research three main impacts of automation emerge: the displacement of labor, as said before, the raise of labor productivity and the increasing in the GDP in the short term because of the investment in the technologies adaptation. From this evidence, it is possible to observe the importance of reemployment of displaced workers: in fact, if they are able to find another work within one year, McKinsey model shows a lifting in the overall economy, as full employment is maintained both in long and short term, wages raise, and productivity grows. Instead, if workers take years to find jobs, unemployment

rate raise in the short period and the labor market takes time to adjust with a slower growth pace. In general, education level required for future occupations may grow with respect to the level demanded now for the roles that are decreasing because of automation (Manyika et al., 2017).

Moreover, in addressing the doubt about if there will be enough work to ensure full employment, it is important to say that history teaches us that large-scale sector employment declines have been countered by growth of new sectors absorbing workers. Furthermore, with sufficient economic growth, innovation and investments there can be sufficient creation of new job to balance the impact of automation. Many economists view automation as the new wave of technological advancement, and so as in the past the equilibrium between demand and supply of jobs will be reached (this is not excluding the fact that there will be period of difficulties) (Manyika et al., 2017).

But, on the other hand, some experts state that the automation today is different, and probably it will act differently with respect to the last revolutions. In fact, it is because of the ability of machines, the rate of regress in innovation and the fact that machines will teach themselves without the human intervention, that it is possible to say that this Industrial Revolution differs form in other in terms of power of impact. So now, the real issue is to identify what exactly could be different compared with previously technologies. McKinsey states that in some sense the present revolution is quite similar to the one in 1700, but what will be differ is the *speed* at which scientific advances are been made and the *potential displace* of worker that is much higher in a relatively short period of time (Manyika et al., 2017).

So, at the same time, it is important to analyze what can make the difference in this scenario: maintaining robust economic growth to support job creation, retraining workforce and creating skill development program, enhancing labor market dynamism and providing income and transition support to displaced workers.

Focusing on scaling up job retraining and workforce skill development, it is necessary to enable individuals to learn marketable new skills. History, offers examples of large-scale programs to improve the skills of workers (such as United State provided US High School Movement between 1910 and 1940 and GI Bill in 1944). Recently Singapore through "Skills Future Initiative" provided 400 dollars to aged 25 and above to pay work-skills related courses (Manyika et al., 2017).

What it is going to be emphasized is how businesses can play a significant role in training and retraining workers becoming the front lines of automation as they will have the earliest and most detailed knowledge about skills they need. One intensive approach to corporate training programs mergers the on-the-job training with formal education through apprenticeships, and they exist in many countries (but this is something that will be explained later in next chapters) (Manyika et al., 2017).

Lastly in ordert to give a clear vision of what are the general ideas shared by different reports, in the Table 1 all the main factors that have an impact on the workplace environment are summarized, comparing what World Economic Forum and McKinsey instutite say about them. In particular the ones treated in the scheme are the ones taken into account by both references: benefits inadoption of technologies, factors affecting an extent of adoption, roles increasing in the demand and reduntand roles.

Table 1: Sum Up for Work Enviroment's Changes

WORK ENVIRONMENT	WORLD ECONOMIC FORUM The Future of Jobs Report (2018)	MCKINSEY GLOBAL INSTITUTE Job Lost, Jobs Gained: Workforce Transitions in a Time of Automation (2017)
BENEFITS IN ADOPTATION OF TECHNOLOGIES	- Reach higher levels of efficiency of production and consumption - Expand into new markets - Compete on new products for a global consumer base composed increasingly of digital natives	- Labor cost savings - Get closer to customers - Predict maintenance needs - Reducing the cost of operations in some activities - Extending the life of existing capital assets - Increase scale and speed - Higher throughput, raised productivity - Heightened safety
FACTORS AFFECTING PACE OF ADOPTION	- Commercialization - Public adoption of new technologies - Existing labor laws	- Sectors and geography - Technical feasibility - The cost of developing and deploying automation solutions for the workplace - Labor market dynamics (including the supply, demand, and cost of human labor) - The net economic benefits of automation - Social acceptance
ROLES INCREASING IN THE DEMAND	Data Analysts and Scientists AI and Machine Learning Specialists General and Operations Managers Big Data Specialists Digital Transformation Specialists Sales and Marketing Professionals New Technology Specialists Organizational Development Specialists Software and Applications Developers and Analysts Information Technology Services Process Automation Specialists Innovation Professionals Information Security Analysts Ecommerce and Social Media Specialists User Experience and Human-Machine Interaction Designers Training and Development Specialists Robotics Specialists and Engineers People and Culture Specialists Client Information and Customer Service Workers Service and Solutions Designers Digital Marketing and Strategy Specialists	Rising incomes: consumer goods Retail salespersons, Cashier Combined food preparation and serving workers, including fast food Waiters and waitresses First-line supervisors of retail sales workers Rising incomes and aging: health care Registered nurses, Nursing assistants Personal care and home health aides Licensed practical and licensed vocational nurses Investments: real estate and infrastructure Construction laborers, Carpenters Electricians First-line supervisors of construction trades and extraction workers Plumbers, pipefitters, and steamfitters Business investment in technology Software developers, systems software developers, applications Computer user support specialists Computer systems analysts Computer user support specialists Computer programmers Rising incomes: education Teacher assistants Elementary school teachers, except special education administrators, elementary and secondary school Secondary school teachers, except special and career/technical education administrators, postsecondary Energy transitions and efficiency Construction laborers Insulation workers, floor, ceiling, and wall Carpenters, Construction managers First-line supervisors of construction trades and extraction workers Professionalizing previously unpaid work Childcare workers, Nursing assistants Preschool teachers, except special education Janitors and cleaners, except maids and housekeeping cleaners

Table 2: Sum Up for Work Enviroment's Changes

WORK ENVIRONMENT	WORLD ECONOMIC FORUM The Future of Jobs Report (2018)	MCKINSEY GLOBAL INSTITUTE Job Lost, Jobs Gained: Workforce Transitions in a Time of Automation (2017)
REDUNDANT ROLES	Data Entry Clerks Accounting, Bookkeeping and Payroll Clerks Administrative and Executive Secretaries Assembly and Factory Workers Client Information and Customer Service Workers Business Services and Administration Managers Accountants and Auditors Material-Recording and Stock-Keeping Clerks General and Operations Managers Postal Service Clerks Financial Analysts Cashiers and Ticket Clerks Mechanics and Machinery Repairers Telemarketers Electronics and Telecommunications Installers and Repairers Bank Tellers and Related Clerks Car, Van and Motorcycle Drivers Sales and Purchasing Agents and Brokers Door-To-Door Sales Workers, News and Street Vendors, and Related Workers Statistical, Finance	Customer interaction jobs Hotel workers Travel agents Entertainment attendants Cafeteria workers Office support jobs Including information clerks Payroll processors Administrative assistants Jobs carried out in predictable settings Factory workers Material moving machine operators Transportation workers Installation and repair workers

Source: Author's elaboration

What it is important to highlight about the Table 1 is that across different reports some common features can be found. Both McKinsey and World Economic Forum, talking about workplace changes, agree to the fact that the benefits in adoption of technologies are: higher level of productivity and the capacity to get closer to the consumer.

Instead, for what concern factors that could affect the pace at which digitalization is adopted identified by the two researches are the commercialization variables, the degree of utilization by the society and the labor market dynamics.

Moreover, in the analysis of the role that are expecting to increase, McKinsey and MEF have been presented them in different ways; in fact, in the former's report roles are divided into general categories, while the second has considered specifics job descriptions more related to technology. But it is anyway possible to identify common points, such as the fact that roles linked to technology, the ones liked to software implementation will rise, as well as the roles regarding training and education and client and customers service. By contrast, those roles considered redundant, that could be found in both researchers, are the ones related to the office supports including administrative roles and clerks; other

redundant role will be factory workers, mechanics and machinery repairs and the ones related to the customer interactions.

1.4.2. Skill Shift Analysis

Automation and artificial intelligence are considerably transforming the nature of work: concentrating on skills it is possible to observe that workers' skills shift will see an acceleration compared to the one of the last 15 years. For example, demand for social and emotional skills such as leadership a managing will raise by 24 percent of hours worked; by contrast, the demand for basic cognitive skills decreases living the floor to a high cognitive skills general rise. A drop can be seen in the demand for physical and manual skills, by 14 percent. In the McKinsey analysis, it emerged that three firms over ten are worried about the lack of skills they need in the automation adoption, with the consequent loss in financial performance (Bughin et al., 2018).

So, as a matter of fact, with the Fourth Industrial Indeed, for workers it is necessary to possess new appropriate skills that enable them to grow in the future workplace, and even for those who currently have the skills required, they must consider that the pace at which skills change is accelerating. For this reason, it is possible to say that reskilling is quite important: in this sense, there is the need to find a win-win solution for both workers and companies' results, and what assures the success is to have motivated and agile workforce equipped with adequate skills, able to take advantages of new opportunities and continuously subjected to retraining and up-skilling (Leopold et al., 2018).

Furthermore, WEF identifies three possible strategies that make possible to stay competitive: hiring staff already owing skills relevant to new technology, seeking to completely automate work task, retraining existing employees. Focusing on the last strategy, employers survived by WEF state that by 2022, more than 54 percent of employees will need significant reskilling or up-skilling. In doing so companies can evaluate a tangible collaboration including partnering with schools, colleges, other companies of the same/other industries, unions. Companies as learning organizations is a concept that has been highlighted, as they give the possibility to improve skills (Leopold et al., 2018).

Going specifically, the prospect below describes the change in the hours dedicated to each skill: it is easy to note that skills more required will be higher cognitive, social and emotional, technological, while physical, manual and basic cognitive skills will register a decrease in hours dedicated to them (Bughin et al., 2018).

Table 3. Automation and AI will change the skills needed in the workforce

SKILLS	Physical and manual	Basic cognitive	Higher cognitive	Social and emotional	Technological
Hours spent in 2016 (billions)	203	115	140	119	73
Change in hours spent by 2030 (%)	-14	-15	+8	+24	+55
Skills with the biggest shift in demand	▼General equipment operation and navigation ▼Inspecting and monitoring	▼Basic data input and processing ▼Basic literacy, numeracy, and communication	▲Creativity ▲Complex information processing and interpretation	▲ Entrepreneurship and initiative taking ▲ Leadership and managing others	▲ Advanced IT skills and programming ▲Basic digital skills

Source: Bughin et al., 2018

A mismatch between skills possessed and skills required (the skills gap discussed before) has been already registered by OECD: they found a discrepancy between in individuals' skills and educational credentials and what companies are looking for. This is also observable in a report done by DHI group in 2016, where many employers surveyed stated that they face recruitment problems due to skill shortage; in addition, a 2013 survey lead by McKinsey also confirm that only less than half employers could find enough skilled entry-level workers (Bughin et al., 2018).

Then it is possible to consider technological skills as one specific area of mismatch, where several countries report shortage of specialized workers and data scientist. Skill shortage considers also basic digital skills: in fact, McKinsey reports the urgency of develop basic skills for the new age of automation because they find the basic digital skills as the second fastest-growing category (after IT skills and programming) among 25 skills analyzed by McKinsey. The rates of growing are: Advance IT skills and programming about 91 percent in hours worked by 2030, and basic digital skills 65 percent in hours worked in 2030. Following to technological skills, social and emotional skills will grow rapidly by

2030, considering that these are skills that cannot be mastered by machines yet. The highest level of increasing will be reached by entrepreneurship and initiative-taking and leadership and managing others (Bughin et al., 2018).

For what concern the category "cognitive skills", as anticipated before the demand will shift from basic to higher one; the request of higher cognitive skills like creativity and critical thinking and decision making, and complex information processing will growth by 2030 up to about 35 percent for creativity and 17 percent for the others. But overall, even if the need for physical and manual skills will decline, they will remain the single largest category o workforce skills in 2030 (Bughin et al., 2018).

This framework it is also confirmed by what employer expect to need the most in the future: in fact, they state that they will require more emotional, higher cognitive and technology skills and less basic cognitive and physical and manual skills.

Regardless the level of automation, large proportion of companies McKinsey surveyed identify the need of for their workforce to upgrade skills and continue to learn (Bughin et al., 2018).

To sum up, in the Table 2 there are summarized all skills that have are increasing and decreasing in the demand due to hte Industry 4.0, comparing what World Economic Forum and McKinsey instutite say about this topic.

Table 4. Sum Up for the Skills' demand

SKILLS SHIFT	WORLD ECONOMIC FORUM The Future of Jobs Report (2018)	MCKINSEY GLOBAL INSTITUTE Skill Shift Automation and The Future Of Workforce (2018)
SKILLS INCREASING IN DEMAND	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 Systems analysis and evaluation	Higher cognitive skills Quantitative and statistical skills Critical thinking and decision making Project management Complex information processing and interpretation Creativity Social and emotional skills Advanced communication and negotiation skills Interpersonal skills and empathy Leadership and managing others Entrepreneurship and initiative-taking Adaptability and continuous learning Teaching and training others Technological skills Basic digital skills Advanced IT skills and programming Advanced data analysis and mathematical skills Technology design, engineering, and maintenance Scientific research and development
SKILLS DECREASING IN DEMAND	Manual dexterity, endurance and precision Memory, verbal, auditory and spatial abilities Management of financial, 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 Technology use, monitoring and control	Physical and manual skills General equipment operation and navigation General equipment repair and mechanical skills Craft and technician skills Fine motor skills Gross motor skills and strength Inspecting and monitoring skills Basic cognitive skills Basic literacy, numeracy, and communication Basic data input and processing Higher cognitive skills Advanced literacy and writing

Source: Author's elaboration

It possible to observe that World Economic Forum and McKinsey Global Institute agreed that those skills increasing in demand are creativity, complex information processing and interpretation (problem-solving), leadership, social influence and emotional intelligence and technology design and programming (at both basic and advanced level).

On the other hand, skills that will see a decreasing in demand according to what MGI and MEF report are the ones linked to physical and manual skills and basic cognitive skills like basic literacy, numeracy and communication.

But, also according to Accenture Report made by Ovanessoff et al. (2018) (that has not been considered in the analysis summarized in tables as it does not drill deep as the other two do) employers are now in front of a skill crisis that could limit the potential of the technology application. Indeed, it is known that digital innovation will continually alter future skills' demand with a rapid pace, making educational changes and corporate learning not adequate. Studying the cost coming from the inaction, it is possible to say that if they do not meet future skills demand, over the next decade 14 G20 countries could miss about US$11.5 trillion of cumulative growth promised by intelligent technologies (of course the impact differs across countries and how labor is distributed across roles). Moreover, Accenture's diagnosis is that present education and corporate learning system are not equipped to address the coming revolution in skills demand. The challenge varies in impact effects according to economies and industries, requiring then targeted interventions

So, to face this crisis leaders should reevaluate the methods through which workers are prepared, starting form anticipating their skills needs to helping people to learn and apply these new skills (Ovanessoff et al., 2018).

In doing so, Accenture's advice is to focus on both technical and human skills (such as empathy, and critical thinking), and they suggest that experience-based skills, like on-job training and apprenticeships are much better as they create a greater commitment. But also, entrepreneurs now have the possibility to exploit new methods of training methods and approaches that will help create a versatile future workforce more cost effectively.

So, Accenture offers a possible solution: learning with experimental techniques shifting the focus from institutions to individuals, boosting people to learn. Moreover, advances in the science of learning combined with new technologies, allow pioneering businesses to offer new approaches to learning.

In this sense, it is more important to talk about learning and not education, as learning in a much wider concept. It is also important to say that lot of learning is taken in non-educational contexts, and the number of learning opportunities are growing.

To address this issue, the next chapter is going to introduce a new concept related to how the adults approach the learning experience. In fact, in addition to the changing in workplace and skills, this type of analysis it is necessary to understand which are the critical aspects that should be taken in consideration when business try to find the best methods in training workers on new skills.

2. TRAINING IN A NEW PERSPECTIVE

In companies, workers' education could play a key role: in fact, it is important to have workers aligned with the technology's evolution and so to cover the Skill Gap discussed before. For this reason, this chapter is going to address why education in companies is important and in which way workers learn, to find the elements that permits an effective training practice.

2.1 The Key Role of Education

According to what Butera said (2018), introducing technologies inside a company without changing processes and the organization could develop wastes and chaos. This is the concept of "naked technology" that indicates the annulment of improvements in productivity and return on investments. Moreover, Keynes said that the problem is about competences, organizations and institutions inadequacy that follows the technological change. According to this, Rullani stated that investments in professional capacities of workers are essential to exploit the benefits of technology (Butera, 2018).

Vivarelli (2014) stated that to effectively and efficiently support the adoption and diffusion of the technologies: sustainable skills are required, as well as qualified workers. This is called "human resource constraint": in the presence of labor-saving and skill-biased process innovation, the scarcity of skilled labor can easily generate unemployment among unskilled workers, unless proper retraining policies are put in place. Also, the result of McKinsey research is that, because of work removed by automation growing, job categories require a higher educational level (Manyika et al., 2017). According to Butera (2018) training programs for the creation and conversion of new skills and new job have already started and now it is a matter of speed improve and accelerate them (Butera, 2018).

Half of those companies of the survey conducted by McKinsey *Skill Shift Automation and The Future of the Workforce* (Bughin et al., 2018) declare that they expect to lead the formation of building of the future workforce and stakeholders in doing so will should

work together to manage this large-scale retraining. In fact, firms could collaborate with educators to reshape school and college curricula; with labor unions to help the cross-sector mobility; governments will need to encourage mobility including portable benefits. In many countries companies complain that they have difficulties in finding talented workers, and on the other hand workers complain of being under qualified of even overqualified for their job. Skill shortages and mismatching have negative consequences on the economy and particularly on the labor market: they can imply increasing in labor costs, unfilled vacancies (and so lost in production), slower adoption of technologies and implicit and explicit costs of the rising unemployment rates. Vice versa, appropriate skills can boost an economic growth. In this regard, a study tried to quantify this link finds that an increase in educational achievement by 50 points in the OECD's PISA student assessment tests translates into a 1 percentage point higher long-run growth rate (Woessmann, 2014).

According to Butera (2018), some of the variables that will deny the negative balance (of jobs lost) could: the retraining and re-allocation of those who have lost, or are threatened to be lost, their job; innovative formation systems and education of young; continuous formation for everybody. For this reason, many universities are trying not only to offer a qualitative high level of education, but also constantly improve it and in doing so, educational institution will adopt interactive learning method. New technologies and pedagogies must cover the most important role in the institutions' teaching and learning strategies becoming an integral component of everyday institutional business (Eberhard et al., 2017).

The study on the German educational system done by to Eberhard et al. (2017) demonstrate a higher education is to provide students with an able to act professional education. Furthermore, four different types of competences that students should gain have been defined:

- Professional competence: includes specific skills and abilities required to do a certain job;
- Methodological competence: comprises cognitive and metacognitive necessary to solve complex problems;

- Social competence: involves knowledge and abilities to realize aims and plans in social interactions, featured by communicative and cooperative behaviors towards other people;
- Personal and Self-competence: includes personal disposals like attitude, values and motives that influence the working behavior as well as skills for self-perception (reflection of own skills) and self-organization (time management).

Moreover, Eberhard et al. (2017) in their work reported the new skill portfolio presented by World Economic Forum (2016): it focuses on the skills that graduates from each types of study should hold in 2020 in order be able to supply the related labor market (see Figure 5 below).

Figure 5: Skills portfolio for university trainings

Abilities	Basic skills	Cross-functional Skills	
Cognitive skills	**Content skills**	**Social/Interpersonal skills**	**Resource management skills**
Cognitive flexibility	Active learning	Coordinating with others	Managem. of financial ressources
Creativity	Oral expression	Emotional Intelligence	Managem. of material ressources
Logical reasoning	Reading comprehension	Negotation	People management
Complex problem solving	Written expression	Persuation	Time management
Mathematical reasoning	ICT literacy	Service orientation	
Visualization		Training and teaching others	**Technical skills**
Troubleshooting	**Process Skills**	Ethics and social responsibility	Equipment maintenance and repair
Analytical Skills (statistics,…)	Active listening	Virtual collaboration	Equipment operation and control
	Critical thinking	Communication skills	Programming
Personal/mental abilities*	Monitoring self and others		Quality control
Knowledge in psychology	Interdisciplinary skills	**System skills**	Techn. and user experience design
Body language		Judgement and decision making	New technologies (ICT, etc.)
Resilience		System analysis	
Intrapreneurial skills		Change mangement and adaption	**Intercultural skills***
		Goverance, risk management	Language skills
		Compliance	Open mind-set
Legend		Entrepreneural skills	
Added skills			
*added skill sets			

Source: Leopold et al., 2016

Industry 4.0 challenges need to be faced considering the educational system to avoid the exclusion of those who feel a gap between speed of change and speed of learning. The aim is to address the educational system to the continuing employability considering a market subjected to fast and unpredictable changes. In these environment, there is the necessity of public and private institutions able to offer multiple opportunities of digital skills learnings.

Then, Millennials expressed admiration for corporations that are adapting to advancing Industry 4.0 and developing their people to succeed in this evolving business environment. Companies and senior managers that are aligned with Millennials in term of purpose, culture and professional development have more possibilities to attract and retain best talent (and then increase financial performance): in fact, it is proven that Millennials desired leaders that prepare employees for Industry 4.0 effects (Parmelee, 2018).

Moreover, three-quarters of young workers answering to Deloitte survey say that business could be particularly effective in education, skills and training, economic stability and cyber security. about eight in 10 Millennials say that on-the-job training, continuous professional development and formal training led by employers will be important to help them perform their best". In this sense employers support and training not only help workers in improving performance, but also their role of "employer as educator" acquires a great significance. this also helps the retaining of workers inside the organization: 73 percent of those who plan to stay with their employers more than five years say their organizations are strong providers of education and training (Parmelee, 2018).

To clearly understand how companies could be effective in offering the right type of training, it could be useful to illustrate which are the main pillars about how workers learn. For this reason, a further analysis about the adult as learner and different generations' learning styles will be presented.

2.2. The Adult as Learner

In the literature about adult learners it is important the contribution of Malcolm Knowles, Professor of Education and General Consultant in Adult Education at Boston University School. In his work "The Adult Learner: A Neglected Species" (1973) Knowles describes in detail the emerging theories about adults as learners. Moreover, he is considered the father of the Andragogy, defined as the art and science of helping adults learn. His study has been deeply analyzed by Fogarty and Pete (2004) in the book "The Adult Learner: Some Things We Know".

Fogarty and Pete (2004) analyzing Knowles' findings figured out nine key points about adults as learners:

1. Control of their learning
2. Immediate utility
3. Focus on issues that concern them
4. Test their learning as they go
5. Anticipate how they will use their learning
6. Expert performance improvement
7. Maximize available resources
8. Require collaborative, respectful, mutual and informal climate
9. Rely on information that is appropriate and developmentally paced

The discussion of individual points presents more details about these nine attributes of the adult learner.

Control of their learning. Adult want to control what, where, when and how they will learn, but also, they want to determine the location, the timing and the learning method. Each decision must be made among a range of options.

*Immediate utility***.** Adults are pragmatic learners that want to know about the utility of what they are learning but also the immediacy of the utility, understanding how to use the learning and how quickly the learning result in a meaningful application. Adults select learning situations depending on the sense of urgency they feel, consequently they decide to take courses or attend class always for a reason that meets their needs.

Focus on issues that concern them. Adult learners are focused learner with goals that are specific and related to precise situations. They are interested in features that are relevant at a personal level; indeed adults continually and persistently ask focused questions that may concern only themselves. This because their mission is to learn about the topic and how it is related to issues that concern them.

Test their learning as they go. Adults want to test their learning along the way to mastery, in fact they want to know how they are going through the learning experience. They are not so much interested in general information and background theory, they want to check every little step and the various phases on their way to final accomplishment. For this reason, they are particularly interested in little success and rewards along the way, step-by-step, part-by-part, moreover they want periodic feedback.

Anticipate how they will use their learning. This point is closely related to the point 2 concern the "immediate utility" and it states that adults scan their cognition horizons for ways they can apply their learning. Accordingly, during the entire time they often wan to anticipate the ways to use and apply the new information. They have a defined expectation for the transfer of information, and they are always poised for relevant and worthwhile opportunities to exploit the new information. This is one of the characteristics that separate adults form younger learner: adults have a natural expectation of transfer the information; by contrast children learn only for the sake of learning and not for purposeful utility as adults. So, it is noticeable, that anticipated application it is the hallmark of adult learning.

Expert performance improvement. Adult learners expect to see their performance improver as a result or their classes or lessons, as they continually self-appraising their level of improvement expecting noticeable progresses. When they are not perceived as expected, they easily evaluate negatively and ineffective the teacher or trainer, justifying themselves as motivated learners and so it must be the instructor's fault.

Maximize available resources. To maximize available resources, teachers working with adults take advantage of the vast experience and resources that adults bring, sharing adult learners tried-and-true resources and making them accessible to everyone through photocopies, web-site link, and other means. A wise teacher should honor the expertise of adult learners and should know that sharing information illuminates the discussion and highlights issues from different persons' point of views.

Require collaborative, respectful, mutual and informal climate. Adult learners want to collaborate and share as they are social individuals. They are able to understand the power of the dialogue and they seek advice from collogues since they know the value of "reasoned opinion" and they also have a genuine respect for peers' ideas. Moreover, the concept of mutual respect and mutual learning situation is embraced: they seek social settings and they are stimulated through discussion and articulation of ideas.

Rely on information that is appropriate and developmentally paced. Adults learners want to learn paced and step by step, without giant leaps, and so with information that go beyond to their comfort zone where they feel like unable to handle those kind on information.

Another characteristic that differs adult and children learners is the so called "metacognition": adults have more control of their own understanding and learning, and for this reason they prefer to move carefully to the next step, and as soon they sense obstacle they demand a more logical and incremental path.

In the formulation of his pillars, Knowles put anchors on the five following assumptions: self-concept of the adult learner, experience of the adult learner, adult learner readiness to learn, adult learner's orientation to learn and adult learner's motivation to learn.

Self-concept of the adult learner means that adult learners are directing their own plan, scheduling calendars, prescribing about their own training needs and learning experiences to embrace. In other words, they decide about their own programs.

Experience of the adult learner refers to the fact that people' repertoire of experience continually improves and expands providing new resources for learning; so adult learners have a rich bank od experiences to draw form.

Adult learner readiness to learn indicates the pragmatism through which adults are focused and ready. This means that they want to learn things that make their lives easier and better in a concrete way, looking for skills, concepts and attitudes related to their work, families and themselves (so for their own purposes).

Adult learners' orientation to learn summarizes the concept that adults are highly oriented to learning for an immediate purpose or urgent concern, in fact they expect to apply their learning at once fulfilling that need of issue they own.

Adult learners' motivation to learn is intrinsic and it is not easy to make them happy, because they cannot get enough, fast enough, indeed if they are learning is because they feel this sense of urgency.

Complementary studies - lead by Drikx, Lavin and Pelavin (1995) (see Fogarty and Pete, 2014) - integrate Knowles' assumptions providing other five concepts. The first one is that adult learners are different, and they vary in age, abilities, level of schooling, job experiences, cultural background and personal goals. Furthermore, they expect their training to be well spent sure that it will help them in solving their problem, as they of busy and pragmatic persons.

Adult learners want to exercise degree of control in their learning: their maturity level and familiarity with the content often determines a greater or lesser degree of self-directness. Additionally, they have a varying degree of self-efficacy, in fact they may have different level of awareness about their own learning style and this influence their learning experience (Fogarty and Pete, 2014).

An integration of these studies can be found in Zemke and Zemke work (1995) where the authors present a persuasive view of adult as learner according to three categories. The result for the category "motivation" reveals that: adults have preference for the real-world and problem-based approaches; they are looking for opportunities for personal growth or gain; the increased participation is has a positive impact in the adult's motivation (Fogarty and Pete, 2014).

Another aspect that needs to be considered is the adults' attitude to change: in general, all agree that to be effective change should take time, energy and patience and must be accompanied by a well-articulated plan that stretches over time. Adults, change slowly and do not leave their comfort zone easily. (Fogarty and Pete, 2014).

Addressing the concept of adult as learners to the digital environment, some information has been provided. Indeed, adult learner experience more difficulties in achieving their educational purposes: for those who has studied during 1980 and early 90's, the technology aspect of their learning is something perceived as "no intuitive" as in their original education program technology was scarcely. Nowadays is different: in fact, it is quite problematic to accomplish things without using a computer (Badke, 2008).

Furthermore, the switch from analog to digital is not a matter of learning how to use a computer, as lot of educator believe, but it is a completely shift in the way of thinking. Adult learners have more problems (than Millennials) in using tools linked to technology because they need to start from the ground as they do not have experience with searching for and manipulation data; they need to try and try only then moving to the other parts (Badke, 2008).

They find difficulties in the digital thinking, that describes the ability to change course and imagine many possible and alternative paths to do something, so it expects a wide range of strategies to achieve the success: for those who have been learned few strategies could face more obstacle in move cleverly (Badke, 2008).

Furthermore, adult learners prefer to conceptualize the whole process, better if with a road map that explains all the point met along the way; this is done not because they prefer the "easy way" in receiving information, but because in this way they feel more confident in grasping the essence and goals of the assignment, understanding which are the steps required to transfer information (Badke, 2008).

This is simply the way that they used to: in fact, in the analog world steps are set up in order and learners should follow them; by contrast, in the digital environment adult learners might feel confused by the fact that it is a continuous sequence of activities that have a purpose but can look like chaos. In fact, for Badke (2008), the method that works better in teaching digital to adult starts giving them the possibility to learn how to "plod", meaning how to learn step-by-step, and only after use other types of techniques. The realistic world of the adult sees them as learners that do not have time to master the proves and do all the researches that they need, and it does not mean that they are lazy. They just do not want to muddle through information and process they need to be provided by research model with digital tools that they need to achieve their goals.

So, now it is interesting and useful to understand which the consequences of ageing in the individual as worker in order are to highlight how the capacity of learning is affected. The relationship between competences and ageing is complex because competences can be acquired, developed and preserved, but also lost. The first studies of this relationship come from Jones and Conrad (1933) (see Roma et al,.2012) and then they have evolved until the studying of the relationship between age and basic cognitive skill and cognitive foundation skill (for example literacy, numeracy and problem solving). It has been demonstrated that the cognitive functions are stable until the fifth decade of the life, and then there is an evident and continuous decline, increasing with advancing age (Roma et al., 2012).

Evidences show that in the adult age the cognitive ability are not uniform: in fact, different types of skills follow different kind of development. Further distinction has been made by Horn and Cattell (1967) and Salthouse (1985) (see Roma et al., 2012) in the definition of "fluid intelligence" and "crystalized intelligence": the first one consists on basic mechanisms that elaborate the information and it is strictly related to biological and physical factors; the second one is based on the knowledge acquired through education

and experiences. The age so affects the two distinct ways: the fluid intelligence is subjected to the decline with advancing age, while the crystalized one tends to be preserved with a clear minor decline (Roma et al., 2012).

2.3. **Different Generations in the Workplace**

An important thing that could be noted is that the type of education received has a great impact on the level of performance registered according to the different age group (Roma et al., 2012). Younger groups have received a wide formal instruction with respect of older groups, and they also have trained with more emphasis on the development of cognitive abilities. Furthermore, the age impacts on the competences in a field where also social, cultural and individual forces are important. It is also important to say that youngers benefit from the "recency" effect, so the result of a more recent schooling, and it is known that the more the time distant to the instruction and education system, the faster the decline rate of competences (OCSE, Statistics Canada, 2011, see Roma et al., 2012).

Generation types are divided as following (Shullery, 2013):

Table 5: Different kinds of generation

YEAR OF BIRTH	NAME
1946 – 1964	BABY BOOMERS
1965 – 1980	GENERATION X
1980 – 2000	GENERATION Y (MILLENSIALS)
2000 – 2018	GENERATION Z

Source: Author's elaboration

The four generations currently in the workplace include Baby Boomers (the ones born between 1946-1964); Generation X or GenX (1965-1980); and the Millennials (1980-2000); the younger one involves the Generation Z (2000 – 2018) (Shullery, 2013).

According to Guo et al. (2008) two different categories could be distinguished: *digital native* and *digital immigrant*. The former comprehends young people born after '80s (Millennials and Generation Z), while the latter, involves those born before 1980.

Millennials needs an active, engaging environment for learning, so there is the need of a classroom adaptation to stimulate the engagement. Although Millennials' brains may function differently due to early exposure to digital technologies, their learning options are broader than video games (meant as interactive, experiential learning tools) (Schullery, 2013).

Experts in adult learning advocate moving away from lecturing Millennials to using the principles designed for teaching adults (Werth & Werth, 2011). Teaching based on the assumptions identified by Knowles (1980) about maturing learners becomes more student-directed, with the instructor facilitating rather than. But one additional element should be considered in the analysis Millennials' learning: their values. In fact, addressing Millennials' values can help the giving them practice for the workplace so that they are more independent and productive lecturing (Werth & Werth, 2011).

Employees coming from different generations have different expectations of their working lives, and this varies wants and needs, so in front of differences among generations the policy "one-size-fits all" it is not effective anymore (Merrick, 2016).

Focusing on Millennials, they have grown up with more encouragement than Generation Xers, and in general they feel more confident in express their opinion in the workplace. In the PwC's "*Millennials at work: Reshaping the workplace'*", this concept is even deepening, in fact, young individuals expect detailed, frequent feedback and praise for a job well done; they want to be challenged outside their job role and they desire regular employee feedback, forcing HR in rethinking their engagement strategies (Merrick, 2016).

Millennials, are the first wave of the digital generation, who were born into the world of technology, they are surrounded by digital culture, and this is their natural environment and they cannot exist without the Internet, smartphones, and tablets. Their characteristic is that they easily accept changes, cultural differences and they really like active life (Bencsik et al., 2000).

Most of the Millennials are already in the market and the greatest part of them have university degrees and work together with a lot of people from Generation X and with fewer people from Generation Z. The distinguish feature of Millennials is the ability of searching for information: this generation has wide but shallow knowledge, but they know where to look for them. Furthermore, it is multitasking meaning multi-sided and shared attention (Bencsik et al., 2000).

Millennials are not motivated by a fixed long-term workplace and, given the opportunity, they will switch jobs every one or two years, especially if they do not enjoy being at that firm. They are motivated in achieving success and work is often a priority for them, while family remains in the background (Bencsik et al., 2000).

Focusing on Generation Z, they can be described as the "Net Generation", due to the highly developed digital era into which they were born. As Generation Z was born into the world of technology and they feel confident in the digital environment. They are more impatient and more agile than their predecessors, they look continuously for new challenges and stimuli; they also possess much more information because of the Internet, where they try to find the problems' solutions. They are not fan of commitment and formalities, and for them it is hard socialize with older generations. Moreover, their technical and language knowledge are of a high level (Bencsik et al., 2000).

In conclusion, a virtual world is natural for Generations Y and Z, and these last two generations - entirely different from the previous ones - demand a whole different leadership style and a use of tools and organizational culture which can present a great challenge for management (Bencsik, 2000).

Deloitte's report "2018 Deloitte Millennials Survey. Millennials disappointed in business, unprepared for Industry 4.0" is based on the views of 10,455 Millennials responses coming from 36 countries and 1,844 Gen Z from Australia, Canada, China, India, United Kingdom and Unites States. Following Deloitte's distinction, Millennials are a group born between 1983 and 1994, while Gen Z are the one born in the period 1995 – 1999 (Parmelee, 2018).

The aim of the survey is to demonstrate what Millennials perceive about the evolving threats and opportunities in an increasing complex world, including generation Z for the first time. The key finding involved are: the perception of business as not focused on what

Millennials believe; the link between loyalty and diversity and flexibility; the feeling of lack of Millennials' preparation to face Industry 4.0 (Parmelee, 2018).

Digging deeper, only a minority now believes that corporations behave ethically and focus on helping the improving society, then three quarters of the respondents think that businesses are more orientated in their own agendas, rather than in the wider society. Gen Y and Gen Z feel that business's success should be measured not only in terms of financial performance, but also including broad balance of objectives including: making a positive impact on society and environment, creating innovative ideas, products and services, creating jobs and development careers improving people's lives, enhancing inclusion and diversity in the workplace (Parmelee, 2018).

Incorporating what Millennials believe that business should achieve and what they think their own organizations' priorities are, it is possible to observe a wide gap in the nine areas that are shown in the Figure 6.

Figure 6: Employee are "out of step" within Millennials' priority
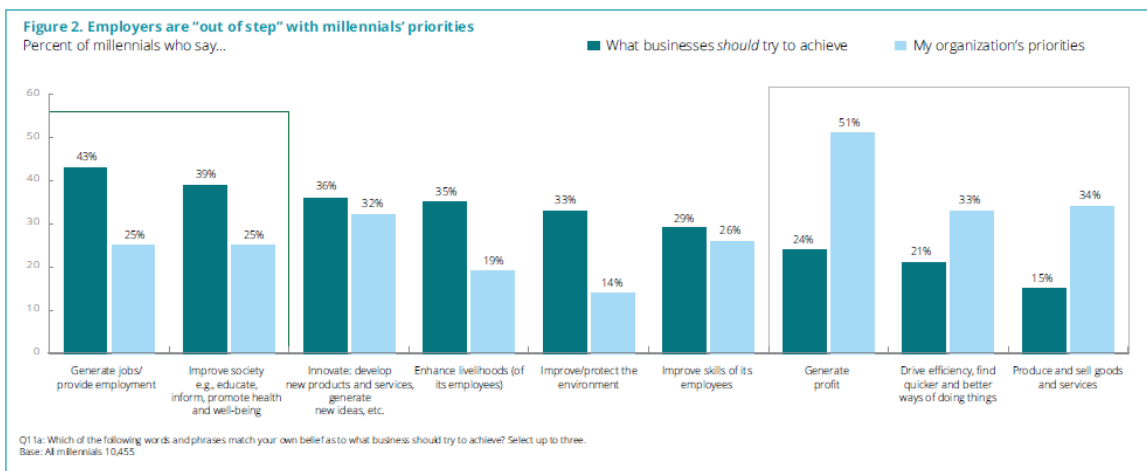
Source: Parmelee, 2018

What is also important to say, is that it seems that business do not prioritize issues that matter to Millennials: in fact, the report shows, according to what young workers say, multinational corporations have a potential in helping society's economic, environmental and social challenges, and in some business could be particularly effective in the area of education, skills and training, economic stability and cyber security.

Moreover, young workers appreciate development and diversity (and this is something in contrast with older workers). This has been demonstrated by the fact that they express admiration for those companies that adapt to the advancing industry 4.0 and develop their employee to succeed in this evolving environment. Furthermore, they like diversity which, in their opinion, is defined as forward-thinking mindset and viewing it as a tool able to boost business and professional performance. The 69 percent of employees believing that their senior managers teams are diverse, consider the working environment motivating and stimulating.

When asking to young employees how they feel about future, considering the world in general and comparing to their parent (so coming from the other generations) the result is the only in emerging markets youngers feel confident about future and expect to be happier or financially better than parents; while, overall, generation Z expect less opportunities than parents (Parmelee, 2018).

Focusing on the loyalty theme, it is important to start by saying that the gap between what Millennials believe companies should do and what they observe to happen has an important impact on the willingness to stay with their employees. Indeed, younger workers need positive reasons to stay, and it means that they need to be offered the realistic prospects and programs to develop faster as individuals (Parmelee, 2018).

Among the factors influencing loyalty it is possible to find the prioritization of innovation and societal improvements. Millennials and gen Z respondents identify several tangible factors that engaged workers: at the top (for Millennials) there is the financial rewards – with the idea that employers should share the wealth and provide good jobs and enhance workers' lives - followed by positive workplace culture and flexibility in terms of hours and location; by contrast Gen Z prefer a positive workplace culture and they also cited *flexibility* and opportunities for *continuous learning* (Parmelee, 2018).

Has said before, high level of flexibility and enhance the degree of employees' loyalty as Millennials appreciate not being tied to strict hours or locations, and also, they value employers' trust in terms of flexibility offered. Moreover, the recent rise of the gig economy has seen many people prefer short-term contracts or freelance work: 62 percent of respondent declare that gig economy is an alternative to full-employment because of higher income and then more flexibility and freedom (Parmelee, 2018).

Students and young workers have been grown with computers in their home and smartphone in their hands and for this reason they perfectly aware that the Fourth Industrial Revolution is present causing rapid work changes. Deloitte survey address questions to discover the extent to which younger workers observe this revolution and the possible impact on their work and careers, but also the level of support offered by employers (Parmelee, 2018).

The results show that they expect a dramatic impact in the workplace over the next five years, reporting that 38 percent of respondents have stated that their organization already use of advanced automation, advance connectivity, artificial intelligence or robotics that fully perform mechanical task previously done by people. Most of Millennials (and half of Gen Z) believe that Industry 4.0 will augment their work giving more time for creative and value-adding activities (Parmelee, 2018).

In general, Industry 4.0 is perceived as having the potential to affect positively the workforce freeing people from the routine and mundane activities. For this, people need support and Millennials are looking to business to provide it. Studying the lack of preparedness of Industry 4.0, among Millennials and Gen Z, only few believe that they are fully prepared and have the skill and knowledge they will need; additionally, this level of confidence about having the right skills is higher in men and members of senior management teams. More interest it is the fact that who feel the most prepared also feel the most threatened by Industry 4.0 changes (Parmelee, 2018).

Another noteworthy thing is that organizations that have adopted more flexible working practices or have diverse senior management teams, have the higher levels of confidence over Industry 4.0, and this support the idea that business leaders who take holistic approach to running their organizations are better able to retain and motivate Millennials and Gen Z. The important issue is that just 36 percent of Millennials (and percent of Gen Z) think that their employers help them to understand and prepare for changes due to industry 4.0. In this sense, on-the-job training from employers or continuous professional development acquire much more importance. Because employers support and help younger workers in performing their job, the employer's role as educator will take a greater importance and the concept of businesses as educators has been started to be popular (Parmelee, 2018).

Apart from technological skills, Gen Z feel the need to increase their level of confidence and interpersonal skills and they expect to improve them during the experience and from employers' trainings. Moreover, they are looking for employers that support with informal and formal initiatives to develop skills as communication, leadership, finance and economics, languages, having global mindset and analytics skills (Parmelee, 2018).

2.4. Need of Effective Training Methods

So, in front of the evidence of how digital in influencing labor market in terms of work environment changes and Skill Gap creation, how adult behave as learners and how technologies have affected the differences between different generational groups within the same workplace, it is possible to move on with further analysis. Next chapter is going to focus on figuring out which are the best training methods in this new context, that take into consideration the critical factors analyzed and are focused on finding the best solution in the adult workers' training on new skills.

From a general point of view, because the support of the new technologies of Industry 4.0 considered in the first chapter, now workers are supposed to face new kind of issues such as the quantity of present information and the speed at which they evolve. So, two kinds of obstacles emerge from this new framework: how worker can manage the amount of the new information combining them with the already present ones, and which is the best way to stay up to date with all new technologies, information and changes occurred. So, before going on to the next chapter an important concept is going to address the workers' problem in facing huge amount of information available and the fast pace at which they change becoming easily obsolete: the unlearning.

2.4.1 What is Unlearning?

Unlearning has born as consequence of a turbulent changes due to the abundance of knowledge and possibilities of its use, and for this reason it is proposed as a solution to address the issue of quantity of information existing and the pace of change that they follow.

Tsang e Zahra (2008) have studied the unlearning phenomena defining it as the decrease in the range of firm's potential behaviors, discarding knowledge described by different authors as obsolete, misleading, redundant or unsuccessful. For Becker (2008), the major reason for encouraging and engaging in unlearning is to allow the inclusion of new information of behaviors and facilitate learning.

For what concern the difference between Unlearning and Forgetting, there are some contrast point of views. For example, some authors consider unlearning and forgetting as synonymous terms, while Tsang and Zahra (2008) distinguish them into two different categories: they define unlearning as conscious, deliberate decision to give up useless, obsolete knowledge, and forgetting as unintentional, inadvertent loss of knowledge in the organization's memory. For this reason, unlearning is considered as one type of forgetting.

In Tsang and Zahra's (2008) paper it is discussed when unlearning brings betterment to the organization: in fact, according to what authors find, the discarded routines are generally defined as useless and obsolete, but what Tsang and Zahra suggest is that they are not always worse than the new ones, thus it is possible that unlearning does not improve the organizational performance. Moreover, there might be a short-term negative effect for the substitution, where performance fall due to the change of institutionalized and well understood routines.

In fact, it is possible to observe that accurate organizational learning, which refers to the acquisition of accurate knowledge, is quite difficult as at the individual level various human errors and biases could limit the experiential learning, and the errors may translate into organizational actions. It is also important to say that organizations are now face increasingly complex and fast changing environments, so it becomes even more difficult to find the link between unlearning and acquisitions of new skills or improvements on organizational performance (Tsang and Zahra's, 2008).

To find when betterments are brought, Tsang and Zahra (2008) firstly define the characteristic of the definition of unlearning involving two dimensions: the behavioral dimension and the cognitive dimension. The former is the repetitive patterns of independent actions, while the cognitive dimension reflects the fact that organizations' members often should interpret their actions in order to make sense of what they are doing, so with the consequence task to decide whether routines are outdated and abandon them.

Moreover, another critical point to highlight, to understand how to implement an effective unlearning, is the difference between ostensive and performative routine: ostensive routine refers to the schematic form of routine, so its principle, while the performative one denotes the action performed by a person in a specific place and time, so it is the use of the routine. Both aspects are needed in the routine's definition. In fact, a successfully elimination of a routine is verified only when both ostensive and performative aspects are removed from the organization. If an organization decides to discard an existing routine and then replace it by another, this action first comprehends the ostensive aspect of the routine. Then, the change inevitably demands corresponding adjustment of work practices by the affected organizational members: but if members of an organizational unit continue to apply an old routine, it becomes clear that he performative aspect of this routine has not been successfully discarded (Tsang and Zahra's, 2008).

Unlearning in the organizational level requires unlearning at the individual level, that means that a person becomes aware that certain items of knowledge possessed are no longer valid or useful, with the need to stop their enactment.

One thing that could create a barrier to organizational unlearning is the inertia caused by age: in fact, as organizations become older, traditional ways of doing things are strongly rooted, and it is observable that the more roots are strong, the more existing routines are legitimize their continuation. Indeed, routines are stored also in the collective memory of organizational members, thus old organizations are more likely to have more individuals working in their operations for a longer period, and these people have performed old routines numerous time, becoming their habits. That is that the substitution of these old routines with new ones is more difficult (Tsang and Zahra's, 2008).

According to Becker (2008), both and organizational factors could enable or inhibit the individual unlearning. Among individual factors, there are person's experience,

personality, resistance to change; and in the organizational ones, type of change, management, colleagues, cultures are considered. For this reason, the Figure 7 below shows the process model of unlearning.

Figure 7: The process model of unlearning
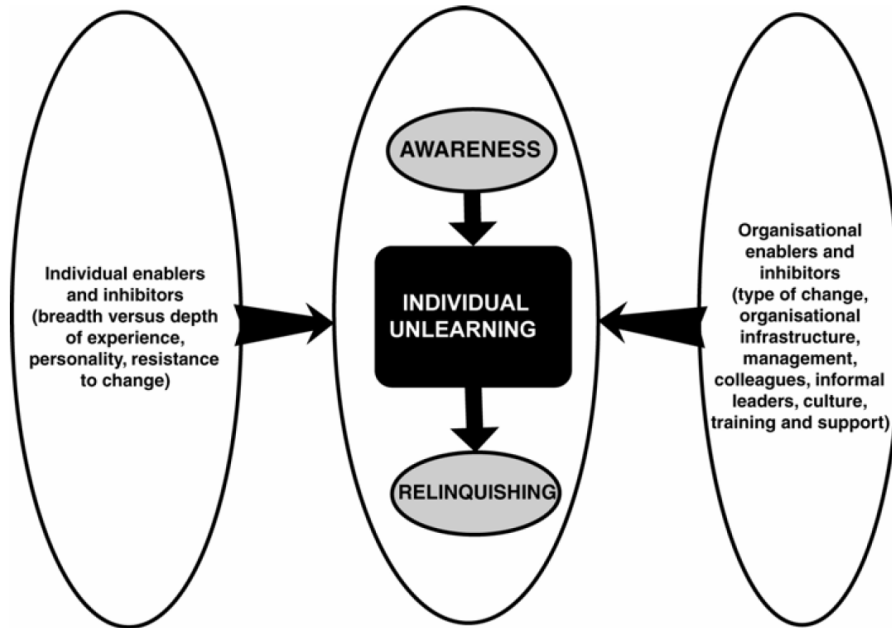
Source: Becker (2008)

The model's focus is the individual unlearning represented by the black box: before beginning there must be an increased in the level of awareness in the individual that there is a new way of doing things; then either internal and external forces should facilitate the process, and this not means that the individual agree the new way, but only he or she is aware. After that the process of unlearning start and concludes with the outcome of relinquishing of the past behavior. As the figure shows, during the process several individual factors have the potential to act as enables or inhibitors.

Another important research that helps to understand how unlearning process works it the Navarro and Wensley's (2017) one: they define unlearning as a process that can be operationalized though three different sub-processes: awareness, mistake and relearning.

Awareness: it is the process by which individuals become aware of obsolete rules, routines or processes. The relevance of this sub-process highlights the importance of creating awareness or a sense of urgency to facilitate unlearning (this confirmed what Becker (2008) already said).

Mistakes: it is necessary that the individual gives up knowledge affected by mistakes, as it allows people to stop making the same errors again by surfacing the knowledge basis of such mistakes that may in the past have been hidden. Individuals unable of renouncing knowledge, values, beliefs, or methods can create rigidity in thinking and acting, which in turn could suppress the organization's adaptability. Therefore, failures, mistakes and problems can help organizational members in finding inappropriate knowledge.

Relearning: it indicated the ability of learning new things, while someone is doing something new (e.g. a new routine). Usually, in order to do this, it is necessary to unlearn some habits and mindsets and adopt new routines that will become habitual. Thus "relearning" is considered essential in the acquisition of new knowledge that is not compatible with current knowledge in different contexts and situations.

The work of Navarro and Wensley (2017) provides a synopsis of the three contextual components considered necessary to enable intentional unlearning processes (i.e. awareness, relinquishing and relearning); these components prepare the necessary groundwork for creating awareness of the implications of outdated knowledge, the relinquishing of outdated knowledge and the relearning of new knowledge. Incorporating the concept of unlearning into these three contextual components enables individuals to identify mistakes, errors or inappropriate or wrong assumptions which may need to be put aside or ignored (Navarro and Wensley, 2017). They are:

- Individual level structures that provide the possibility to consider alternative interpretation of the information that is available, so those that permit individuals to think outside the box and re-examine their habitual, comfortable state of being.

- Group level structure that facilitate the changing of individual habits (routines, assumptions).

- Organization level structures that facilitate the consolidation of emergent understandings.

To sum up, in this chapter a different point of view has been introduced: in fact, it has been examined how workers (as adult) can be trained to cover their skills gap. Some key elements have been considered: the classical view of how adults learn, the fact that nowadays labor market includes different generations that have distinctive features and

needs and then the importance of the unlearning presented as an important method used in order to face the rapid changes registered in this age.

Next chapter is going to introduce which could be the training methods able to encounter these series of issues presented before.

3. TRAINING METHODS PROPOSAL

In a time characterized by rapidly changings, with new skills required and new organizational structures, where being agile is the new imperative (referring to the ability to adapt, change quickly and succeed in a rapidly changing and turbulent environment), companies are facing a substantial challenge in making ready their workforces. It is something that will be significant for the society at large as there is the need to build up a "learning economy" where while workers' skills continue to evolve, people are able to keep pace of the innovation (Ovanessoff et al., 2018).

The need of a well-trained workers became indispensable to be competitive and for this reason the evaluation of training methods and outcomes has been studied, becoming an interesting topic of investigation (Hedderly and Scott, 2015).

There are different actions through which it is possible to develop the workforce of the future, and they vary across sectors and companies, but those issues in common in the whole economy are: the compulsory upgrade in skills of workers; the necessity to retrain and redeploy employees according to business changes; the importance to be able to hire new talent for those "gaps", in particular where advance technology skills are required; need to manage individual and overall implication when workers are released. This topic has become so important that five important action that matter in the construction of the workforce skills have been thought: retrain, redeploy, hire, contracts, release (Ovanessoff, 2018). The focus of this thesis is the analysis of is the first point: retraining, that comprehends raising the skills capacity of current employee teaching them skill that are new or different but better form a qualitative point of view, but also to improve the existing skills of an employee keeping them to a higher level following the technological pace (Ovanessoff et al., 2018).

Some studies concentrated in evaluating the effectiveness of the training; Hedderly and Scott (2015) have shown six elements to consider in making training evaluation: participant satisfaction with the training; learning achieved by the participants; pedagogical coherence of the training process; transfer of training to the workplace; impact of training on organizational goals; profitability of training for the organization.

Moreover, other researches, like the one of Accenture (in *It's learning. Just not as we know it,* 2018) shave shown that today's training system are ill-equipped to build the necessary skills required today, in fact, skills gaps are widening, and institutions are not ready to cope.

This has been confirmed also by CapGemini Consulting, that, already in the 2013, has reported the presence of a lack in synchronization and alignment between corporate training budget and its allocation in the digital training (Spitzer et al., 2013).

Moreover, skills like complex reasoning, creativity, socio-emotional intelligence and sensory perception by nature are developed through practice and experience over long periods of time and they are not taught in the classroom, lecture or library. So, the issue is how the education can be adapted to face this evolution taking in to account that there is no longer a competitive advantage in knowing more (Spitzer et al., 2013).

By the '40s, it is possible to find some attempts to figure out which methods guarantee the higher impact on trainees. Indeed, Edgar Dale in 1946 introduced the Cone of experience that illustrates the progression of experiences form the most concrete to the most abstract (at the top). This concept has been studied by lot of authors interested in the effectiveness of teaching methods.

Going in detail, the base of the cone is characterized by more *Concrete Experiences*, such as direct experiences (real-life experiences), contrived experiences (interactive models), and dramatic participation (role plays). Then, *Direct Purposeful Experiences* represents reality or the closet things to real, hence the common things in this level are the "doing" things. In the middle part of the methods are more abstract and characterized by "observing" experiences, where learners do not interact directly with the phenomenon in question. In this section, the cone includes demonstrations, field trips, exhibits, motion pictures, and audio recordings or still pictures. Concluding, peak's cone is the most theoretical part represented by non-realistically by symbols, either visual or verbal i.e. listening to the spoken word. Furthermore, the chart offers the retention rate of the various method of teaching: the idea is that the further you progress down the cone, the greater the learning and the more information is likely to be retained. Indeed, it reveals that "action-learning" techniques result in up to 90% retention and so people learn best when they use perceptual learning styles; contrary methods like reading have a retention rate of about 10%. So, according to Dale's cone, which helps to take decisions about developing

activities, instructors should design trainings that offer more real-life experiences (Beverly and Summers, 2014; Belohlav, Cook and Heiser, 2004).
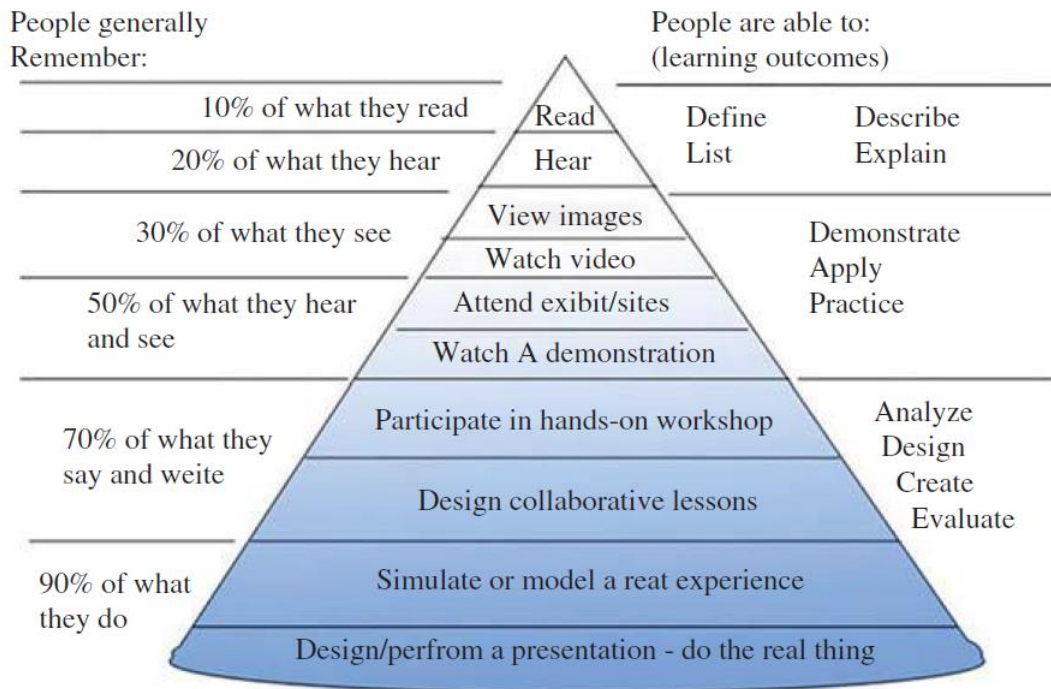
Figure 8: Dale's Cone of Experience

Figure 1. Dale's Cone of Experience.

Source: Beverly and Summer (2014)

Today the theme regarding how to learn and what people tend to remember has become fundamental in training, so that, thanks to new technologies, some specific studies in neuroscience have been conducted, in order to give a valuable base that can go beyond Dale's proposal.

It has been discovered that in neuroscience and technology Experiential Learning techniques have been growing in the last years and they focus on learning through hand-on application rather than absorbing knowledge by listing or reading (Ovanessoff et al., 2018). The advantage of the Experiential Learning is that it is able to catch the attention thanks to its immersive approach: in fact, learners are active participants and not passive recipients of knowledge -for example, some schools use team-based learning methods in order to engage children-. A confirmation of the efficacy of these techniques come from

not only neuroscience but also the behavioral sciences, that proved that they lead to a faster and deeper learning. Indeed, a study of the University of Chicago (2015) used brain scans demonstrate that hands-on learning activates sensory and motor-related areas of the brain (Ovanessoff et al., 2018). Another investigation comes from the US National Training Laboratory, which has proven that the retention rate obtained through Virtual Reality is 75 percent, certainly higher than the 10 percent gained through lecture style (Ovanessoff et al., 2018).

According to Washington University professors of psychology and brain sciences, Henry Roediger and Mark McDaniel it is possible to say that when the learning is effortful and active the brain forms new connections more easily. They also suggest that when learners are obliged to solve a problem they learn more and making mistakes and correcting them improves skills retention. This approach has been found particularly adapt for adults, and brain plasticity decreases over time, retaining information through listening and reading becomes more difficult. So, involving these techniques in the training programs will guide to the best results (Ovanessoff et al., 2018).

A group worthy for a personalized intervention is the older workforce, as they tend to participate less in training, because a mix of their reticence and corporate bias and as populations is aging, equipping seniors with the required skills will become a priority to keep them productive; so, it is necessary to provide a learning guidance and flexible access to training. Companies should offer different kinds of option suggesting pathways towards actual jobs. Lasting training programs must be flexible in order to help busy adults with many responsibility and work (Ovanessoff et al., 2018).

In general, what is suggested by Spitzer et al. (2013) is that in order to develop successful skills development, it is possible to follow a road map based on four steps:

1. Define vision and identify future skill requirements: it means to define a clear digital skills vision for the organization understanding what are the skills that the company needs in meeting the digital transformation goals.

2. Undertake skills gap assessment: once the vision has been established, it is important to self-assessment the existing skills, comparing the skills level owned and the desired one. This also permits to identify the digital knowledge of employees determining the existing Skill Gap   and the potential way to cover it.

3. Bridge the skills gap: in these steps it is important to overcome the Skill Gap recognized using a training method that depends on the technology focus area, intensity of Skill Gap and availability of resources.

4. Constantly evaluate progress: it is particularly relevant establishing a continuous monitoring process to evaluate the training system success.

Despite the evidence of an increasing necessity in find new effective training methods, according to CapGemini (which has confirmed that traditional approaches do not help the evolution of the digital environment) only 4 percent of companies align their training efforts with the digital strategy and there are no company spending more than 20 percent of their training budget on digital. Moreover, for what concern the types of methods used, more than half of companies (63 percent) are using traditional methods to obtain digital talents, and only 13 percent of companies are using innovative methods (Spitzer et al., 2015).

In next paragraphs, three different training methods are going to be presented, attempting to give some alternative proposal to traditional ones. They are: Reverse Mentoring, chosen because it adequately considers the difference between different generations inside workforce; Video and Virtual Reality as they have been presented by Accenture as, thanks to their potential (later described) are tool able to increase the effectiveness of training.

3.1 Reverse Mentoring

Since 2014 mentoring is considered the top training and development priority for companies.

According to Spitzer et al. (2013), Reverse Mentoring can help in addressing the gap in digital skills in the senior employees, and for this reason some big companies like General Electric, Cisco and L'Oréal have already exploited this training tool.

But, looking at the history of mentoring, also traditional economies, like the medieval guild system, incorporated their own versions of mentorship, with the mentors represented by master craftsmen, and the protégés called apprentices. The current mentoring relationship presents similarities to the old one, such as transferring of skills, knowledge, and wisdom from generation to generation. Among the different types of mentoring methods, in *peer mentoring*, colleagues have the same level of experience and so mentor each other, learning from each other and collaborating. Instead, *Reverse Mentoring* involves young people acting as mentors to more senior colleagues, recognizing that even people with limited experience have valuable skills and perspectives to share (Berselson, 2014).

Mentoring is considered a so valuable approach that it is possible to find a list of different shades that have always the principle of someone (the mentor) that transfer skills and knowledge to another person (the mentee) (Berselson, 2014).

We can observe that there was transition of the meaning of training, from a narrow version to a broader one comprehending the scope of learning and development and so introducing a more varied and personal learning modality, like the mentoring approach. From social learning to expanded mentoring use, learning based on relationships become reference points in the last few years as this method effectively addresses competency gaps (Berselson, 2014).

Reverse Mentoring often let leaders to be exposed to new trends in technology, new ideas and innovations, and to innovative and diverse perspectives coming from younger generations.

Moreover, the important concept to highlight it that since a rising number of Millennials join the workforce, Reverse Mentoring is growing as a developmental practice. But it is

possible that this nontraditional mentoring dynamic can cause problems, such as poor communication, vague understanding. So, three tips have been proposed by Emelo (2012) in order to firstly address these potential blocks, and then build a collaborative and effective Reverse Mentoring relationship.

1. Focus on learning. The relationship should not be a matter of power and it should focus on learning. Of course, this could seem difficult at the beginning, since the learner is higher in the organizational hierarchy, but it is true that it can help to better figure out the best aims for the relationship. In order to do this, learners should express what they expect in terms of outcomes, and advisers should measure the way in which they feel able to contribute in achieving those goals. In other words, parties need to be perfectly aligned on the general goals and direction for the relationship.

2. Share responsibility. Reverse Mentoring should lay its foundations on collaboration, where both parties can receive inputs from the relation. The adviser (the younger person) needs to feel free to be more directive as an acknowledged leader is in the relationship. If the learner is a senior leader, this permission needs to be explicit, so the adviser feels safe speaking honestly. Moreover, learners should take responsibility for their own progress and commit themselves to the mentoring engagement.

3. Practice respect and empathy. Trust is a cornerstone of all mentoring relationships and it can only be developed if conversations are confidential. Then, parties must talk about the environment realities that surround the relationship and so determine what level of confidentiality they want to take. People should consider how the partner's positional power affects them before making a request, offering a possible solution or processing a critical issue. In general, with all mentoring, commitment, respect, honest communication and specific learning goals are key for success.

Other several critical elements, completely in line with what has been suggested by Emelo (2012) in the success of Reverse Mentoring are defined by Tibergien (2015):

- The reverse mentor should not have a direct reporting relationship to the mentee
- Both parties should agree on whether they prefer an agenda or a more ad hoc approach to discussion
- Meetings should be scheduled on a regular basis

- The dialogue should be not strictly limited to the schedule, in fact, insights and information should be shared as they occur
- Each party should give constructive feedback
- Organizational hierarchy should be left away focusing on the collaborative relationship between two equal persons
- Both parties should be respect and give the right level of confidentiality

As said before this type of mentoring has been emerged with the shift of the generations, but it is important to say that it is not only having a positive impact in the technology environment, in fact the young generation is properly educated in health and safety, and so good habits: younger people's attitude is knowing this is wrong, and they do not feel afraid to say so (Faragher, 2016). Moreover, according to Professor Karl Moore from the Desautels Faculty of Management at McGill University in Canada (see Faragher, 2016), Millennials' need to have a regular feedback has cause the raising interest in the Reverse Mentoring, particularly in an age where four generations (boomers, gen X, gen Y and gen Z) are increasingly working alongside each other. According to him, Millennials approach technology in a way that is not considered by older employees, just because they do not even know it, also Millennials appreciate different working models and they are less concentrated on hierarchy.

A possible difficulty that could arise is that senior member may not accept that younger members have more valuable knowledge to share and therefore they may not be opened to receive feedback from some less-experienced person. On the other side, younger staff need to feel confident enough to share their views and may be less willing to participate. For this reason, Reverse Mentoring is an overcome stereotype approaching to an ideal world where we would learn naturally from those with the most to offer us, regardless of their age.

For example, a millennial is associate to an executive with the role to teach him or her how to use social media to connect with customers. It is possible to observe how junior employees can give on input to higher levels of the organization, having a window in this area of the business, and so that when the mentees retire, the younger generation has a better understanding of the business (Meister and Willyerd, 2010).

Many companies are exposing to Reverse Mentoring by asking their tech-savvy Millennials to school leaders on social media, mobile computing, and the cloud. In fact, a growing number of organizations have created formal or informal Reverse Mentoring programs, including such industry giants as Cisco, Johnson & Johnson, and General Electric (Ellis, 2013).

Its importance has acquired so much value that, as said before, it is possible to find also different kind of approach that follow Reverse Mentoring's principles. They are: in flight mentoring, speed mentoring, shadow boards, job swapping rotational mentoring, data-driven mentoring, topical mentoring, situational mentoring, peer mentoring.

In practice, there are many examples of application of Reverse Mentoring as training methods, in particular in the largest companies. One example is Microsoft[3] that used it in its training program (kicked off in Austria in 2014, and now rolled out in European countries) reporting in its web site workers' experiences. Microsoft agreed the fact that Reverse Mentoring can help older workers to get insight next generations allowing them to understand how to communicate and interact with them. This is important in a period characterized by different generations inside the same workplace with the related growing generational gap, shifting of expectation and constant need to stay on cutting "digital" edge. Moreover, according to Microsoft, Reverse Mentoring plays the role of a good bridge between X and Y generation, covering the exigency of deal with the biggest challenge where X needs to manage Y, and Y needs to adapt to X. For Kristin Ruud, Human Resources Lead at Microsoft Norway, turning to Millennials for insight is key to business success: in fact, generation Y consumes services in a completely new way. They offer invaluable insights that must be collected and exploited through the full engagement of this group, aware that these insights will help to be able to meet the needs of a demanding consumer market.

At Microsoft Norway, Michael Jacobs, General Manager, regularly meets Magnus Svorstøl Lie, Partner Sales Executive hired through the Microsoft Academy of College Hires (MACH) program. They have share that the program has helped broaden their horizons, build trust, share technical skills such as social media optimization, and even

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[3] https://news.microsoft.com/europe/features/reverse-mentoring-how-Millennials-are-becoming-the-new-mentors/

make concrete changes to day-to-day routines. Rethinking how the middle management communicates within the organization and empowering Millennials to speak up with questions or concerns are examples of changes initiated by their conversations. Besides, and as a direct result of the program, Michael has asked the Norwegian MACH community to plan the new fiscal year's kick-off session in September.

Another example of implementation of Reverse Mentoring comes from General Electric[4]. Jack Welch, the former CEO of the company spread the concept of Reverse Mentoring since 1999, when in his pilot project paired 500 senior and junior employees, hoping that younger would teach the former about technological advances and tools. In the years since Welch's pioneering effort, many companies have developed their own Reverse Mentoring programs and although they vary in scale and scope, all share one common approach: coordinating shared learning between colleagues of diverse backgrounds to create symbiotic corporate learning.

A further example can be found in Cisco. In 2011, Laura Earle had written in Cisco blog[5] about Reverse Mentoring and the Cisco related program involving 31 mentors and mentee for six months. Their feedback about benefits of the program reported that they had understood one another team inside Cisco in terms of how they operate and what are their drivers. They also had the opportunity to enjoy an open and honest exchange of ideas and best practices, and mentors felt that their feedback was valued and well received making them confident in speaking honestly. Some participants also liked the fact that they knew someone that they wouldn't have normally engaged with, getting a completely different point of view, not exclusively referred to business.

Participants also had the possibility to decide if they want to continue the program after the deadline, and few people continue to do it (the exact number was not unknown).

To sum up, Reverse Mentoring is a very effective way of doing training, that facilitate the transmission of information and knowledge among generation and it is particularly adapt in an era in which digital transformation plays a crucial role, and where new generation are more confident in this type of environment.

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[4] https://www.forbes.com/sites/jasonwingard/2018/08/08/reverse-mentoring-3-proven-outcomes-driving-change/#35d859248b51

5 https://blogs.cisco.com/diversity/the-results-how-reverse-mentoring-can-enhance-diversity-and-inclusion

3.2 Video

In the Accenture report cited before, it is also said that according to what emerge from the collaboration with CaseWorx, a video training company, Immersion Neuroscience has shown that watching a video of a case study, rather than reading it, improved knowledge recall by 97 percent (Ovanessoff,2018), and for this reason it is appropriate to deepen this kind of method.

If videos are used properly the can be powerful teaching medium to increase the attentions of students (in this case learners) and they can work as strong motivators (see Chan, 2010). The powerful impact of videos as training tool has been also demonstrated by the popularity gained by videos on the Web, represented by many formats such as demonstrations and explanations, screen captured during presentations, mini lectures. Video not only allow to learn at their own pace, time and environment (house or office for example), but also it provides the opportunity to learn independently without relying on others (Chan, 2010).

Taking for example YouTube, it has been voted as the top Tools for Personal & Professional Learning 2018[6], in fact this site offers lot of informative learning videos including also professional videos, professionals recording, user edited and professionally edited videos (Chan, 2010).

In "Measuring the Effectiveness of Video Training through Technology-Based Education" Hedderly and Scott (2015) studied the case of Aqua Health Management (Aqua), a management support organization providing training and development and other human resource services for six companies in the social service industry dispersed across the western United States. Until September 2012, Aqua had provided all training through traditional face-to-face education but then, the new hired director of training and development convinced the organization to pursue the development of a proprietary learning management system. So, they decided that a mix of videos, written materials and scenario cards would assure a better effective training.

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[6] https://www.toptools4learning.com/home/

The research has shown that video training can actually be an effective training method only if it meets some criteria: in fact, they must be able to keep the trainee focused on the crucial learning objectives; it should have a narrow focus with specific targets of information; the length should consider the engagement of the audience, with a maximum duration of five minutes or one minute depending on the trainer ability of engaging; and it should use the right language (Hedderly and Scott, 2015; Quimet and Rusczek, 2014). Moreover, is not a "one-size-fits-all" approach anymore, as it became a personalized medium from which organizations can acquire a competitive advantage (Hedderly and Scott, 2015).

It is agreed also that videos not only can engage and entertains people, but also, they are easier to remember; they can replace the live instructor with interactive activities method. It also makes possible the introduction of multimedia like graphics, animation, picture, video, and sound to present information.

According to Zhang et al. (2005) simply incorporating video into e-learning environments may not always be sufficient to improve learning: in fact, it is important to include interactive videos that provide random access to contents improving outcomes and learners' satisfaction. Interactivity, meaning the use of computer system to allow proactive and random access to video content based on queries or search targets potentially motivate students improving learning effectiveness (Zhang et al., 2005).

It is evident that videos are an integral part of the educational environment that learners face, and its effectiveness has not been undisputed in particular if compared with print (Merkt et al., 2011)

The advantage of using videos in the learning objects is that they can fit into already existing training programs, allowing to cover gaps and weaknesses or improving contents (Quimet and Rusczek, 2014).

To conclude, as said by Quimet and Rusczek (2014) the power of images has been studied for decades, but SH&E (safety, health, and the environment) has not leveraged this enough to maximize learning, due to the cost of producing visual media of an acceptable quality. But now, to avoid the problem of spending too much money on videos done professionally but easily outdated, with the risk of having old contents, some specialist prefer to invest in doing videos in-house, with the possibility to regularly change and adapt the training materials (Payton, 2018).

A practical example of using videos for training employees is presented by IBM in 2016. Indeed, the company in explaining what the "Run daily standup" has shoot a two minute' video where the office dynamic is shown.

This training video has been designed to show the daily stand-up meeting that everyday each IBM team must do to discuss how things are going and whether any issues are blocking progress. The goal is to keep these meetings concise and no longer than 15 - 20 minutes.

Watching the video[7], not only it is easy to identify which are the key features of methods, but also it engages viewers with an ironic touch. IBM video is effective because it shows how to conduct a stand-up meeting, and why doing so is a such good idea: in fact, the problem is that maybe the teammates could be short on time, feel uncomfortable speaking in front of a group and this kind of training helps them to face those issues and assure that they can return home safely.

Another example is provided by Ernest and Young, that in 2015 created a training[8] where the goal was to show colleagues why email can be not secure at all, but this kind of subjects is just so big and so complex that it is to even more difficult to know how to begin teaching. So EY bypasses the complexity completely and use a strong metaphor. For this purpose, the business created a fictional character to represent an email client. Rather than having to explain how the whole email system works, a personification allows them to work with a visual and emotional shorthand. The video is clever and succinct and shows exactly what is the risk of email in terms that audience can easily understand.

To sum up, it is possible to say that Video Training offers a great method able to improve the effectiveness of the training, to easily update the contents limiting costs and engaging the audience.

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[7] https://www.youtube.com/watch?v=oHcmLKroPqw
[8] https://www.youtube.com/watch?time_continue=107&v=lts-oqqIcLE

3.3 Virtual Reality

As said before, it has been demonstrated that the retention rate obtained through Virtual Reality is 75 percent, certainly higher than the 10 percent gained through lecture style (Ovanessoff et al., 2018), so also this method for sure deserves a further investigation.

According to a Goldman Sachs' estimation, Virtual Reality (VR) and Augmented Reality (AR) will grow up to 95 billion dollars in the market by 2025, due to the requirement by industries in the creative economy (gaming, live events, video entertainment and retail) and other industries such healthcare, education, military and real estate (Hall and Takahashi, 2017).

Virtual Reality and Augmented Reality have the potential to become the next big computing platform, and, through VR, user's experience will be the most important factor and it is possible to increase mobility, to expand the use cases and pervasiveness (Bellini et al., 2016)

The difference between immersive technology and traditional technology, is that the former allows the designer to be provided a more direct experience with the possibility to do all the "real" action like walk, fly and interact with their prototypes. This implies the production of higher quality and potentially cheaper tool that the one offered by traditional tech (Hall and Takahashi, 2017).

Moreover, VR permits users to immerse themselves into manufactured surroundings illustrating actual places or imaginary worlds, as it also blends digital components and experiences with real life, on the other hand AR overlays contextual information on the immediate physical environments saw by users in real life. Both give the chance to set up technologies in a way completely infeasible or impossible. So, it is possible to say that augmented reality and virtual reality are innovation the opportunities offered to companies, on those areas of collaboration, communication, training and simulation, customers service and reinvention of employees and costumers experiences (Kunkel et al., 2016).

In the training and simulation context AR and VR will make it possible for IT to play and active in reorganizing high-cost training and simulation environment, in order to realize critical scenarios without facing real risks. For example, in manufacturing process, workers can replicate maintenance and repair pieces in a virtual scenario, isolating

employees from dangerous consequences. In fact, VR can provide a controlled environment and automated support system, making possible the implementation of a secure environment providing an active learning, involving the "perception-action feedback loop" to transfer the knowledge and behavior acquired in a virtual world to the real one. Moreover, learning in a virtual condition can guarantee additional advantages than learning in the real world: in fact, not only virtual world is a less dangerous environment (that also allows people to feel less worry), but also the learner is exposed to an ambience where there is no intrusive of irrelevant objectives (Foloppe et al., 2015).

Virtual Reality (VR) technology applied in training allows the trainer to move around the environment, clicking on areas inside the ambience, adding realism, interest and engagement to the training (Bentley and Stanly, 2000). In addition, Virtual reality (as well as Augmented Reality) in addition can raise the level of intuition, as the controls are driven by gestures and the interface is in 3D (Bellini et al., 2016). It can in an immersive experience and not a flat one: it exploits cues deriving form ambient sounds or simply a glance to drive both intentional and reflexive movements. In this technology, click and swipes animate flat experiences involving spoken words, gestures, blinks and so on.

It is important to say that the focus changes: in fact, what happens to objectives when users look at them has the same importance of what objectives are doing when user is not looking at them. Gestures for example, could be used to change perception, pausing or stopping time, offering the opportunity for the enterprise to design environments that offer empathetic personalized responses. This makes the enterprise focused on the human-centered design, emphasizing comfort, health, safety, happiness, productivity and growth (Kunkel et al., 2016).

It is also interesting to note that through the Virtual Reality implementation, companies do not need to rely on users' feedback (that vary according the person), but they can use directly data tracked and rated though the site, app, and at the same users can receive training on the job, something that classical training never truly offer (Hubbard, 2016).

To conclude, the world of VR should continue the extension organizations' digital strategy, applying new technologies to enhance the employee empowerment, as it can provide the immersive simulated environments that helps model complex and unsafe environment.

Also, for virtual reality it is possible to find some application examples. One of them is the application of virtual reality in Walmart, that in 2017 has introduced this technology in the world of employee training and development using it to upgrade training at Walmart Academies nationwide. Partnered with Strivr, Walmart prepared employees to Black Friday's long queues and crowds, not an everyday occurrence. Immerging employees in that environment permits to prepare them for this kind of occasion and also it allows to remove the need to disturb normal business operations for training, but also to replicate the same live scenario in any Walmart store without a prohibitive cost[9].

With the huge success of this program, the company is now providing Oculus VR (a virtual reality headset) to all stores in the U.S. to bring the same level of training to more than 1 million Walmart associates.

Employees are reportedly enjoying training more, and their retention is better than employees who are trained using traditional methods like observation or reading instructions on a PDF. In fact, Walmart's blog reports that by the end of the year, all 200 Walmart Academy facilities will be using VR to train associates[10]. Andy Trainor, Walmart's senior director of Walmart U.S. Academies report that since employees watch a module trough the headset, feeling the brain like it is experiencing the situation, they feel more confident and this boosts retention.

Moreover, according to what Walmart share in their website, starting from December, VR training will begin its launch across the country, sending four headsets to every Walmart supercenter and two units to every Neighborhood Market and discount store. With more than 17,000 Oculus Go headsets in stores by the end of the year, every associate – including those on the floor who interact with customers the most – will have access to the same training that their managers and department managers do at the Academies[11].

Brock McKeel, Walmart senior director of digital operations, reports that there are already more than 45 activity-based modules using industry-leading software provided by STRIVR, whose platform delivers realistic, repeatable and scalable training content,

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[9]https://disruptionhub.com/business-virtual-reality-5-uses/

[10] https://trainingindustry.com/articles/learning-technologies/when-is-training-in-virtual-reality-a-good-investment/   https://www.prnewswire.com/news-releases/kfc-creates-virtual-world-to-train-its-real-world-cooks-the-hard-way-300509008.html

[11] https://blog.walmart.com/innovation/20180920/how-vr-is-transforming-the-way-we-train-associates

which helps associates learn information more quickly and retain it better. "We are entering a new era of learning, and Walmart continues to lead the way," said Derek Belch, CEO of STRIVR, which worked with Walmart on its initial launch of VR in Academies last year. "The power of VR is real, and when offered as a cornerstone of learning and development, it can truly transform the way an organization trains its people."

Concluding, Walmart's plan is to exploit the VR in new technology, soft skills like empathy and customer service, and compliance. But it is particularly important in learning new technology; indeed, Walmart has used VR in a pilot test in summer 2018 for training on new Pickup Tower units in their stores.

Another interesting example comes from KFC. In fact, the company[12] last year launched a new training program "The Hard Way – a KFC Virtual Reality Escape Room" in which cooks use Colonel Sanders' hints to virtually fry chicken. This program it is also used to provide the Chicken Mastery Certification that includes e-learning and hands-on training in restaurants. The company is also planning on using VR for its regional general manager training, quarterly franchise meetings and headquarters employee onboarding.

Blending virtual reality and real reality allows to demonstrate how to make Original Recipe fried chicken in a unique, hands-on and modern way. After successfully completing the five main steps – inspecting, rinsing, breading, racking and pressure frying – participants exit the secret training kitchen with a high-level glimpse of what goes into cooking Original Recipe chicken, a process that takes 25 minutes from start to service in its real-world KFC kitchens across the U.S. In the virtual world, the game is able to utilize the magic of modern technology, such as time lapse, to provide participants with a ten-minute demonstration of KFC's cooking process.

To conclude, using Virtual Reality is a very innovative way of doing training, that permits to safely involve workers in a digital environment, letting them to experience their tasks.

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[12] https://www.prnewswire.com/news-releases/kfc-creates-virtual-world-to-train-its-real-world-cooks-the-hard-way-300509008.html

4. COMPANIES' POINT OF VIEW

4.1 Cases Presentation

For validating the research and analyzing issues related to training and its developments, two case studies have been conducted. Specifically, I decided to study Niuko Innovation & Knowledge and Safilo Group; the reason behind this choice is that Niuko Innovation & Knowledge is an association that provides trainings and consulting to companies, while Safilo Group, one of the largest eyewear creator, manufacturer and worldwide distributor of sunglasses and optical frames, has a Global Training Team completely dedicated to internal and external clients' trainings. Another motivation that pushed me to opt for these cases is that the two respondents, despite both working in training areas, deal with training through completely different approaches.

4.2 Methodology

For what concerns the interviews, five questions (see Appendix 1) have been addressed separately to both respondents with the scope of examining in depth experts' opinions about critical aspects of training emerged from the literature review.

The first interview was done in Safilo Group headquarter with the Trade Marketing Training Specialist, who is responsible in developing and coordinating training tools for all departments and third parties involved in each project and she is also responsible for the contents' development of each tool. The second interview was done with Niuko Innovation & Knowledge's Potential Hub Area Collaborator, accountable for the organization of development paths and training in companies, schools and universities.

The questions for the interviews were imagined highlighting some precise issues; in fact, they aimed to have a general idea about what the company is offering in terms of training tools and what features they considered effective, comprehending also the level of technology used in Company's training program and the causes of adoption (or non-adoption). Moreover, another objective was to discover the main impact on training of the huge amount of information's quantity and the speed of their changes, lastly investigating the possible future critical points.

In next paragraphs, some additional details about the companies considered in the two case studies will be given.

4.3 Safilo Group

Safilo Group[13] is one of the largest eyewear creator, manufacturer and worldwide distributor of sunglasses and optical frames. It has its Own Core Brand Portfolio made by Carrera, Polaroid, Safilo, Oxydo and Smith, and a quite big Licensing Brands Portfolio that involves names like Dior, Jimmy Choo, Fendi and Elie Saab.

It is a quite big company, that counts a total number of 7.109 employees spread out the establishments, among which 1.335 are commercial people, making training an essential part. In 2017, it registered 1.035,4 million Euros of net sales and it is now facing a critical period, as during the last year it has suffered a crisis that obliged to take some important decisions and strategies, like the appointment of a new CEO.

Safilo Group has been chosen in the analysis as it includes a team, inside the Trade Marketing Departments, completely dedicated to training: the so called Global Training Team. Since Safilo Global Training Team's target is mainly composed by internal employee, training tools created are dedicated only to corporate's purposes. The information available in this research are coming from not only the interview, but also from a six-months experience done within the company headquarter in Padova, as a trainee in Global Training Team; this has permitted to increase my interest and knowledge in this field, gathering important insights.

The Global Training Team, is composed by four people working closely with other areas of the company, such as the Product Creation Area and the Sales Area. Their main purpose is the development of different kinds of training projects like corporate, mono-brand and cross-brand. Moreover, the Team has the mission to guarantee memorable training experiences to internal Safilo people and external customers, developing appealing tools; they provide structured training programs which are able to enhance localization and an effective deployment.

In spreading information, they communicate with a selected group of employees named "The Training Network", that involves some delegates responsible for the other countries' local deployment. In fact, the Global Training Team in Safilo deals with the development and distribution of tools and contents that must support local sales force, customers and internal employees, providing valuable information about products

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[13] http://www.safilogroup.com/it/

ensuring sales arguments and engaging Safilo's employees. Specifically, the tools offered by Global Training Team are numerous, for example power point presentation during videoconferences; videos available in different corporate portals; vis-à-vis product presentation; paper-based instruments.

In comprehending the company's structure, it is important to distinguish internal and external clients. Indeed, internal clients are those identified as people in contact with Safilo's clients, for example Trade Marketing specialists, Commercial Area's employees, and potentially everyone that could be in touch with clients. On the other hand, the "external" clients, are for example the opticians or the sales force in Safilo's channels (such as airports and boutiques). To sum up, they work according to two levels, the internal and the external one. The interview made in Safilo with a Trade Marketing Training Specialist focused on the first level of client, so the one involving company's workforce's training.

4.2 Niuko Innovation & Knowledge

Niuko – Innovation & Knowledge[14] was born in 2014 through the alliance between Fòrema and Risorse in Crescita, the training agencies of Confindustria Padova and Vicenza, and now represents the biggest hub for competencies development in Italy in the Confindustria network. In the Veneto Region, they have built a strong relationship with SMEs and this cooperation has raised both innovative skills for people and competitiveness for companies; they also collaborate with big firms for organizational setting solutions.

They mainly deal with training and advising services, to support companies and individuals in their transformations. For what concerns their activity, their offer involves 42 percent of training for companies and 27 percent for colleagues, 13 percent of activities is dedicated to consultancy and the remaining to work services. It has 71 dependents, 26 collaborators and more than 300 partnerships activated to build a collaboration network. Their mission is to design and implement training activities adopting innovative tools and methodologies that they have created and tested, the so called "Niuko Way". Their core

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[14] https://www.niuko.it/

activities involve experiential training, soft skills development, corporate academy, re-shaping of the organizations, career support services and social inclusion.

Some data about Niuko Innovation & Knowledge in 2018:

- 4.600 training courses realized

- 2.300 companies served

- 26.800 attendants to the courses

- 63.300 training hours realized

- 14.100 training days provided

Niuko's expertise is about security, organizational development and Lean, Soft Skills and experiential methodologies, Work services and Industry 4.0

Niuko has aroused in me an interest not only for its focus on training, that is the main reason of choice, but also for its interest in the impact of digitalization on training. In fact, on November 16th, 2018, it took part in "Exposcuola" providing a conference *"A scuola con il cellulare? Sì grazie! I super poteri del digitale"* about students' future. The main interest of the conference was to show the main technological achievements of our era that revolutionize everyday life, considering that VR, 3D Print, Artificial Intelligence and Blockchain are instruments with a high potential if implemented in formation. The Workshop had the objective of training participants in approaching technologies with a sense of criticism and responsibility, leading them to the awareness of the digital transformation.

Surfing the Net, it is possible to find lots of articles about Niuko Innovation & Knowledge's initiatives. It is also because of the importance given by those online magazines that Niuko has been selected for the analysis.

An example is the article[15] reported in BitMAT[16], a portal dedicated to the ICT world with news, insights, interviews and videos, that offers a complete overview on the ICT business. In an article published on June 7th, 2018, it discusses about the collaboration between Niuko Innovation & Knowledge and Compar Spa[17] (the company that owns Bata). In details, Niuko has proposed a dedicated platform to let Compar's employees

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15 https://www.bitmat.it/blog/news/75896/lezione-sicurezza-elearning
16 https://vimeo.com/bitmat
17 https://www.compar-srl.it/

access the training tools in every moment, without renouncing to efficiency; in fact, the e-learning is often able to transform contents in engaging, dynamics and interactive ones, giving the possibility for companies to choose their own way of personalization. So now, Compar's employees can move within virtual Bata's shops, "touching" with hands the application of safety regulations in their workplace.

Moreover, the article continues presenting another initiative taken by Niuko: in fact, recently it has collaborated with Medi K[18], national providers of residential training (RES), distance learning (FAD) and field training (FSC), offering to companies' participants occasion to compete with team challenges, starting from role-playing games that involve the simulation of a concrete business case, using 50 inches touch tables, developed by Medi K. This underlines the innovation and rethinking capacity, considered the key of success in Niuko's proposal.

Another online portal dedicated to economic information that has dedicated more than one article to Niuko Innovation & Knowledge is Veneto Economia[19].

The article, dated 6th March 2018[20], presents actions taken by Niuko in dealing with different generations at work. The association, in fact, has promoted the workshop "*Al lavoro con il futuro: 6+1 generazioni in azienda*" debating about the "age management", defined as the capacity to make the presence of different generations a strength through structured interventions.

Another key aspect, where Veneto Economia has put attention, is the alliance between Niuko Innovation & Knowledge and Fischer Consulting Italia[21]. Indeed, together they guarantee to SMEs the support necessary in structuring a 360° lean transformation, intervening in all company's processes, both in Operations and Office. Niuko's purpose is to accompany companies' growth, guaranteeing innovative and unconventional consulting and trainings alternatives, always trying to better comprehend companies needs and demands.

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18 https://www.medik.net/#whoweare
19 http://www.venetoeconomia.it/
20 http://www.venetoeconomia.it/2018/03/age-management-padova/
[21] http://www.venetoeconomia.it/2017/12/niuko-fischer-consulting/

Also, the "*Digital As_L: Competenze a prova di futuro*" seminar promoted by Niuko has been reported by Veneto Economia, on March 15th, 2018[22]. In that occasion, it has offered to hundred students, teachers and entrepreneurs, the possibility to participate to an event in which Fabio Bocchi (member of University2Business, a society born from the experience of a group of university teachers and HR and Digital professionals) has presented the research conducted to reveal the lack of innovation knowledge in Italian young people.

4.3 Interviews' Analysis

From the examination of the two interviews emerged that, despite the presence of different point of views and approaches, there are several common ideas that make it possible to identify macro arguments worth considering. Pointing out those aspects argued by both respondents permits to identify opinions that confirm theories, reported in previous chapters, and opinions that provide innovative concepts, adding extra value to the literature review.

Moreover, the ideas that emerged during the two case studies' analysis can be split into two macro categories: in fact, some aroused concepts are mostly related to the training style, while some others help in the description of the context in which companies (and so workers) are now immerged. For what concerns the first macro area, the element analyzed by both respondents contributes to the identification of the training style that should be applicated, underling the importance of aspects such having an experiential approach and leading the learner outside the comfort zone, promoting Reverse Mentoring and underling training's optimal planning. Each element is going to be analyzed individually, to frame the opinions related to these issues.

Both Niuko and Safilo' respondents highlighted that, despite the wide training tools portfolio provided to clients, it is extremely important to have an **experiential approach**, considered the most effective way of doing training. This is confirmed not only by Dale's

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[22] http://www.venetoeconomia.it/2018/03/internet-of-things-sconosciuta-6-universitari-10-la-ricerca-niuko/

Cone of Experience, but also in the neuroscience researches reported by Accenture, that label the experiential approach as a mean for a faster and deeper learning (Ovanessoff et al., 2018). The way through which companies bring experiential occasions to their clients are diverse. Indeed, Safilo prefers to give to workers the possibility to access their plants, and so to understand how the product is designed: "*this lets employees comprehend how big and how real the product value is*". The company also offers training sessions in which trainees can try, touch and observe the physical product and "*this permits the person to be concretely involved in the training*". On the other hand, Niuko organizes some business games where "*people act, showing behaviors and competences*" and from this kind of technique Niuko can "*map the state of art of competences*".

Talking about the experiential approach, both respondents mentioned the word "**comfort zone**" giving it the following meanings. Safilo's specialist said that:

> "*When you try to do something as you used to, you are in your comfort zone and you try to refuge in what you can do* […]. *Your mind automatically goes there, while going out of the comfort zone you learn faster how to deal with changes*" (Safilo's Trade Marketing Training Specialist, 2018).

On the other hand, Niuko's Collaborator, said that:

> "*Going out of the comfort zone, we experience new competences, seeing their impacts, so we are able to accelerate the development [of skills] and culture, understanding their importance*" (Niuko Innovation & Knowledge's Potential Hub Area Collaborator, 2018).

What emerged is that, the concept of comfort zone has impacts not only in the culture and mentality of people, stimulating them to get used in dealing with new things, but also on the pace of their improvements, accelerating their rhythm. This is aligned to what Chapter Two has already anticipated: adults (and so workers in this case) have some difficulties in leaving their comfort zone as they feel unable to handle new information (Fogarty and Pete, 2014); in this sense, it is crucial to stress the importance to avoid refuging in what we know how to do. This is since immerging us in something unknown increases the retention rate (see results about Virtual reality researches). To conclude, companies tend

to consider comfort zone as a risky area that negatively affects workers' improvements, slowing down advancements.

Discussing about training tools, and particularly about **Reverse Mentoring**, in addition to the respondents' confirmation of the theories reported in Chapter Three, some additional opinions emerged. In fact, employees of both Niuko and Safilo agree that Reverse Mentoring is crucial for companies not only to take advantage of the presence of different generations in the same workplace, but also to bring additional value. In fact, Niuko's Collaborator said:

> "*Young workers that enter the company have a lot of things to say, in terms of digital competences but also at innovation and creativity level, as they are not compromised by experience and so they can provide brilliant ideas*" (Niuko Innovation & Knowledge's Potential Hub Area Collaborator, 2018)

The Safilo's Training Team Specialist confirmed this point of view saying: "*digital natives have more familiarity with some instruments* […] *they are used to play with smartphones* […] *and video making programs*". These opinions confirmed what reported by different authors, who define Reverse Mentoring as a good instrument to overcome generational differences and a tool to receive fresh ideas from generations (Berselson, 2014; Spitzer et al., 2013; Emelo, 2012).

Then, a more "economic vision" has been added:

> "*They [digital natives] permit the company to optimize resources and, through their digital and graphic competences, they allow to save budget and time, giving also advice about platforms handling, and unknown programs may become fundamental for your everyday life*" (Safilo's Trade Marketing Training Specialist, 2018).

So, Reverse Mentoring could be not only a training technique that allows to receive fresh and new ideas, but also an instrument to optimize time and money spending. On the other hand, Niuko's Collaborator introduced the concept of "*positive social ecosystems*". This innovative vision is accompanied by the idea that:

> "*Youngers can interact with older figures that might not have interacted otherwise, and these youngers grow at a personal and professional level; the seniors learn new methodologies and share competences like project management, stress management and so on. In this way, an eco-system is created, and this is the theme that companies are asking the most: they demand the creation, the analysis and the application of these ecosystems*" (Niuko Innovation & Knowledge's Potential Hub Area Collaborator, 2018).

Moreover, Reverse Mentoring has been defined as a crucial point for future training approach as "*with the actual mixture of generations, we are in a period in which everybody has lot to say*". Thus, what Niuko respondent's point of view is suggesting is that Reverse Mentoring is not only a method to share ideas, but also a method to spread a positive ecosystem for the company that encounters different generations' opinions.

Niuko's Collaborator provides another insight regarding the importance of **training moments' differentiation**. In fact, focusing on giving a pre-assessment and a continuum of the activity is considered pivotal. "*I'm trying to ensure that people come ready to the training session, so that they can concentrate on practice*". For what concerns the post-training moment, it is considered valuable to give to participants the occasion to "*experiment, use and see the [training's] functionality, letting them assimilate the contents*". It underlines the importance of putting effort in guaranteeing a complete assimilation of trainings' contents, and so the possibility to apply the concepts to the reality: this ensure the success of the training. The concept of continuous learning has been already presented, saying that generation Z is looking for *continuous learning* opportunities: this stresses the importance of this issue.

Moving to the macro category related to the conditions of the context in which companies and workers are involved into, what appears important is the time optimization with the quantity management; this issue has contributed to the consideration of the unlearning idea of and then the necessity to be agile, finally underling the importance of focusing on the relevant skills.

Starting with the variables "**time**" and "**quantity**", Safilo and Niuko's respondents consider them critical in developing the best training tools. This is suggested also by literature review illustrated in previous chapters, where it is outlined that the Forth Industrial Revolution differs from former revolutions in the speed of advances (Manyika, 2017), and concepts like "Reverse Mentoring" and "unlearning" advise the importance of the time and quantity variables. Moreover, ideas coming from the interviews allow to go more in deep.

First, Niuko and Safilo's respondents think that in an environment where changes are so fast, time optimization is a key success factor. Niuko's Potential Hub Area Collaborator has defined time as the "*motivation that, in my opinion, has upset the organizational components*". Moreover, he has reported that preparing ad hoc training tool for the client is something that permits the company to always deliver updated information. Additionally, implementing Virtual Reality in training (a Niuko's work in progress project) not only permits to exploit the potential that this technology offers, but also it allows to "*speed up the time*" creating a link with training. Specifically, the company will offer its clients the possibility to access some products in advance: "*he [the client] sees it, he knows what the strengths and weaknesses are and then, once the product arrives to be sold to the shop, he is already aligned*". In this way Niuko is able to optimize the time, avoiding further explanation to the client, that already knows the product's key features. A similar idea emerged also in Safilo, where the importance of time is underlined: "*in a company that follows the pace of fashion, it is even more [important]*". In fact, for Safilo Global Training Team, it is essential to be able to give update contents, implying difficulties due to the high "*speed at which [information] become obsolete and the speed at which we must always develop new content, and update contents that are already developed*". In order to face this issue, Safilo created "*lean instruments*": this means that tools should have formats that can be easily adapted, in order to minimize time in making changes. Moreover, the interviewed Training Team Specialist has confirmed that "*contents are not only translatable, but also adaptable to the needs of particular customers [...] and particular markets*".

The other variable considered is the "quantity of information", that has already raised interest in different authors who discussed about methods, like unlearning (Tsang and

Zahra, 2008; Becker, 2008; Navarro and Wensley, 2017), useful to deal with this issue. From the interviews it emerged that it is important to properly manage the quantity of information available. For example, in dealing with the huge amount of training contents, Safilo has created different portals aiming at giving an easy and user-friendly access to all information.

> "*An effort that we are trying to do is also to create a coherent flow* […] *for information, and then to organize it for contents that have a more institutional approach, a more seasonal approach and* […] *contents specifically linked to a particular brand. We have a series of portals that allow us to organize this contents in the best possible way, so that our colleagues can easily find them*" (Safilo's Trade Marketing Training Specialist, 2018).

Consequently, the real challenge for Safilo is to "*develop contents knowing that they will have to respect certain types of logic* […]*, because everything must be very lean and must be user-friendly*". On the other hand, Niuko has reported the "quantity" not as a problem to deal with (like Safilo does), but as an opportunity: in fact, through the monitoring of the huge quantity of information owned, they can "*study the purchasing habits of customers*". This concept is also reported later by Safilo's Training Team Specialist, that talking about quantity said,

> "*Another important thing for what concerns quantity* […] *[is that] it gives the possibility to have a kind of monitoring of contents, meaning that it is fundamental to receive feedbacks from countries to know where to invest, what is missing*" (Safilo's Trade Marketing Training Specialist, 2018).

This permits Safilo to set priorities and develop only required contents.

To sum up, it is evident that from companies' point of views once faced the issue of managing information's quantity (often through online portals) this variable could be a value driver for training. Indeed, if a company is able to exploit "quantity" through the monitoring of feedbacks and inputs, it can also understand how to effectively develop training tools, as Niuko and Safilo are doing, studying clients' behavior and employees' feedbacks.

It has been shown in the literature review, that the concept of unlearning could be related to the idea of giving space to new valuable information, forgetting the obsolete one. This could be seen strictly related to the need of better managing the quantity of information available, being able to give the right priority to the right information. For Safilo, **unlearning** has been defined as "*something that is part of our business's everyday life*". Moreover, the Training Team Specialists said that "*changes are always done to bring value […] and so it is fundamental to forget something to give priority to new things*". This idea perfectly respects the theory shaped by authors like Navarro and Wensley (2017), reported in Chapter Two. By contrast, a different perspective can be found in Niuko Collaborator's point of view, that testified a company's "*step over*", due to its **agility**: this means that a change in the mind of employees has already occurred, transforming the concept of forgetting things in favor of new ones, in being naturally flexible in adapting and welcoming innovative ideas. It is something that is recognized also in Safilo, but maybe it is not completely integrated in workers' mentalities.

Hence, it is possible to deduct that the company's structure could play a key role in shaping learning approach: Niuko is a quite young organization, with 97 employees and an agile-orientation principle; on the other hand, Safilo is a much bigger and older business with a quite deep-rooted mentality, that is now facing the need to lead workers' state of mind to the idea that "*the way of working that until yesterday could have been optimal for [past] logics and dynamics of markets, now, […] are not adapted anymore*" and that "*the world is too elastic to accept rigid mentalities*".

During the two different meetings, the respondents have contributed with some additional ideas that go beyond those concepts I thought probable before doing interviews, always referring to the way through which time could be optimized and quantity better managed. In the first interview, Training Team Specialist working in Safilo has suggested the key features that can make the training tool creation efficient and effective. Indeed, *structure*, *planning* and *format* are the principal concepts for time optimization and money spending to create training contents. Precisely, as said before, tools' formats should be considered, as they are essential in creating "*lean instruments, that could be easily adapted […] and that permit to save money and time for their adjustments*"; instead, highly structured processes and a good planning are two elements that permit to

> *"Clarify tasks' division among workers to have a lean, efficient and effective process; […] this makes it possible to optimize the investment in time and resources, offering training tools feasible to respond to clients' different needs*" (Safilo's Trade Marketing Training Specialist, 2018).

Another important advice is also to find the right partners "*for the development of technologies that could be really impactful, implying a certain kind of investment*": this is crucial for Safilo, that considers the relying on a right partner as a mean to lead the company's workers to a "state of mind" change, importing from partners' competences that workers could not have.

Lastly, since skills required by companies are now increasing and becoming different compared to the ones demanded in the past, it is pivotal to identify the relevant skills to develop. According to this, Niuko's Collaborator provides insights regarding their own **skills' classification**. Indeed, Niuko's definition of skills' categories follows this split: soft-skills, digital soft skills and "*intrapreneurship*". Soft Skills refer to the ones suggested by theories, so "*leadership, communication, agile learning and problem solving*", while the concept of soft digital skills is something innovative that regards "*the application of soft competences to digital areas, like the virtual communication and the digital identity*". Then, the last competence is the "*intrapreneurship*" which refers to *"all the additional actions that workers take in favor of the company"*, and so it is a mix between gumption and entrepreneurship. It is possible to note that Niuko is considering the increasing necessity of focusing on non-traditional skills that permit workers to be agile ad proactive, as the new skills "*intrapreneurship*" concept clearly suggests.

Another important advice is to find the right partners "*for the development of technologies that could be really impactful, implying a certain kind of investment*": this is crucial for Safilo, that considers the relying on a right partner as a mean to lead the company's workers to a "state of mind" change, importing from partners' competences that workers could not have.

Concluding, analyzing what respondents reported, companies are putting their effort in guaranteeing the most valid training tools for their clients, both internal and external ones.

In doing so, companies are shifting the focus on studying who their learners are and what they need, combining this with context boundaries. Moreover, as Safilo's Training Team Specialist has observed, clients are involved in "*a world with constant and new stimulus*". Basically, they are becoming more and more demanding, as they expect a higher level of trainings offered by companies, forcing to make training memorable.

4.4 IMPLICATIONS

After the analysis of the two interviews, it is possible to observe that some new concepts emerged, with the possibility to draw inferences for theoretical and managerial implications.

Regarding theoretical ones, two possible macro categories have been found: one related to training style, that permits to figure out some tactical elements worth considering in training, and one related to the context's conditions in which companies are now embedded, understanding the strategical consequences in dealing with variables like time optimization and quantity of information management, that do not depend on companies. Starting with the training style category, both literature review and interviews confirm that the experiential method is the best way in doing training, but what has been added by respondents is that the experiential approach brings improvements in comprehending the value offered and in mapping trainees' competences state of art. Linked to the experiential concept, respondents include the idea that, implementing this kind of approach leads to the exit from the comfort zone, which in their opinion entails the acceleration of the learning' rhythm. Moreover, considering the type of training tool that could be offered, according to the literature review, Reverse Mentoring could be a great way of dealing with the mixture of diverse generations in the same workplace, but what emerged from interviews is that it could also save time and money exploiting youngers' skills. In the meantime, Reverse Mentoring could spread a positive social ecosystem, originated by mentor and mentees' interaction. Another advice is to provide training with a view to ensuring the continuity of the activity, giving the right focus to the pre-assessment of training, so that trainees can be prepared beforehand, and to the continuum, giving the possibility to assimilate training content, offering new training opportunities.

On the other hand, taking into consideration the condition of the actual context, from literature analyzed, there are no reports and articles that explicitly define time and quantity as critical variables affecting training, but things like unlearning and video making to target a larger audience are based right on the concept of time optimization and quantity managements. In this sense, the interviews confirmed this idea: in fact, they developed solutions to tackle the issues. Specifically, for the time optimization ad hoc training tools and lean instruments were created, while for managing the quantity of information they created portals where contents are properly organized and always available; moreover, the continuous monitoring of feedbacks permits to set training's priorities.

From the theory, it is known that to deal with quantity obsolescence, unlearning could be a useful method; instead, what emerged from cases studies is that this concept evolves into the idea of being agile, despite it is not applied with the same intensity by the two companies. The reason might be that agile-orientation could be related to the size, the age or the culture of the company.

Always linked to handling time and quantity variables, what emerged from Safilo's case study, is that a good plan of the training creation should be the base of optimization of the two variables; it is suggested to consider structure, planning and format of the tool, to be effective and efficient in terms of time management, task definition and choosing the more appropriate format.

Last, something that should be considered is that, according to what reported by studies previously analyzed, skills requested not only saw an increase in their amount, but also, they are different than in the past. Thus, the ability to prioritize the development of the right skills is so significant, that Niuko Innovation & Knowledge provides a new classification of skills: soft skills, digital soft skills and intrapreneurship (something different from literature's classification).

Furthermore, in addition to theoretical implications coming from literature review and the analysis of the two case studies, some managerial implications are going be presented. After the analysis of the training style and the conditions of the context that should be considered, managers in developing the best training tool should involve an experiential approach together with considering the time optimization and the handling of quantity of

information and contents, that should be updated and easy to access; moreover, managers should promote the creation of a positive ecosystem, agile-oriented.

In conclusion, what I suggest is the usage of a portfolio of training tools including Reverse Mentoring, Videos and Virtual Reality; in this way, all the context' conditions and tactical issues presented before could be respected. Indeed, Reverse Mentoring can be a successful tool in managing the presence of different generations in the same workplace, giving the possibility to share fresh skills, digital ones, and also to create a positive social ecosystem. Additionally, Videos are suitable in the optimization of time, as they can be watched in diverse moments creating training opportunities; then, if they are made using a simple format, they can be easily and quickly re-adapted to offer updated contents. Lastly, Virtual-Reality is a cutting-edge tool that permits to experience training in a completely innovative way, immerging the trainees in a digital reality and letting the company optimize space and time, as trainees only need their special headset.

CONCLUSIONS

The theme regarding training has been deepened taking inspiration form the stage, as a trainee in the Global Training Team in Padova Safilo Group's headquarter. After having experienced which the potential of training is, what could mean for companies and in particular for workers, the question "*which are the best methodologies to adopt in covering workers' Skill Gap?*" came to my mind.

The thesis aims to answer this question, considering all the Fourth Industrial Revolution's context, including aspects that could influence this area, getting information from the literature review, companies' employees interviews and personal knowledge matured during the work experience.

Drilling deeper, in the first part of the document, a literature review has been conducted in order to gain insights about the context in which workers are now embedded.

Through a deep analysis done considering McKinsey's and World Economic Forum's researchers, it emerged that adoption of technologies could bring benefits like higher level of productivity and the capacity to get closer to the consumer. Moreover, technology is likely to be more linked with job roles of the future, the ones related to software implementation, as well as the roles regarding training, education and customers service; by contrast, roles related to factory workers, like mechanics and machinery repairs, are likely to see a decrease.

Furthermore, it is important to highlight the identification of a Skills Gap that is forcing workers to cover the lack of some skills now required by companies. Skills that probably will be most demanded are creativity, complex information processing, problem-solving, leadership, social influence, emotional intelligence, technology design and programming. The presence of a Skill Gap has recall the need of an effective training to cover workers' lacks.

On the other hand, the Digital Revolution impacts also generations, that now present dissimilarities in learning styles and in their needs. Workplaces are integrating immigrant native workers and digital native workers: the former are used to learn through traditional training methods, while the latter have different needs and skills as they grew up in a

digital context. In addition to generational differences, other influencing factors emerged, in particular during companies' interviews, as: the huge amount of quantity of information, usually managed using digital portals able to collect and order contents, and the speed of change. This makes the optimization of time and money a company's key success factor for training activities.

After the analysis of the problems presented by the literature review and the different comments reported by companies' respondents, it is possible to say that the three methods proposed in the chapter three might be a valuable solution in offering training. Indeed, Reverse Mentoring allows to have fresh contents coming from new generation together with sharing of positive social ecosystem; utilization of Videos in doing training permits optimization of time and quantity, in the sense that they can reach a larger audience and they can be easily organized in portals; then, through Virtual Reality trainee can be immersed in an experiential training, also allowing companies to optimize space and time. An important concept that emerged from this elaboration, is the need to have well trained workers to better exploit the benefits of the actual evolution. Furthermore, all the new aspects generated by this change must be considered to have an effective training and so to create a tool able to encounter all the for learners' fundamental needs.

This thesis is only an overview of what is happening in the labor context, but I hope that it can contribute in making light about the importance of the workers' education in this Revolution, helping firms to become aware about what is needed for effective training.

APPENDIX

Interview's Questions:

1. Quali sono i metodi di training maggiormente usati da voi nella formazione del lavoratore? Quali sembrano più efficaci?

2. Usate dei metodi formativi che utilizzano le tecnologie della comunicazione e dell'informazione? (ad esempio metodi che usano la realtà virtuale)

Quali sono le motivazioni che vi hanno portato a scegliere questo tipo di strumenti e quali sono i maggiori vantaggi dal punto di vista formativo

Quali sono i motivi per cui non adottate questi metodi? A quali condizioni potrebbero essere convenientemente adottati nella vostra organizzazione?

3. Oggigiorno il mercato offre una grossa quantità di informazioni con la conseguente difficoltà di gestirle e immagazzinarle, quali sono stati i relativi impatti nel training?

A tal proposito, nella mia tesi sto studiando il fenomeno dell'*unlearning*, il fatto che alcune cose debbano essere "dimenticate" al fine di lasciare spazio a nuove conoscenze. È un tema rilevante nella vostra organizzazione e per i vostri collaboratori?

4. La velocità con cui le informazioni cambiano e diventano obsolete sta crescendo sempre più, con un bisogno continuo di essere aggiornate. In che modo questo sta influendo sui metodi formativi che utilizzate in azienda?

5. Ritenete che possano esserci altri punti di criticità per cui il training possa subire importanti cambiamenti?

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