Chapter 3
People at the Centre of I4.0

Mireia Dilmé i Martínez de Huete

3.1 Introduction

As presented in previous chapters, our world is rapidly changing economically and technologically. In order to stay relevant, every enterprise has to adapt to these changes. The Fourth Industrial Revolution represents one of the major drivers of change today. By investing in innovative technology that better connects people, machines and systems, manufacturers can become more efficient and agile than ever before.

These changes directly affect the ways of managing an industrial organization and the development of people working in this new digital and hyper-connected environment. The ability of an organization to adapt is a great competitive advantage.

I4.0 is about people as well as about machines and processes. Having the right workforce, with the necessary skills and training for implementing I4.0 is no less important than being financially ready and equipped with the required machines and upgraded systems.

Traditional manufacturing skills will need to evolve (and, even be replaced) with new capabilities such as programming, data and analytics, software development, etc. Moreover, whilst an organisation can buy technology. It can't buy employee engagement. Key success factors for organisational adaptation to Industry 4.0 such as teamwork management, cultural transformation and adaptability to change need to be progressively developed and properly managed.

M. Dilmé i Martínez de Huete (✉)
Eurecat, Barcelona, Spain
e-mail: mireia.dilme@eurecat.org

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The present chapter deals with the impact Industry 4.0 in the human resources management. Taking into account that people are central to the success of Industry 4.0 strategies.

3.2 Workforce Management and Teamwork Evolution in the Connected Industry

Technology is an agent for change. The advent of Industry 4.0 is giving manufacturers more flexible, faster and more efficient processes to produce higher-quality products at reduced costs. But one of the most critical disruptions in manufacturing is happening around the global workforce. I4.0 and digital transformation is less about technology and more about people. Companies must be aware that they need to take into account people ready to take on and develop the changes brought by the digital revolution. Progressively, the company will have to review all its operating and functioning values, its corporate policy, its organizational chart as well as the profile, competencies, responsibilities and functions of its employees.

The process of moving to a smart factory requires an organisation to adapt and change beyond the simple introduction of new technology. One of the key challenges that derives from the implementation of modern technology is the new skillsets that are needed from employees to code up new processes, run machines and fix new devices. Across the board, skills need to be developed. Thus, it is important to consider the people who are affected by the change at all stages in the transformation process. The evolution and buy-in of the workforce is integral to the interconnected and digital industry.

3.2.1 Focusing on People and Culture to Drive Transformation

The first phase of the transformation process concerns developing the culture and essential values for the organisation and workforce, as well as rethinking conventional operating models for the business. Aspects which should be considered include:

- The degree of commitment of what/whom?
- *Unlearning / Learning:* Having the capacity to unlearn knowledge, methodologies and old assumptions. Unlearning challenges assumptions in the conventional wisdom that may have become invalid and obsolete under the disruptive Industry 4.0 era.
- *Self-criticism capacity:* It is critical for leaders to recognize and accept fears, risks and errors, whilst learning from each experience and initiative undertaken.
- *Transparency of information:* Clear communication is critical during a digital transformation.

- *Ambition and new challenges:* Paving the way for new, often disruptive business models. Provide employees with personal growth opportunities, which drives engagement and retention. Therefore, be open to accepting those changes and have the ability to transform challenges into opportunities. In this transformation towards the digitalised, automated or robotised company, the role of people evolves towards an analytical and problems solving role, so that people are more autonomous and flexible in their jobs.

The management of an organisational change must be oriented to ensuring people enjoy their work, and are willing and able to learn new models and work systems.

To get the expected results, change must be occur at three levels, each of which are interconnected:

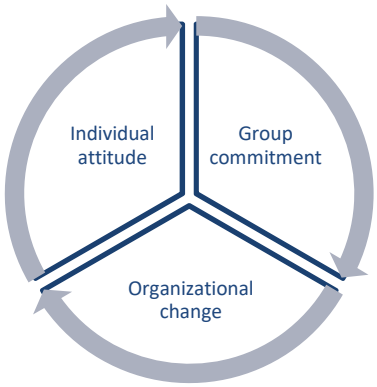

Figure 3.2-1 Keys to success and adapting change towards Industry 4.0.

- *At the individual level of attitudes and aptitudes:* This process is done through experimentation and learning. Adaptation is the result of a circular and constant process of exploration, understanding and modelling. Innovative initiatives are fundamental and mistake tolerance with failures with limited impact versus avoiding failure are indispensable.
- *At the group level with commitment and alignment:* When people interact in groups, it is essential to generate a long-term commitment to building a real team. Around a common project, members can share ideas and unify the analysis, thus spreading a true enthusiasm. Cohesion is the most critical factor in teamwork and it is a prerequisite to achieving total collaboration.
- *At the organizational level taking in account the cultural change:* Empowerment and delegation to collaborators to make decisions through established mechanisms is necessary to facilitate the emergence of self-leadership.

The necessary collaborative culture to drive an organization oriented to the connected industry affects the three levels and it implies a certain tolerance of error for people, aligning the objectives around a common project for the teams and a decentralized organizational structure.

One of the biggest mistakes that can be made in the digital transformation, and in any transformation, is to assume and expect that everyone's reaction will be positive and biased. If employees don't buy into the reason for change, don't trust leadership and don't share the organization's vision, there will be no successful change, regardless of how brilliant the strategy. Therefore, it is essential to apply change management strategies to prepare and support all the employees.

One of the most widely adopted change management frameworks is the Prosci ADKAR model which presents a step-by-step approach to help companies achieve success on a transformation process. The process, illustrated in Figure 3.2-2, focuses on the individual and the steps are as follows:

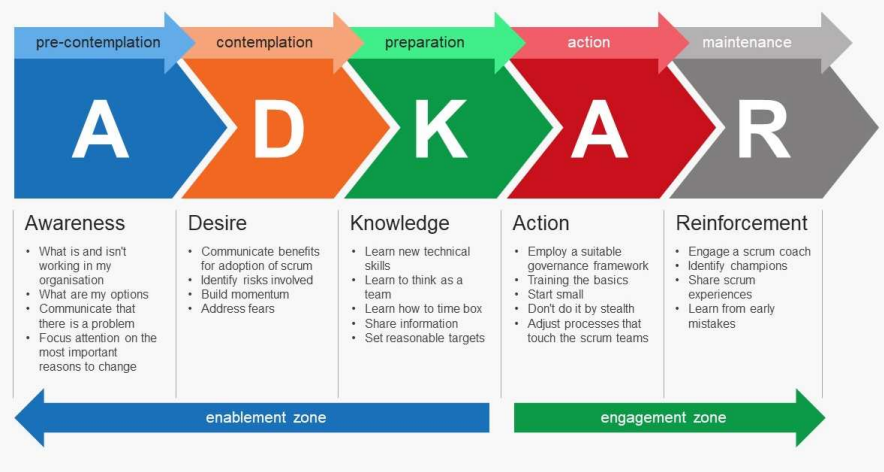

Figure 3.2-2 ADKAR methodology for change management [1].

- *Awareness of the need for change:* It represents workers' understanding of the rationale/drivers of that change, why it is happening and what are the effects of it. It helps answer "*what's in it for me*?"

  Actions that can be undertaken: Share vision and reflection of the future with all workforce. Demonstrate need for change, build trust and commitment.

- *Desire:* Relates to the personal choice and willingness to engage in a change and support it.

  Actions that can be undertaken: Clear communication of objectives and purposes. Resistance management.

- *Knowledge:* Represents the training and information (skills, tools, systems, responsibilities, etc) necessary to know how to be an active agent of that change.

  Actions that can be undertaken: workers' empowerment, developing talent. Streamline: flexibility, adaptation, evolution, speed.

- *Ability:* Is the capacity to turn knowledge into action. Having resources, time and support to develop those changes.

  Actions that can be undertaken: Creation of the work team (internal / external) as well as specialised change agents.

- *Reinforcement:* Is the critical and final milestone. While making a change is hard, sustaining it over time is even more difficult. It is a natural human tendency to revert back to what we know.

  Actions that can be undertaken: Constant monitoring and piloting. Feedback, dissemination and integration into culture.

3.2.2 The Development of Work Teams in Industry 4.0

Industry 4.0 seeks to move from a factory focused on its product offer to a service company focused on its customers, and for this a company has to be outward oriented. The traditional industry has to change its models, systems, ways to share information, data, make joint decisions, and adapt to the demand. Just as quickly as this, it also needs to accept that changes are continuous. Industry 4.0 has to innovate in new processes to increase operational efficiency and, at the same time, redesign the supply chain. Connectivity and collaboration with the client/customer allows the creation of new business models, such as buying for hours the use of a product, or renting systems management services.

The orientation that the organization should follow for adapting to the many changes of I.4.0 includes:

- *Ability to interact with the client (service):* Means managing the change of orientation of the traditional industry towards a collaborative industry. This implies an open attitude of the employees who are willing to accept [suggestions for] modifications and improvements to products and new product ideas coming from suppliers and/or clients. This vision implies a change of mentality, viewing the client as a partner in the definition of the proposal or the project. In this case, the product offer does not have to force the demand but it can adapt and meet the needs or requirements of the demand.
- *Adaptability and evolutionary flexibility:* Industry 4.0 has mechanisms and systems to have data available in real time (hyperconnected industry) which streamlines manufacturing processes, services and distribution points as well as the changes or modifications required by the client. Employees must adapt their mind-sets to these new paradigms, through the analysis of data, shared decision-

making, flexibility to move towards new processes or materials, and agile supply management systems.

- *Innovation in new processes:* The client orientation generates new solutions and new manufacturing processes. This implies that engineers have several opportunities to be able to give a more efficient service through economies of scale and, in addition, a much more personalised service using flexible manufacturing. On the manufacturing floor a few decades ago, fixed automation produced a limited assortment of part types manufactured in very large batches. At present, flexible automation technologies, robotics and 3D printing technologies enable manufacturers to quickly modify the layout the production plants orienting them to the needs of the client. Therefore, bringing the capability of making wider variety of part types/ products in shorter time frame and smaller batch sizes. These manufacturing premises encourage the creation of new processes closer to the customer, offering competitive advantages which were previously not possible.
- *Connection, collaboration:* Information technologies are used to generate data in real time. Individual work stations, computers, mobile devices and local area networks connect to the global internet, creating a collaborative environment that allows different partners to share the same information. This allows a continuous virtual connectivity between the team members, external partners and clients.

The evolution of the ways of working in the digital era are generating many changes in both the aptitudes and the attitudes of the manufacturing companies' workforce as well as team management practices, as illustrated in Table 3.2-1

Work evolution in the digital era	
PAST	**FUTURE**
Hierarchy	Flat structure
Fixed work schedule	Flexible schedule
Confidential information	Shared information
Direct the employees	Empower and inspire people to lead
Fixed technology	Cloud technology
E-mail as a method of communication	New digital communication methods
Corporate ladder	Opportunities based on competency
Fragmented company	Connected and interactive company
Office work	Work from anywhere

Table 3.2-1 Work evolution in the digital era.

One example of change in team management practices is the increasing emergence and support of high-performance teams. These teams refer to interdependent, stable, role-defined working groups with a strong structure, compelling direction, mutual trust, values and a supportive context that outperform all similar teams.

Principles of the actions required to create a shared vision of high-performance teams include:

- *Transparency:* Direct and clear communication. Encourage opinions with respect.
- *Participation:* The team's vision is built between all team members. Promote that all members can have an important role, since teams have different workloads and relationships.
- *Pride of belonging:* Highlight the importance of the team's mission. Always celebrate successes.
- *Define the mission, the objectives and the strategy of the team:* To specify together where the team are going, how it will do this and what it wants to achieve. Set effective performance goals.
- *Maintain periodic communications:* Information exchange meetings. Facilitate positive feedback. Let everyone think and contribute with new ideas. Coach the team as a team, not as a group of individuals with individual skill sets.
- *Create a feeling of shared responsibility:* Socialize the destination, the successes, the efforts and the problems.

3.2.3 Adaptation of the Leadership for Industry 4.0

In the face of the changes provided by digitization, managers have to develop and adapt to the team's needs.

With the analysis of the different theories of leadership, we can see that managers have to change beliefs of previous industrial eras. We understand that the difference between managers and leaders is that managers try, in a hierarchical way, to achieve their objectives through negative feelings (fear, intimidation, criticism, domination), while leaders try to motivate their collaborators through positive actions, such as inspiration, encouragement and training. A boss manages his employees, while a leader inspires them to innovate, to think creatively and to strive for perfection. Each team has a boss, but what the teams need in the connected industry are leaders that accompany them to reach excellence.

One of the keys is delegation. Delegation increases morale, productivity and trust. An excessive control of the tasks assigned to employees generates discomfort and dissatisfaction. Employees will constantly feel under scrutiny and will not feel confident towards the manager. To assign important responsibilities to teams and give them freedom to collaborate and complete their tasks, strengthens morale, innovation and teams' satisfaction. Leaders must not only trust their employees, but also show them that trust.

Another key factor is to encourage collaboration among different knowledge units, The different disciplines and knowledge that we find in Industry 4.0 open up the possibility to combine technologies, (IOT, Artificial intelligence, predictive maintenance and machine learning etc) with which the specialists of each unit can collaborate to take advantage of technical and digital capabilities, how is the data

processing and its subsequent applications to reach higher levels of quality and productivity, or generate disruptive solutions to its customers. Leaders should animate multidisciplinary teams to encourage cooperation, motivation and commitment, and guide to changes and innovation.

The team leader in the connected industry has a genuine interest for people in their technical and personal development, which allows a maximum performance of your team.

Evolution of competences from Boss to Leader for the team management in Industry 4.0		
Manager	**Leader**	**Leader in the digital era**
Knows everything	Open to new learning	Creativity and intralearning promoted (no barriers, no limits)
Speaks more than listens	Listens more than speaks	Constant digital communication
Gives solutions	Searches for shared solutions	Searches for global solutions including from the client
Critique	Gives encouragement	Gives encouragement and provide solutions
Highlights the weak points	Recognizes effort	Motivation based on particular needs
Directive	Coaches	Connected coach
Oriented to self	Oriented to the team	Part of the high performing team
Blames others	Assumes responsibility	Shared and assumed responsibility and commitment

Table 3.2-2 Evolution of competences of Boss to Leader for the direction of equipment in Industry 4.0.

3.3 New Professional Competences and Lifelong Learning Strategies, Paradigms for I4.0

The speed of change and the need to be permanently updated in today's world requires a never-ending specialization and practical knowledge. As a result, there is a need for new forms of training and new models to access the training.

Lifelong learning is the search for continuous, voluntary and self-motivated knowledge, whether for personal or professional reasons. It is not only "training" and is not only "professional", it is a predisposition to acquire continuously new lasting knowledge and not necessarily for only professional reasons but also includes personal development and cultural enrichment.

Rapid changes are taking place in access to information and in the capacity to generate new information or materials. These changes have challenged conventional training models or at least relegated them to a different function than they have had previously.

The new forms of learning and consumption of training must be, due to the need of the demand, ubiquitous (they should be able to be accessed anywhere), informal and personalized.

New models of intelligent learning are expected to emerge together with new paradigms for learning. Here for instance, machines, through the use of artificial intelligence and thanks to the observation of our activities, will decide which training materials can be of interest to increase our productivity and skills.

Traditionally, the learning process throughout a person's professional career has involved a linear progression from the apprentice or "novice" stage to the "master" stage. Throughout this long period, the person acquired knowledge and skills at an intermediate level before consolidating them at an "expert" or teacher stage.

At the present time these levels of knowledge are blurred and chaotic in nature. The process of learning and developing skills ceases to be linear and is now structured to be experiential or experimental.

These new forms of professional development are based on practice and experimentation, on realizing what is being done and learning from our achievements and mistakes. They necessarily involve phases of discovery, creation and application, and others of reformulation, trial and error until achieving incremental improvements and effective learning.

Figure 3.3-1 Traditional approach to professional career development. Image rights: Heather McGowan @HEATHERMCGOWAN

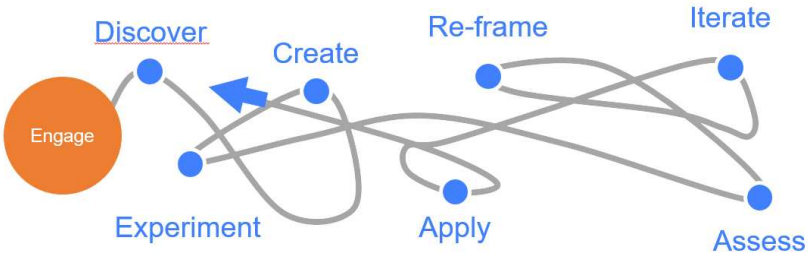

Figure 3.3-2 New approach to professional career development. Image rights: Heather McGowan @HEATHERMCGOWAN

3.3.1 How will I4.0 Impact the Job Market?

From a worker's perspective, the digital revolution will drastically change the labour market. As some studies point out, around 35% of current jobs are likely to be automated over the next 20 years. From 2015 to 2035, 8.3 million industrial jobs are expected to be lost, mainly due to a lack of productivity and competitiveness. McKinsey Global Institute estimated that intelligent automation technologies could save employers worldwide over $15 trillion in wages by 2030. Those massive labour savings raise a crucial point which needs to be considered: how will Industry 4.0 impact the job market?

In an extensive research paper released on 2019, McKinsey estimated that between 400 and 800 million current occupations could be displaced by 2030. The jobs most vulnerable to being replaced relate to data gathering and processing, physical labour, retail, manufacturing and repetitive tasks. When researchers analysed the bigger picture, however, it actually appears to be far brighter; it is estimated that 555 to 890 million new jobs will be created by 2030, with McKinsey noting "*this job growth could more than offset the jobs lost to automation.*"

The reason behind this growth is the growing demand of employees in non-repetitive, creative, mental tasks that can only be performed by humans and employment growth in sectors such as green technology, elderly care, and consumer goods and services.

Jobs expected be created relate to relocation of activities leveraging Industry 4.0 business models by:

1. Reinvestment in new industrial products and equipment.
2. Reinvestment in new services activities.

Companies will struggle without talented employees who are able to use existing digital technologies and adapt to evolving methods and new approaches. Companies will need people with digital design and technical skills, including UX/UI experts, human-centred design talent, data scientists, and data and technology engineers. Employees that are flexible, able (and willing) to learn and adapt, will be at a premium. To attract, develop, and retain the people they need, leaders need to adapt their organizations in multiple areas.

When embracing Industry 4.0 we should be constructive, asking how we can upgrade what we already have in terms of staff skills and their valuable capacities and reinventing ourselves. Engaging in continuous learning to develop new skills and lead the change. Upskilling and reskilling should be a priority to ensure that people stay at the forefront of the digital revolution and no one is left behind. Keeping in mind that people are the most important factor in digital, technological and knowledge developments.

3.3.2 The New Professional Competences and Profiles in Industry 4.0

Are the same competences and learning skills from the last century, important and relevant nowadays? Absolutely.

Previously, perseverance, procedure, order and deductive reasoning were competencies that could guarantee successful learning. These competencies continue to be important and valued skills. Today, however, today the competencies to guarantee success also include creativity, critical analysis, the resolution of complex problems and the ability to learn.

A report from the World Economic Forum 2018 lists which competences are professional development directors looking today compared with those pursued a few years ago:

Figure 3.3-3 Change in professional competences [2].

The implementation of Industry 4.0 requires a broad range of new professional roles which draw on skills from the STEM subject areas (Science, Technology, Engineering and Mathematics). Examples of areas where new skills are required include:

- *PLC/SCADA:* Professionals with knowledge in systems integration, automation, and supervision and control.
- *MES:* Professionals for the management of operations, integration with ERP, document management or management of manufacturing orders, among others.
- *M2M/IoT:* Engineers in charge of all technologies related to automation and sensors within the smart factory.
- *ESB:* Professionals in Big Data, Open Source software and Middleware to integrate all systems.
- *Operational Intelligence:* Experts in the analysis of real-time data for the improvement of the industrial plant and business operations.
- *Cloud:* Cloud experts to make the connected industry possible.

- *Machine Learning:* Experts to improve processes and perform preventive maintenance actions.
- *3D printing and additive manufacturing:* Experts for the development of processes, materials and design of parts.

Technical and social competences are considered equally important by companies who are transitioning to or have already transitioned to Industry 4.0. Therefore, the new technical profiles have and will have to be more and more trained in “soft skills” in order to achieve more senior roles within a company, and be able to join excellent companies. Examples of key competencies and soft-skills that will become more and more important for the change adaptation of digital industry workers include:

- *Open to Change and Flexibility:* This is the ability to adapt to different mentalities. It also extends to working in multiple disciplines, and extracting and integrating data and concepts from different fields.
- *Analysis and Solutions of Problems:* In the connected industry, this is the cognitive competence focused around the analysis of very detailed data (indicators, sensors, etc) that allows competence to be developed oriented to critical decision making.
- *Service Orientation:* In Industry 4.0 this is the ability to become a reliable "partner" of a client and the ability to share information with all project partners. Industry 4.0 cannot depend on the offer but must be oriented to meeting demand.
- *Computational, Data and Non-linear Thinking:* Big Data is a reality in our companies, so the ability to adapt to different approaches and thinking are skills that skilled workers must enhance. Some of the approaches that should be considered as fundamental thinking approaches to foster include:
  - *Design Thinking:* Non-linear, iterative processes that teams use to understand users, challenge assumptions, redefine problems and create innovative solutions to prototype and test.
  - *Lateral Thinking:* A new vision for solving problems using a creative approach. This involves ideas that may not be obtained using only traditional step-by-step logic.
  - *Systems Engineering:* Focussing on how to design, integrate, and manage complex systems over their life cycle.
- *Virtual Collaboration:* This is a key competence to share with virtual teams. It is necessary to promote knowledge of the functioning of technology platforms. It is the basis for sharing tasks and common work spaces. Technology is the facilitator, and the skills to take advantage of multiple tools effectively are key factors.
- *Independence:* This is the ability to work on your own, with little or no supervision; this is having the ability to monitor and evaluate your performance and be aware of your own strengths and weaknesses.

- *Achievement Orientation:* Give priority to actions that contribute to achieving the stated objectives and demonstrate an approach towards high levels of performance and quality. To be actively looking for continuous performance improvement.
- *Communication:* The ability to exchange information and ideas effectively through verbal and non-verbal communication. Adapt the communication style for different situations, people and media. You listen to understand, clarify understanding and take into account different points of view.
- *Teamwork:* This is about working with confidence within a group and assuming a specialist role to enable the team to achieve both personal and collective goals.
- *Critical Thinking:* This is asking the right questions to obtain quality information for a purpose. It is about interpreting the information in its context.
- *Ethical Behaviour:* This is about acting in accordance with agreed principles. It is to apply criteria of impartiality and transparency. It is about being generous, honest and acting with empathy as well as being oriented towards social objectives.

3.3.3 Training within Organisations

When, during a professional career, should we be trained through micro- (brief, concise, direct) or macro-(extensive) learning? Both have a place in lifelong learning and each one has its space and its objectives:

Figure 3.3-4 suggests that macrolearning is useful both at the start of a professional career and in the medium term, to provide support and updating of skills. Among these "periods" of formal learning, micro learning takes on special significance, as a permanent, fluid and agile update.

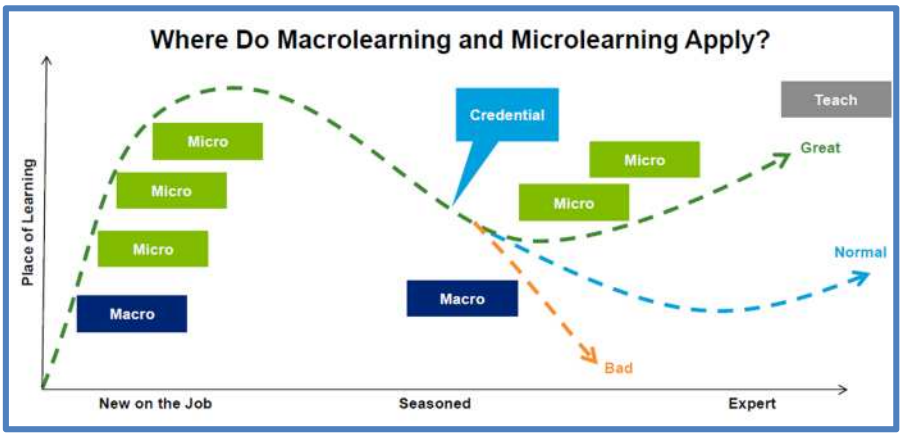

Figure 3.3-4 Understanding Macrolearning versus Microlearning [3].

As can be seen in Figure 3.3-5, there are countless sources of training that we can access almost instantaneously, free or almost free of charge, and through the internet.

Figure 3.3-5 Training resources [4].

Figure 3.3-6 Digital Learning Architecture [5].

Trying to put a bit of order in between so much training resources, the scheme in Figure 3.3-6 systematizes the type of materials that we can use to improve our learning.

Traditionally, the role of a training unit within a company has been to develop materials and training programs to ensure that the organization has the necessary talent at the right time. However, nowadays the previous concept has changed radically.

It is not efficient or even possible nowadays for the training unit department to respond to a permanent and almost erratic demand. Thus, it is no longer feasible to plan long-term training itineraries in a context in which everything is changing and evolving very quickly. The training unit should instead support three fundamental functions:

1. To promote a culture of continuous and self-directed learning in its organization, ensuring that all staff understand the importance of getting involved and committing to their continuous updating of skills.
2. To facilitate access to relevant (external) training resources that members of staff may use and teach techniques for its use.
3. To advise staff on the competences that they should develop, the resources they can access and lead these people through the difficult world of selection and search for quality resources, organized and systematized for a better understanding and use.

3.4 Bring innovation into your organisation: Practical Case Study

Encouraging workplace innovation not only helps SMEs stay on top of the market but also creates happier workplaces with higher levels of employee involvement and retention. As already mentioned, it is highly recommended that workers are directly involved in the innovation process. One way to achieve this is through creativity workshops. Teams from all areas work together with the aim of developing new ideas and solutions. Workers may feel inspired and mobilized towareds innovation if the workshops are well moderated and if they have the opportunity to solve key problems the enterprise may face. Of course, it is also crucial that the ideas don't end up in a drawer, but rather have a real effect.

In the case study below we present an example of how an enterprise used two creative workshop methodologies “role storming” and “Walt Disney model of creativity” to stimulate their team collaboration, problem-solving capacity and bring technical solutions to reality.

3.4.1 ABB Case Study – Collaborative Creativity Session to Optimize Line Operations

Foundation Year: 1934
Type: Large Company
Industry: Manufacturing of Electrical Components

Company Description

The ABB plant in Dalmine (Bergamo, Lombardy) can be considered the largest medium voltage switch factory in the world: it manufactures medium voltage devices and switchgear, with about 750 employees and an annual turnover of over 250 million dollars. The production process consists of the assembly and testing of configurable products, starting with ten thousand components purchased from suppliers.

Objective

Complete revamping of the materials and product handling systems along the assembly line. The scope was to improve the efficiency of the production process by optimizing the line operations.

Starting Situation

The initial assembly and testing process was completely manual handling, based on workbenches, rollers and forklifts with operators. Automatic handling systems were not available across the production line.

Proposed Solution

From a methodological perspective, the material handling system was revised according to the "role storming" and "Walt Disney model of creativity", two approaches aimed at improving the problem-solving stimulating creativity.

The "role storming" and the "Walt Disney model of creativity" have been inspired by Walt Disney. In line with these approaches, people assume different thinking styles in order to propose ideas and suggestions: they act as an outsider to gain an analytical and external perspective. In the second thinking style, they act as a dreamer to propose radical ideas. In the third thinking style, they adopt a pragmatic point of view to select the best idea. Lastly, in the fourth thinking style they act in a critical ways to review and improve the idea.

From a technological perspective, the following solutions have been adopted:

1. Autonomous guided vehicles (AGV) equipped with artificial intelligence for an independent and efficient management of routes and material collection.
2. System of localization of the load units through the use of RFID technologies.
3. Central Internet of Things-based directing and coordination unit fulfilling the role of the Manufacturing Execution System (MES), which makes it possible to autonomously communicate multiple interconnected systems (Enterprise

Resource Planning, localization system, the AGVs, Programmable Logic Controllers on machinery, etc.).

More specifically, AGVs with magnetic guides were used for the handling of semi-finished products and the assembly of components. Moreover, they have been interconnected with the MES for the quality control of each single component and the management of production activities (visualization of the bill of materials, assembly drawings, production orders etc.) using tablets and barcode readers.

A SCADA (Supervisory Control and Data Acquisition) system has been adopted to monitors AGVs remotely and in real time, allowing preventive and predictive maintenance through the use of intelligent algorithms.

Further, to assist the operator in lifting and assembling materials, an intelligent electronic manipulator – equipped with a diagnostic app allowing the real time connection with the supplier's service / maintenance department and controlled by tablets and smartphones – has been introduced.

Barriers Encountered

During the phase of analysis of the technologies necessary for the implementation of the project, the company realized that the technologies on the market were not ready to satisfy the initial ambition. This caused difficulty in identifying the correct partner able to develop and implement the chosen solution in a short time.

Advantages Achieved

From an impact point of view, the case illustrates how the application of new automation systems from an Industry 4.0 perspective allows enhancement of the material handling flows, accelerate the production process and improve quality through real-time control, increasing the overall efficiency of the production process. Moreover, the case exemplifies how employee involvement and collaborative innovation methodologies supported the enterprise brainstorm on the final implemented solution.

3.5 Conclusions

The digitization of the industrial environment has caused vast changes in the way we work, think and interact with each other. Therefore, previous models (and techniques) for learning, training and managing teams have also been affected and even changed.

The evolution of the labour market in Industry 4.0 represents a paradigm change. Companies wishing to attract STEM, digital and technical talent need to evolve their processes for talent selection, training, staff management and retention. Technical and social competences are considered equally important by companies who are transitioning to or have already transitioned to Industry 4.0.

This leads to changes in jobs and workspaces, and requires teams to shape these changes. Therefore, in many places of work it will be more and more important to learn from and with others. A culture of cooperation is needed. The teams that are better prepared for digital transformation are those in which team members help each other to acquire professional knowledge. Teams that continue their education and that enjoy learning and trying new things. In the coming decades it will be necessary to consider the opinion of all – large and small teams, decision makers and team leaders, each individual employee.

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Project ref: 2017-1-UK01-KA202-036807