



**CONCERTED PAPER  
BETWEEN PARTNERS AND PROJECTS**

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# **THE ROLE OF AI TECHNOLOGIES IN WORKING THROUGH COVID-19 AND ITS AFTERMATH**

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## FOREWORD

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By: Carina Dantas

For many, in addition to the disease, the impact of the state of emergency and the containment measures due to COVID-19 has been truly devastating. And this will be an even greater challenge for the near future. Long-term consequences are more serious than those existing at present times and have a broader influence.

In recent years there was already a solid discourse and political will, transversal to most European countries, on the need to invest in prevention, in promoting accessibility and person-centred digital solutions. In short, consensus on the need to move forward and invest in wellbeing and quality of life is widespread.

However, it can be expected that the post-pandemic economic crisis and the social changes that are emerging from this period will easily create the opportunity to move down these priorities in the political agenda and funding plans and that, unless action is taken, can lead to a setback of more than five years in implementing innovation and quality of life for citizens.

During this pandemic period, many services had to be closed; teleworking suddenly became the rule; many families were at their homes, with kids tele-schooling, no sufficient computers, neither the most adequate digital tools available.

Digital services, if implemented correctly, can be the right tools to address many of these challenges. This can be indeed an opportunity for projects, such as the ones in this paper, as now everyone understands how they could have been helpful if fully available in the market.

However, we have never been more aware of inequalities and their impact on universal access to the digital world.

A huge ethical challenge to be faced will be to redefine the balance between digital tools and human presence. If this was already somewhat stable in public opinion, the emergency period polarized opinions once again and this may actually be a threat to the broader adoption of Artificial Intelligence (AI) tools for an increased work ability.

It will take an enormous sensitivity and a great social conscience to evolve in the right direction and not lose focus - all political, economic, and social measures must have the ultimate goal of people's wellbeing and the promotion of common good.

# INTRODUCTION

By: Karolina Mackiewicz

The SmartWork project, under the leadership of Caritas Coimbra and the ECHAlliance for its Concertation Activities, invited all projects funded by the European Union under the call SC1-DTH-03-2018 to join the efforts to elaborate on the role and contribution of the digital solutions and systems to the COVID-19 implications in various work environments.

The main aims of this paper are to:

- reflect and share about the COVID-19 implications to the work environments, now that teleworking turned into a main instrument and necessity for us all;
- understand how the digital solutions and systems could be developed, adapted, optimized or applied to better respond to the pandemic context challenges;
- understand the implications related to industries where the workforce is employed in on-site jobs that cannot be done remotely.

The contributions collected followed three proposed guiding questions, although the contributing partners were free to explore other relevant aspects, in their understanding:

- How can technology applied to the work environment be leveraged to respond to the emerging challenges raised by COVID-19?
- Are there changes to the actual priorities and needs, considering the pandemic situation?
- Is this an opportunity for projects such as those in the SC1-DTH-03-2018 “cluster” to underline the needs to introduce a digital revolution in the workplace?

A transversal underlying question was also included in the reflections, concerning if and how the proactive deployment of smart technologies can be explored for creating social distancing workplaces, dynamically reconfiguring safety measures and ensuring sanitation especially critical for front-line employees who have to be on-site.

During the next pages, all the different contributions were aligned. The individual contributions and opinions of SmartWork partners are constituting Chapter 1 of this paper. Chapter 2 collects the contributions provided by other projects that were funded under the same call.

Some similarities can be highlighted:

- The desire to leverage the existing knowledge to rapidly respond to the challenges of this new (even if hopefully temporary) era;
- The understanding of the challenges ahead and the will to overcome them collectively.

The collective first step is already the creation of this common paper. It is surely a positive sign for the future. But also some conclusions can be drawn:

- COVID-19 impacted the way we live, work and spend free time severely,
- It has effects on physical and mental health and wellbeing,
- AI can play a great role in providing solutions, not only during the emergency but also in the long-term, and not only for the officer workers but also for the more traditional industries.

# CHAPTER ONE

## THE SMARTWORK PROJECT



## THE SMARTWORK PROJECT



<http://www.smartworkproject.eu/>



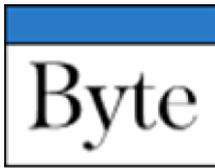
The design and realization of age-friendly living and working environments is a huge challenge that we have just only started to address as the number of older citizens who are and want to continue being active members of society and live independently is constantly increasing.

SmartWork is building a worker-centric AI system for work ability sustainability, integrating unobtrusive sensing and modelling of the worker state with a suite of novel services for context and worker-aware adaptive work support.

The unobtrusive and pervasive monitoring of health, behaviour, cognitive and emotional status of the worker enables the functional and cognitive decline risk assessment. The holistic approach for work ability modelling captures the attitudes and abilities of the ageing worker and enables decision support for personalized interventions for maintenance/improvement of the work ability.

The evolving work requirements are translated into required abilities and capabilities, and the adaptive work environment supports the older office worker with optimized services for on-the-fly work flexibility coordination, seamless transfer of the work environment between different devices and different environments (home, office, on the move), and on-demand personalized training.

## BYTE COMPUTER S.A



By: Andreas Raptopoulos

BYTE COMPUTER S.A. is a leading Greek Information Technology and Communications (ICT) Integrator company with a dynamic presence of over 30 years in the Greek ICT Market and focus on the private sector. At the same time BYTE is among the five leading ICT vendors that successfully carry out nationwide projects in the Greek public sector, which is absorbing the largest share of the Greek national economy.

The company is active in the development of custom information technology (IT) applications, such as a wide range of computer systems, software, computer networks and communications and support services. The Company has three business segments:

- A) Systems Integration
- B) Custom Software Application Development
- C) Value Added Services, including Consulting Services, Project Management Services and Training Services.

Digital transformation is a latest trend, related with transformation in business and operations by utilizing digital technologies. This trend is considered a major development ankle for corporations, supporting them against competition and enhancing their mid-term viability. Usually, the deployment of digital technologies for supporting different aspects of a business (from sales and marketing, to everyday operations and financial management), is based on the vision and decision making of c-level executives, who are responsible for defining and monitoring the company's long term strategy. Furthermore, the application of new technological trends (e.g. teleworking) in working environments is a gradual and time-consuming process, especially in the most traditional ones (e.g. banking, public sector), requiring a long transition period, during which the employees will be trained and ultimately the majority of them will accept the changes.

However, the recent COVID-19 pandemic (and its results) proved to be a greater disruptor for the existing working environments, compared to the C-level executives. The enforced lockdowns and social distancing policies made it almost impossible for companies to maintain their full force at their premises, and had to proceed fast to an organizational transformation, from office settings to a fully remote format, in order to keep their personnel safe and healthy and their business running.

Despite the fact that many employees were also allowed previously to work from home for a minimum amount of their time (e.g. four times per month), such policies have never been applied before at such a great extent.

Digital solutions and (on-line) software tools made this transition possible. Technology proved to be the greatest enabler for successfully completing this transformational phase. By leveraging the capabilities of services already applied in the office environments, and with the addition of a limited number of novel ones, a virtual office space was formulated where all employees may interact, collaborate and participate in company's everyday activities while being physically placed at their homes.

For instance, tele-conference services, like Teams, Skype, Zoom, GoToMeeting, along with more informal channels (e.g. Viber, WhatsApp etc.) tackled the communication needs. Cloud-based repositories like Dropbox and SharePoint enhanced the exchange of files, documents, and information. Online office tools, like Google or Office 365 allowed for the simultaneous access and editing for their content.

VPN tools enabled the access to internal information stored in a company's server. Last but not least, collaboration and project management tools like Trello or JIRA made possible the monitoring of a project progress and the efficient task allocation. The list of digital tools is long and covers all operations of a company from human resources and high-level management to IT services and marketing and sales, ensuring the efficient collaboration in a fully remote environment.

However, the adoption of technology cannot solely make the difference leading to the aforementioned transition, as several non-technological challenges need to be also tackled. For instance, the vast majority of companies from smaller ones to large multinational organizations have established procedures and processes that formalize the operations and set the framework for running their businesses. Therefore, in order to make a company fully running in a remote environment the procedures should be adjusted accordingly. Modifying or adjusting these, in order to exploit the available digital tools may prove harder than learning to use the technology itself. Indeed, the modification in aspects that were successful and became part of a company's comfort zone (business-as-usual) may create a high resistance to change, limiting the impact of the digital intervention.

Similar to the procedural changes, another challenge that needs to be tackled, is the change in a company's nature. The transition in a remote setting may have been proven easier for companies already in the technology domain (e.g. software houses) or companies utilizing a great deal of digital tools. But what would happen in a more "traditional" business (e.g. food production)? In this case, the adoption of social distancing policies within the companies' premises, the enforcement of strict hygiene measures and the implementation of shift-work programs, will have a better effect for such organizations, whose premises are core elements of their business. Even here, technology may play a supporting but substantial role in the effective employee management and the monitoring of social distancing policies.

Last but not least, one of the greatest challenges during the COVID-19 period is how to keep the employees healthy and safe. As the employees are the heart of a company, making sure that they will not get sick is crucial for keeping the business running. In addition, this period was proven to be extremely stressful, the consequences of which in personal health have not been measured yet. Therefore, maintaining the good mental state of the employees is of equal importance. Preserving the good physical and mental health of the employees does not only concern the older ones, who may belong to a vulnerable group and consequently are more susceptible to COVID-19, but also affect younger ones who may be living with their parents or families, are more concerned about the future and may experience higher stressful conditions. Technology interventions in this case, may help to monitor their health and ensure the good level of their mental and physical wellness.

Current, international research actions (e.g. H2020 SmartWork, H2020 WorkingAGE) are focusing on the development and validation of technology-driven interventions, for supporting older employees in their everyday tasks, monitor their health status and enable them to stay longer in their work, while allowing companies to efficiently exploit their long experience and collected knowledge.

Digital tools and services deployed in these projects can pave the way and act as indicative paradigms to similar commercial initiatives on the management of older as well as younger employees, working on a remote basis. Primarily, these interventions would be more feasible for office workers where the use of digital tools has the greatest impact. But, even in this case, the application of these technologies is not a straight-forward task. Pivoting activities should be performed first, in order to address the new requirements imposed by the COVID-19 pandemic and the tele-working conditions.

However, as the “work-from-home” trend is becoming the new reality, the availability of digital solutions that would support this, is crucial. Therefore, the work and research performed in these actions is important as they contribute to this direction.

### In summary:

Summing up, the pandemic crisis extensively affected the way companies operate, transforming them from premise-centered to remote (work from home)-centered business. The use of technology and available digital tools enabled this transition, without the need to seriously disrupt the on-going operations.

However, the success of this transformation significantly depends on how effectively challenges related with the established procedures, company’s nature and the safety of the employees are tackled. Towards this direction, current research initiatives can play an important role, creating indicative examples with their results, on how these issues can be addressed.

Nevertheless, these technological paradigms cannot be applied directly, but further elaboration will be required in order to be adjusted in these unprecedented working conditions.

## CÁRITAS DIOCESANA DE COIMBRA



By: Sofia Ortet

Cáritas Diocesana de Coimbra is a social non-profit organization that supports people and communities in five districts of the Central Region of Portugal. It has nearly 90 centres (with 150 different services), 1000 workers and 150 volunteers and supports around 25000 people/year with social, health, education and pastoral care. Its main intervention areas are; Education; Health; Social Support; Family and Community; Children and Youth at Risk; Ageing/older support; HIV/AIDS; Addiction; Homelessness; Community Intervention; Migrants and refugees; Training; Summer camps and Social Tourism.

Currently, Cáritas Coimbra is Coordinator of 2018 Thematic Network Smart Healthy Age-friendly Environments, a founding member of the European Covenant on Demographic Change, Coordinator of group D4 of the EIP-AHA - Age-friendly Buildings, Cities and Environments and a member of Ageing@Coimbra, a EIP-AHA reference site with 4 stars.

The current pandemic scenario in Europe has triggered some unexpected demands for digital health technology solutions, not only regarding their design and testing processes, but also their functional ability to respond to the emerging challenges raised by the COVID-19 contingency measures. In fact, spending more time at home, including teleworking whenever possible, turned into a reality for many workers and their families, transforming digital technologies into crucial "professional" instruments within their daily routine.

Although many targeted responses are already being developed and implemented, there are still some gaps to fill in, namely regarding the way that digital solutions and systems could be applied, adapted or optimized within the workplace or context, especially for older workers 55+. Whether for the ones who will be allowed to stay teleworking at home, or for those who will need to return to their jobs, coming across new settings, restrictions and safety rules is and will be a challenge.

## 1. How can AI technology applied to work environments be leveraged in this period?

In order to prevent employers from interrupting their business activities, as employees from losing their income, COVID-19 pandemic has been triggering remote work in a way that, probably, may never be completely reversed to its original state. Modern computer technology is actually the main driving force allowing the majority of office workers to continue with their work, even if not in their usual workplace.

When applied to the work environment, AI poses several possibilities related to its ability not only to learn and predict human behavior, but also to develop its own value and 'morals'. Under the actual pandemic context, which seems to be here to stay for a while, the AI potential allows us to daydream on how, at the workplace, it could be used to promote and ensure the compliance of contingency measures and safety procedures, by workers, employers and even clients within the organizations, as well as to maintain or increase the workability sustainability of the oldest ones in the active.

On the other hand, at home or within other personal contexts (e.g. outside, while shopping, or in the gym), AI solutions could be conceived and personalized to ensure social distancing, to detect risk behaviors, or to avoid unnecessary travelling or face to face interaction, thus avoiding the spread of Coronavirus. In addition, AI could also contribute to prevent older workers (at greater risk towards this threat) from becoming dangerously isolated, lacking social interaction or family support, by enhancing their linking to the people and services in the outside world.

## 2. Are there changes to the actual priorities and needs (at work)?

Digital technologies, and particularly AI, are disruptively transforming the way we live, work, and communicate. Moreover, "safe and healthy working conditions are fundamental to decent work". However, a year ago, health and safety needs at the workplace were not the main focus of AI's attention, as they also were not conditioned by any pandemic contingencies whatsoever, as they nowadays tend to be.

Building a Europe fit for the digital age in the next few years will thus probably require adapting the role and features of AI to the new demands imposed by global threats like this one.

Keeping businesses and employment running (despite possible lockdowns, services closure, travel restrictions and containment measures), ensuring facilities cleaning, physical distance, individual hygiene and protection equipment, providing adequate staff training, promoting a safe, secure and tranquil environment at work, preventing increased stress from scaling up, and guaranteeing immediate and efficient responsive procedures in case of an emergency, are only some of the unprecedented challenges currently faced by the organizations, that AI technologies applied to working contexts could help to implement and to easily accomplish.

### 3. Is this an opportunity for projects such as SmartWork to underline the needs to introduce a digital revolution in the workplace?

AI's future impact on the working habits and conditions is huge and undeniable. Apart from the obvious negative consequences deriving from COVID-19, this threatening context also draws an opportunity for projects dedicated to the creation of smart age-friendly working and living environments through AI to step up and propose some innovative, adapted and useful ways of contributing to address the COVID-19-related challenges and implications to the workplace, mainly regarding the office contexts.

This may mean having to consider homes as the new additional workstations (besides personal living spaces) not only, but mainly focusing older workers health and wellbeing needs.

<https://www.who.int/news-room/detail/03-04-2020-digital-technology-for-covid-19-response>

[https://www.ilo.org/wcmstp5/groups/public/@ed\\_norm/@relconf/documents/meetingdocument/wcms\\_711674.pdf](https://www.ilo.org/wcmstp5/groups/public/@ed_norm/@relconf/documents/meetingdocument/wcms_711674.pdf)

[https://ec.europa.eu/commission/sites/beta-political/files/political-guidelines-next-commission\\_en.pdf](https://ec.europa.eu/commission/sites/beta-political/files/political-guidelines-next-commission_en.pdf)

[https://www.ilo.org/wcmstp5/groups/public/---ed\\_protect/---protrav/---safework/documents/publication/wcms\\_742463.pdf](https://www.ilo.org/wcmstp5/groups/public/---ed_protect/---protrav/---safework/documents/publication/wcms_742463.pdf)

## CENTER FOR ASSISTED LIVING TECHNOLOGY



By: Tom Thomsen

The Municipality of Aarhus has been participating in R&D activities as an end-user organisation for many years. The municipality has a strong commitment to provide better services to its citizens in general and elderly in particular. It has a dedicated department for piloting of new innovation solutions appearing on the market, it also employs people providing services to its citizens on a daily basis.

Center for Assisted Living Technology (CAT) - organised within the Health and Care Department of the City of Aarhus, is the primary driving force of the innovative and organisational work done with assisted living technology in the city.

The dedication to new solutions and rethinking existing solutions is fundamental to the Department of Health and Care and a clear necessity due to the demographic development in most western countries, where the average age and life expectancy is rising and thus presenting both manpower- and economical-challenges for the future. At CAT we test the latest assisted living technology and implement the technologies that show potential on a large scale. In doing so, CAT has attained deep knowledge of potential barriers in implementing new technological solutions, and how to realize the potentials of such solutions in a complex, public organization.

During the past years CAT has successfully worked within the entire scope of assisted living technology; from development to evaluation.

At the Center for Assisted Living Technology (CAT), we find that COVID-19 epidemic, as we have experienced so far in the Danish environment, does not call for adoption of digital solutions and systems used in the workplace of our colleges and employees regardless of age.

When asking: “How can technology applied to the work environment be leveraged in this period?” it turns out, although the offices have been closed for more than three months, that our employees do not experience any significant change. The technology is applied as usual and the change in the daily routine is minimal. This finding must be considered under the condition that all employees are familiar with working from home as it has been implemented for some 10 years now.

This of course presupposes that everyone is equipped with PC/laptop, mobile, network infrastructure. Without these, none of the approx. 6000 employees can do any office work at Aarhus Municipality. Almost all employees and managers take a laptop/mobile home every day, which can also be used for private purposes. This behavior requires that the company, i.e. Aarhus Municipality has the necessary IT infrastructure and security measures for remote access, as also service organization for Helpdesk, program installations/updates, access changes, etc. regardless of whether employees perform their work at the office, at home or elsewhere. It should be mentioned that the working procedures are “paperless” and have been so for several years. With paper mail/letters being rare, management of employees and teams during the COVID-19 period did not change. Of course the physical contact and meetings are lacking and most people miss those. When discussing “digital revolution at the workplace” we believe it has already happened at our premises. It is not exclusive to the Municipality, but state-of-the-art in Denmark across private companies and public administration.

The real interest at CAT for SmartWork is the focus on health, health monitoring and AI-driven interventions towards the individual office worker. If health monitoring had been available during the COVID-19 lockdown period, we believe we would have been able to both guide employees (older office works) and learn more on how they react and adapt to the changed working conditions. These observations might have led to change and adaptation in working procedures, individual performance, management and most important preventive measures to maintain physical and cognitive abilities.

In Denmark, it is the employers’ responsibility that the workplace complies with the working environment regulations. When the office worker works outside the office, it is difficult for the employer to enforce the rules. In collaboration, the office employee and the employer may, through SmartWork monitoring of health status, presumably be able to take initiatives ensuring that the working environment also outside the office is in accordance with the rules and to the best of the office worker. The AI technology, as it is planned to be used in SmartWork, may show to be the tool to individualize the office employee’s needs - a new and real asset.

The perspective at CAT and the Aarhus Municipality’s Magistrate for Health&Care is to take the results of SmartWork further to be applied in care for the citizens which is its prime task. It provides a much larger perspective than office workers only. Nevertheless, it may increase quality of life and improve the socioeconomics.

## EUROPEAN CONNECTED HEALTH ALLIANCE



By: Karolina Mackiewicz

European Connected Health Alliance (ECHAlliance) is the trusted connector, facilitating multi-stakeholder connections around ecosystems, driving sustainable change and disruption in the delivery of health and social care.

Our community gathers 350+ member organizations and 16,500+ experts: governments, health & social care providers, leading companies and start-ups, researchers, insurances, patients and citizens, investors... through ecosystems meetings (100+ per year), international events (such as Mobile World Congress) and our online platform “Connector”.

The Alliance is active in 25+ regions/countries (Europe, USA, Canada, China), the ECHAlliance members develop innovative solutions around mobile Health, chronic diseases, active & healthy ageing, Internet of Things, wearables, personalized medicine, genomics, Big Data, etc.

ECHAlliance has for over 6 years a large community of 16500+ people across the Europe, North America (USA, Canada) and China. It owns an associated qualified contact database that allows large communication and dissemination of innovative ideas, projects and solutions.

ECHAlliance is responsible for the Dissemination and Exploitation work package of SmartWork. In June-July 2020 ECHAlliance conducted a series of non-scientific interviews with its target group - older office workers - about their health and wellbeing related to the shift to telecommuting during the times of pandemic. We were interested to know how working from home has affected office workers’ physical and mental health and if the digital solutions like SmartWork can practically support them in situations like the one with COVID-19 now and in the future.

Based on the results of the four interviews, we can conclude that there is a high demand for the SmartWork services to monitor people’s health, stress level and physical activity. At the same time, the opportunities the SmartWork solutions bring go well beyond the limited target group of the 55+ and can be exploited also to the other age groups. Also, generally healthy people in need for self-monitoring and self-management tools, are being more interested in the SmartWork apps, which were developed originally for monitoring of chronic conditions.

The pandemics brought the digital solutions into the spotlight and many agree that it will have a lasting impact on the working environment, meaning that more people will be allowed to work from home or a hybrid approach will be embraced, where the worker shares their working week between the regular and home office.

## 1. How can technology applied to the work environment be leveraged in this period?

According to the study by European Foundation for the Improvement of Living and Working Conditions (Eurofound)<sup>1</sup>, overall 37 percent of those currently working in the EU began to telework as a result of the pandemic. In some countries the percentage is even above 50%. Most of the workers are generally happy with the switch and plan to continue the telecommuting after the COVID-19 crisis ends.

This brings the whole new demand for the digital solutions to be deployed to the work environment, creating the opportunities for the new technologies. The interviewees highlighted the fact that during the pandemic, they finally received the access to some of the digital tools (e.g. for teleconferencing) they were applying for a long period of time. During the COVID-19, they were made available within a couple of days.

## 2. Are there changes to the actual priorities and needs?

An increased demand for health monitoring tools, which could follow e.g. one's stress levels and physical activity levels can be observed. In the case of SmartWork, the healthyMe service was mentioned at some occasions as very useful and helpful. healthyMe monitors physiological and behavioural parameters for efficient self-management of chronic health conditions, positive change of behavioural attitudes and improved quality of life of the older worker.

Besides, because of the fact that the working teams are currently more geographically dispersed than previously, the demand for the services like digiTeam could grow. digiTeam is a service for smart and flexible management of the workforce from the side of the employers and could help monitor the health status of the team members when not together in the office.

### 3. Is this an opportunity for projects such as SmartWork to underline the needs to introduce a digital revolution in the workplace?

Yes. There is certainly a growing demand both for digital solutions and health monitoring tools. The original Exploitation Report for Y1 of SmartWork and the conducted initial market analysis showed that some of the barriers for SmartWork solutions might be the mistrust in the digital technologies and long period of deployment. The pandemic and its consequences - the imposed lockdown and massive switch to home office, proved that we need smartwork solutions. The mental barrier of the digital tools was broken.

<sup>1</sup> Living, working and COVID-19: First findings - April 2020, Eurofund, Published 6 May 2020, <https://www.eurofound.europa.eu/publications/report/2020/living-working-and-covid-19-first-findings-april-2020>

## UNIVERSITY OF PATRAS



By: Otilia Kocsis

University of Patras (UPAT) is the third largest university in Greece, with over 20000 undergraduate and postgraduate students, 1000 faculty and research staff and 300 administrative personnel, and has extensive experience in implementation and management of European and national research projects, with a dedicated financial and administrative body, the Research Committee.

UPAT participates in Smartwork through its Communications and Information Technologies Laboratory (WCL), established in 1967 at the Department of Electrical and Computer Engineering, and especially through the Visualization and Virtual Reality Group.

The WCL currently has a staff of more than 50 researchers, support personnel, and PhD students and is active in the following main areas, with organized R&D Groups: (i) Artificial Intelligence, (ii) Audio & Acoustics Technology, (iii) Network Architectures and Management, (iv) Digital Transmission and Coding, (v) Communication Networks Traffic Engineering and Applications, (vi) Communications and Telematic Applications, (vii) Pattern Recognition and (viii) Visualization and Virtual Reality.

### 1. How can technology applied to the work environment be leveraged in this period?

The COVID-19 pandemic has driven the Greek government to taking very fast measures towards stopping the spread, and in particular the educational institutions in the area of western Greece where Patras city is located, were closed ~1 week earlier than the rest of the country, due to an initial high number of cases in the area among people returning from an excursion in Egypt/Israel.

As a result, immediately after the first 2 weeks the educational activities were abruptly and completely stopped, as the public educational institutions were not prepared with respect to infrastructure and procedures in order to easily adopt/move to online teaching/learning and remote academic work. Although there is a wide range of technologies proven to efficiently support students towards adaptation to and adoption of remote learning, these were not used in the past for the undergraduate students teaching in the public high-level educational institutions in Greece.

There were some early adopters of such technologies, which however were more oriented towards postgraduate teaching and life-long learning.

The research work was not affected at the same level, as the vast majority of the researchers are already used to remote work, although such work was not officially recognized/encouraged before COVID-19. Still, the HR personnel are missing some work management tools allowing for planning of the office working hours for researchers, in order to avoid the presence of many people in the same research facility when needed to conduct experiments or use specific equipment. Furthermore, the administrative and logistics processes in place for the management of research grants, still require a huge amount of unnecessary paperwork. To give just a simple example, the excel version of time sheets have to be printed on paper and signed by both the researcher and the principal investigator, before being handed to the Research Committee administrative personnel. Then a manual data entry takes place, to have these time sheets transferred to the project management system - definitely not an efficient work management process overall, especially when talking about over 1500 researchers at University of Patras.

Having the technologies and tools is only one step in their adoption and efficient use process, as providing students, faculty and staff with access and training to use such systems is a critical point. And this is not only a necessity for the higher education environment, as, for example, the primary school activities were completely ad-hoc and relying on the informally acquired individual teacher' skills during the first 3 months of COVID-19 lockdown. There was no appropriate training (platform and materials) to support especially older teachers to acquire in a short period of time the necessary skills in order to efficiently use remote communication and teaching tools and systems.

## 2. Are there changes to the actual priorities and needs?

There is an urgent need for infrastructure and digitization of processes at the workplace in all educational, academic and research environments of public institutions in Greece, which should provide adequate means for coordination, management and execution of remote work and online teaching. This should be accompanied by a life-long learning system able to support training of workers at all ages in order to acquire necessary skills for efficient remote work.

## 3. Is this an opportunity for projects such as SmartWork to underline the needs to introduce a digital revolution in the workplace?

Digital revolution in public Greek academic and research institutions is needed, and projects such as SmartWork have an opportunity to provide integrated services both for workers and employers.

## ROESSINGH RESEARCH AND DEVELOPMENT



By: Miriam Cabrita and Monique Tabak

Roessingh Research and Development is an SME in the area of rehabilitation technology and eHealth with strong formalized links to one of the largest rehabilitation Centres in the Netherlands (Roessingh Rehabilitation Centre) and the University of Twente. RRD’s mission is to carry out excellent scientific research and contribute to its commercialization and implementation in clinical practice. RRD develops innovations in a multidisciplinary team and in close collaboration with all stakeholders (patients, informal and formal caregivers, academia, health care organisations and industry). RRD has extensive experience in many aspects of the development of innovative technology supported health and care services from initial scenario development and requirements elicitation with all stakeholders, technology development (ambulant sensing, IT services platform, Decision Support, personal context aware coaching systems), user studies focused on usability, acceptance and user satisfaction, and large scale clinical evaluation studies up to implementation of new services in daily clinical practice. RRD has developed its own service platform that enables multimodal monitoring and coaching of physical and mental health - including a virtual agent that guides the user through the care path.

### Perspective: support physical and mental wellbeing of the employee

The COVID-19 pandemic brought severe consequences for the health of the global population and not only for those who were infected with the coronavirus. The lockdown experienced in many countries worldwide forced a large part of the population to work from home (e.g. office workers), to temporarily stop working or to work under very strict circumstances inducing stress and feeling unsafe (e.g. factory workers). Both scenarios presented undeniable challenges to the physical and mental wellbeing of individuals. In the next paragraphs we will analyse three of these challenges and reflect on how these challenges can turn into opportunities for AI technologies.

## Challenge 1: Disruption in work-life balance

### Scenario 1: Working from home

While some organizations were already familiar with the practice of working from home, for many office workers the COVID-19 lockdown represented the first experience with working outside of the office environment. From one day to the next, the home of the individual became a place for both work and leisure, disrupting the work-life balance by removing the defined barriers of the physical work and private space.

Next to the obvious opportunities for AI technologies supporting the employee in managing the work activities (e.g. time management), digital health solutions can also play a crucial role in supporting individuals prioritizing their health, while finding their work and leisure rhythm. Such technologies can support the individual setting personalized plans to make sure to incorporate healthy moments in the new working routine of the individual.

For example, the healthyMe app developed in the SmartWork project, reminds the user to take regular short breaks (e.g. go for a walk or do some stretching exercises) during working hours.

Moreover, while searching for their work-life balance, individuals might actually find the flexible work as an opportunity to adapt their working schedule to their own circadian rhythm. Several scientific studies have shown that there are “morning types” and “evening types” of people with forced working schedules that have a negative impact on productivity.

AI technologies combining monitoring of health behaviours (e.g. sleep) and work productivity factors (e.g. focus) have the potential to support the individual learning the most ideal working rhythm, promoting physical and mental wellbeing.

### Scenario 2: Sudden stop working

The disruption in work-life balance in case of professions forced to stop working comes after the lockdown. By limiting the capacity of workers in indoor locations, labour workers are likely to see their shifts changed.

For example, factories who only had day shifts, might be forced to work 24/7 including nights shifts to guarantee their production goals. Changing shifts has severe implications to the physical and mental health of the individuals.

From the perspective of the employee, AI technologies have the potential to support the individual adapting to the new working routine while promoting healthy behaviours. For the employers, AI technologies monitoring fatigue at the workplace, such as in Bionic, support the management team analysing the impact of the shifts in the health of their employees and adjust accordingly.

## Challenge 2: Abrupt changes in health management

A challenge shared by those working from home and those who completely stopped working during the COVID-19 lockdown was the abrupt change in daily routines, and in particular, in health management routines.

Taking the physical activity as an example, with fitness centers and community swimming pools closed, many people found their exercise routines disrupted; the light intensity physical activity (e.g. normal walking) was also highly disrupted with people responding to the call to stay at home as much as possible.

Moreover, for countries where active transportation is the preferred way of commuting, such as cycling in the Netherlands, stop of the daily commuting had a drastic influence on the daily physical activity of the individuals. All these constraints to regular physical activity forced them to find alternatives to keep active while staying mostly at home, or even in total confinement.

On a positive note, the flexible work was seen as an opportunity for some people to make their own exercise schedule without the constraints of rigid working times. These are some of the main conclusions of an online survey (N=97) performed within the SmartWork and BIONIC projects to investigate the facilitators and barriers that motivated an eventual change in physical activity while working remotely due to the COVID-19 lockdown.

Respondents who reported becoming more physically active during the lockdown (31%) were more intrinsically motivated to be physically active. This indicates that those who were physically active for the inherent satisfaction of the activity, were more likely to adapt and find alternatives to the constraints to physical activity than those who were less (42%) or equally active (27%) during lockdown.

When looking at the facilitators to physical activity during the COVID-19 lockdown, respondents that considered themselves more active than before the COVID-19 quarantine ranked “no work-related travel”, “fewer social obligations”, and “access to facilities” significantly higher than those that are less active than before quarantine.

“Own work schedule” was one of the strongest facilitators for all respondents. In terms of barriers, those who were less active during the lockdown rated “no time due to job”, “no active transportation”, “closed facilities”, “no group activities”, “no social support” and “not being allowed outside” significantly higher than those that are more active than before quarantine.

The results of this study will be used in the SmartWork and BIONIC projects to personalize interventions promoting physical activity based on the motivation profile of the individual worker. Furthermore, SmartWork and the healthyMe app in particular will highlight the facilitators and work around the barriers together with the user.

Likewise, in the last months many studies have investigated the consequences of the lockdown to the physical activity of the general population. For example Garmin, one of the largest producers of activity trackers, reported that, compared to the previous year, the number of steps worldwide reduced by 12% April 2020 compared to the same month in 2019, but steps from workout activities increased by 24% .

Technology is the strongest enabler of workout activities at home with numerous livestream and recorded exercise training available online. By combining these workout activities with wearable technology to monitor daily activity, AI technologies can help the individual set personalized plans to reach their health-related goals and coach throughout the process, while adapting to the constraints of the environment (e.g. home confinement).

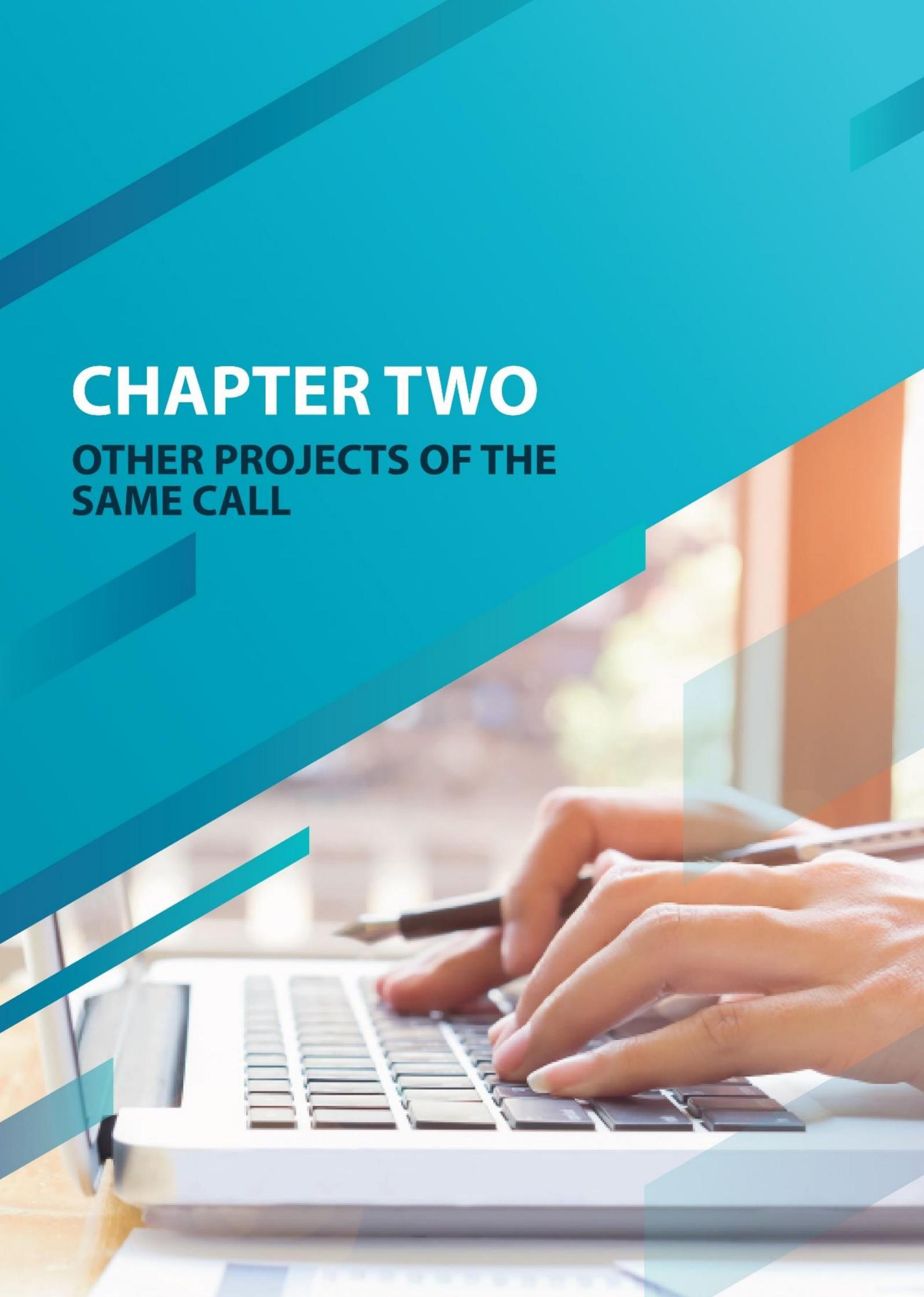
### Challenge 3: Limited control on the working environment of the employees

Finally, we address a challenge posed to the employer. Each employer is responsible for the safety and health of the employees while at the workplace. However, with the changes in the work environment (more stress and fatigue at work due to COVID-19's mental, physical and social consequences) or default workplace moving to the home environment, employers need to find alternative ways to guarantee and foster the health of the employees when the physical workplace is much changed or out of their control.

Services as SmartWork and BIONIC can support taking care of work productivity and health by using multi-modal sensing and AI ensuring that the physical and cognitive skills of their employees stay up to the level by providing personalized training to the demands of each specific job.

# CHAPTER TWO

## OTHER PROJECTS OF THE SAME CALL



## PROJECT PARTNERS

### AGEING@WORK



Ageing@Work

<https://ageingatwork-project.eu/>

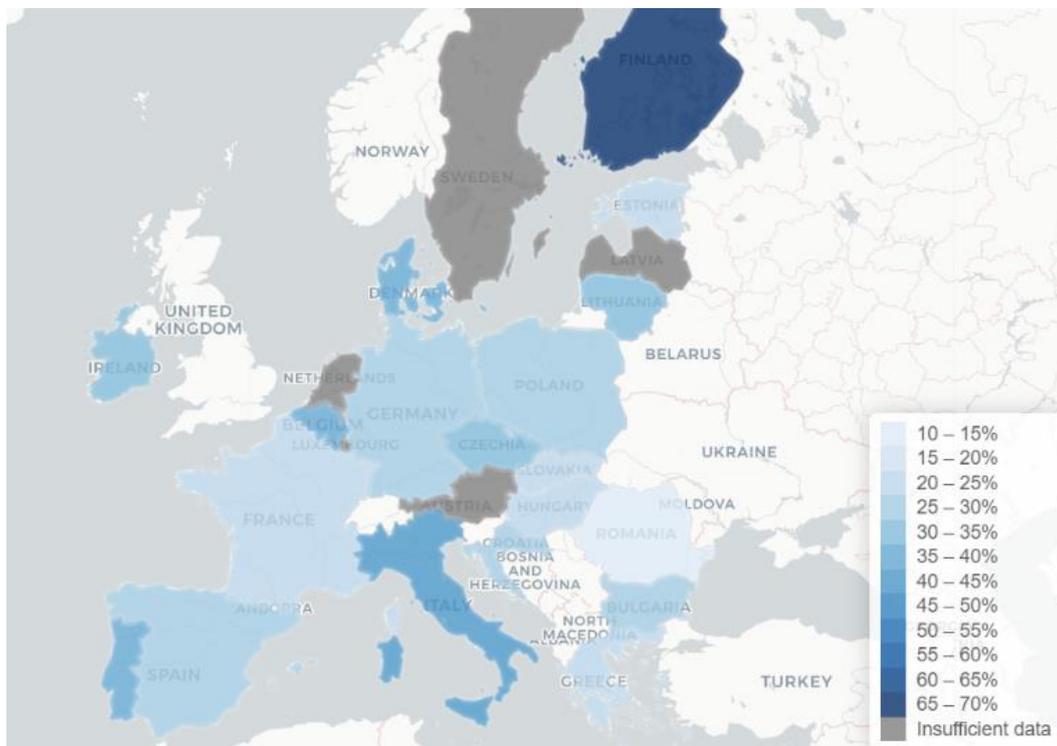
By: Andreas Triantafyllidis



## AGEING@WORK AND THE COVID-19 OUTBREAK

The COVID-19 outbreak has been a major shock for the European and global economy. According to the Spring 2020 Economic Forecast, the EU economy will experience a recession in 2020, with projections that the EU economy will contract by 7,5% in 2020, far deeper than during the Global Financial crisis in 2009, and grow by only 6% in 2021. Many businesses are experiencing economic difficulties as a result of the COVID-19 crisis and have had to temporarily suspend or substantially reduce their activities and the working hours of their staff. Mobility restrictions, social distancing and obligations for the protection of vulnerable groups -especially older people- have urged employers to look for alternative ways of continuing their business, such as offering the possibility of remote working or else teleworking.

The EU-funded Ageing@Work project (H2020) is developing adaptive and personalized ICT solutions to improve the workability and well-being of the ageing workforce. In this context, the Ageing@Work project provides workers with a range of productivity enhancement, remote collaboration and health promotion digital tools. Ageing@Work takes advantage of cutting-edge technologies such as Augmented Reality and Virtual Coaching, to promote independent working and living of ageing workers, and offers a novel integrated platform which is tailored to worker needs and provides both physical and mental health support. The developed age-friendly solutions based on the remote collaboration of workers, knowledge sharing, lifelong training, and situation awareness, will help ageing workers to maintain productivity and workability for longer, while achieving a balance between work and personal life, and promoting active and healthy ageing both at work and at home.



The figure shows 'Yes' for respondents of age group '50+' in the EU27 when asked: Have you started to work from home as a result of the COVID-19 situation?

Source: Eurofound, 2020 (<https://bre.is/TQquDVTX>)

In terms of social consequences, COVID-19 has put extra pressure on challenges related to the demographic change in Europe, with the continuously growing older population. The European ageing population, beyond the threat to life from COVID-19, is now additionally facing risk of unemployment, discrimination and isolation.

Even more, older workers will be the last to return to work when the containment measures will start to get lifted as they constitute a high-risk group and they often suffer from aggravating factors or chronic diseases.

This is expected to lead to a massive absence of elderly workers in workplaces for an unknown duration, which will deprive the respective companies of the experience, skills and know-how of a large part of their employees.

- Affected employers will look for solutions to issues that will arise in terms of facilitating older employees to continue working without having a physical presence in the workplace for as long as the measures last;
- Assisting and training younger employees that will be forced to take over the roles and responsibilities of older employees staying at home;
- Maintaining and making available the organizational knowledge which is usually in the possession of older employees.

Based on the above, it becomes more than evident that the COVID-19 pandemic, regardless of how devastating it is, may pose a unique opportunity for products such as Ageing@Work by abruptly meeting the urgent needs of both companies and ageing employees.

Ambient Assisted Living (AAL) solutions, if they successfully respond to the challenges posed by the pandemic, can prepare the ground for their establishment and widespread acceptance in the workplace.

Ageing@Work will develop a novel integrated platform of advanced, personalized and adaptive Information and Communication Technology (ICT) tools that will help ageing workers of the modern industry to maintain productivity and workability for longer, while achieving a balance between work and personal life. To this end, the platform will on one hand help tailoring the workplace to the evolving needs and specificities of the ageing workers, and on the other, will enhance their productivity and workability.

In parallel, the platform will support the ageing worker's active and healthy ageing at work and at home, through personalized physical and mental health support ICT tools.

In particular four core productivity enhancement tools will be developed with the aim to improve the working experience and elevate the productivity within a flexible work context, absolutely relevant to above-mentioned priorities and needs emerged within the COVID-19 crisis:

- A bi-directional Augmented Reality-based telepresence tool which enables workers to communicate in real-time and provides an enriched view of the physical workplace through shared visual annotations and digital information - a tool with particularly great significance during the COVID-19 pandemic crisis period, where solutions are intensively being sought to enhance senior workers to work from their home and provide guidance to on-site younger workers.
- A personalized lifelong training tool based on a virtual 3D environment to remove training barriers and promote knowledge, facilitating the older worker into the learning of new tasks and processes that may need to be addressed as time goes by.

- A knowledge sharing toolkit, easing the way that knowledge and experience gained by the older workers is transferred to younger workers as well as allowing new knowledge gathered by younger workers to be provided to the ageing workers in an understandable, intuitive and easy-to-use way.
- A situation awareness enhancement tool, boosting situation awareness whether the worker is on-site or working remotely. This tool will provide the workers with information streams regarding the task under way, personalised reminders regarding other scheduled tasks, as well as notifications highlighting imminent dangers or accident related factors.

European Commission, 2020, Spring 2020 Economic Forecast: A deep and uneven recession, an uncertain recovery, available at: <https://bre.is/FNMm6fWH>

## CO-ADAPT



<https://coadapt-project.eu/>

By: Giulio Jacucci

CO-ADAPT is a project aimed at investigating how technologies in work and life should adapt to change conditions due to ageing and at the same time provide support for people in behavior change to improve wellbeing and workability.

CO-ADAPT proposes a framework that provides principles for a two-way adaptation in support of ageing citizens. 1) Human Adaptation Support: CO-ADAPT empowers ageing citizen to adapt to changed conditions through a personalised Artificial Intelligence (AI) conversational agent providing comprehensive change support based on language and physiological analytics. 2) Work Systems Adaptations: CO-ADAPT defines three types of smart adaptations in work systems with different level of technology sophistication to age thresholds in smart shift scheduling tools, to individual capabilities considering cognitive workload in assembly stations, adaptations to work tasks in contextually recommending people, documents and applications for cognitive augmentation. The evaluation and validation are carried out in Italy and Finland in organisations and realistic environments. The consortium includes comprehensively stakeholders and disciplines geared for a participatory design approach, compliance with ethical and data directives, and effective exploitation of results.

## The role of AI technologies in working through and after COVID-19

The role of AI in CO-ADAPT is particularly geared towards personalization and scaling coaching and support for mental and physical wellbeing in particular considering change behavior.

In the context of COVID-19 challenges include at least two challenging problems: 1) maintaining and improving work ability in a safe way, 2) maintaining an improving mental wellbeing in the context of raising health, economic risks and disruption to normal life.

To address improving safe work ability, AI should be able to embody rapidly changing health safety guidelines as the science of how to reduce risks of contagion is changing rapidly. To maintain workability in the change conditions AI can be used also to provide alternative ways to carry out work including remote work and remote operations ([University of Padova Professor Gamberini and BNP srl work on collaborative robots and their remote operation](#)), provide intelligent support to organize work in a safe way ([as FIOH work shows on smart shift scheduling](#)), as well as providing intelligent collaboration and information access opportunities ([University of Helsinki and Aalto University work on proactive information retrieval](#)) .

In this context providing scalable coaching is of paramount importance to address increased strain on mental and physical wellbeing. Along with these issues change behavior is very important to also maintain a safe work environment as people need to understand and adopt new practices to reduce health risks. To motivate individuals and teams to change behavior towards safe working practices following recent motivational theories people need to learn and understand COVID-19 and be empowered to contribute to solutions through being made responsible. Change behavior and mental wellbeing are addressed by Professor Giuseppe Riccardi group at the University of Trento, through the development of resources that combine conversational technologies and intelligent interpretation of health data to scale and improve the quality of coaching.

The work in CO-ADAPT also develops necessary tools for intelligent processing of health and other sensor data that can be used for risk analysis, change behavior and contact tracing as exemplified by [iSPRINT work on a distributed data gathering platform](#).

## SEEFAR



<https://www.see-far.eu/>

By: Angus Kintis

SEE FAR (“Smart glasses for multifacEted visual loss mitigation and chronic disEase prevention indicator for healthier, saFer, and more productive workplAce foR ageing population”) is a digitally enabled adaptive solution supporting the ageing workforce with vision deficiencies to remain actively involved in their professional life, helping them to sustain and renew their work and personal life related skills and support independent, active and healthy lifestyles.

### How can technology applied to the work environment be leveraged to respond to the emerging challenges raised by COVID-19?

At the present time (Jun 2020), the features and functionalities to be extended by the See Far solution for the benefit of its users, are not so impacted or influenced by the COVID-19 pandemic or the challenges that come with it. Nevertheless, the technologies upon which the See Far solution builds on, such as Augmented Reality (AR) displays, self-improving Artificial Intelligence (AI)/Machine Learning (ML) algorithms, etc., will be ‘the norm’ in the not so distant future, once certain technological, cost, regulatory/privacy and other considerations have been thoroughly tackled and put to rest.

In this ‘not so distant future’, a third , fourth or perhaps even later version of the ‘original’ See Far solution, will allow the user to not only overcome his/her visual impairment’s constraints and challenges within the work environment on a daily basis, but will further also utilise its high-resolution, almost 180o FOV (Field-Of-View) AR display for standard working tasks, such as reviewing/editing of a Word/Excel or other file, sharing as a screen/feed for collaborating with colleagues, etc.



Most importantly however, in terms of the COVID-19 or any analogous pandemic situations, the future See Far solution will allow to perform all such work (and beyond) related tasks, through the use of voice commands (hence minimising the contact of the user's hands with the See Far Glasses, and thus the possibility of contracting a disease), while also the See Far Glasses themselves will be even lighter, more compact and more ergonomic, taking advantage of the latest technological developments in terms of AR displays, processor chips, synthetic materials for the glasses' frame, etc, thus allowing their users to wear them throughout the whole working day, without even noticing.

Although the currently projected configuration of the See Far solution at the end of the project will not largely accommodate its users in overcoming the COVID-19 related challenges in their daily working environment, it will certainly go a long way in ensuring that the patients with the related vision impairments (i.e. AMD, diabetic retinopathy, glaucoma, cataract and presbyopia), will keep safe and healthy, through a greatly improved capability of remote screening and monitoring for the said impairments, through the use of the See Far Mobile App, the D-EYE Ophthalmic Camera and the AI/ML algorithms for the retinal pathologies detection and monitoring service on the See Far Cloud.

## Are there changes to the actual priorities and needs, considering the pandemic situation?

The See Far Consortium was already considering the incorporation of voice commands as a potential means for interaction between the user and the See Far solution itself. The predominant reason for this until recently was in order to accommodate the needs for interaction with the solution, of people classed as “legally blind”, i.e. with a much-reduced vision (typically 20/200 or less).

The case of the COVID-19 pandemic, is now an additional reason for considering the incorporation of voice commands, as a means of interaction with the See Far solution, this constituting a 'safer' practice in the frame of COVID-19 or other similar pandemic situations, as discussed above.

In this frame, the See Far Consortium will thus consider if given other constraints involved (i.e. timing, technological, cost, sizing, processing, etc.) it would be prudent to incorporate the option for voice commands/control of the See Far solution, during the 2nd version of the project's design documentation (i.e. Functional/Non-Functional Specs and Architecture deliverables), due at the end of Nov 2020.

## Is this an opportunity for projects such as See Far to underline the needs to introduce a digital revolution in the workplace?

Most certainly, the COVID-19 pandemic has created a great opportunity for solutions, systems and approaches that will accommodate more ‘flexible’ and ‘remote’ methods of working and collaborating as part of our professional lives. For companies, projects and initiatives that were already moving in that direction, this could be an unprecedented opportunity, to capitalise on in a commercial sense.

The See Far project however, as highlighted above, is NOT focused in such a direction.

For the See Far project, the COVID-19 pandemic has created a significant opportunity as far as the capability offered to its users to perform remote screening and monitoring of particular vision impairments (i.e. AMD, diabetic retinopathy, glaucoma, cataract and presbyopia).

Either by pitching to the end-users themselves (i.e. the people with such vision impairments) or the eye clinics which would monitor such patients, there could be a significant sales potential in the near future for the D-EYE Ophthalmic Camera, as a stand-alone product, or as part of the ‘integrated’ See Far solution.

In fact, telemedicine can be seen as an adequate solution in these pandemic circumstances. The need for remote technologies and medical solutions are increasing as people need to stay healthy and disease-free. Technologies such as the D-EYE and other digital healthcare medical devices are limiting the patient’s risk of spreading the Coronavirus by travelling to hospitals or clinics for check-up routine visits.

In this manner, the D-EYE integrated in the See Far solution, can be perceived as a ready-made solution in the near future. Users will be able to consult doctors from their homes and monitor the diseases’ progression.

SUSTAGE

# sustAGE

<https://www.sustage.eu/>

By: Rossella Monferino, Massimo Di Pardo, Felice Tauro



SustAGE aims to develop a person-centered smart solution to promote the concept of “sustainable work” for EU industries, in close collaboration with occupational specialists, psychologists and end-users, aiming to support the employment and later retirement of older adults from work, as well as well-being, wellness at work, and productivity of aging employees through three main dimensions: 1) Occupational Safety & Health - is directed toward improving occupational safety and health via risk assessment and prevention strategies based on workplace and person-centered health surveillance monitoring; 2) Personalized Recommendations - aims to promote the wellbeing of employees via personalized recommendations for physical and MH improvement; and 3) Workforce productivity - supports decision-making related to task/job role modifications and aims to optimize overall workforce productivity by assessing the abilities of individual persons (e.g., physical, mental, social) in relation to work demands and risks.

sustAGE explores two critical industry domains, with significant challenges and requirements: manufacturing and transportation & logistics. The project aims towards a paradigm shift in human machine interaction building upon strategic technology trends: Internet of Things, computer vision, machine learning, micro-moments, temporal reasoning, recommender systems, data analytics and gamification, to deliver a composite system integrated with the daily activities at work and outside.

Teleworking turned into a main instrument and necessity for many European workers during the lockdown imposed by most governments as a response to the pandemic emergency.

Many of the 65.000 workers employed in the EMEA region of Fiat Chrysler Automobiles (FCA) have been made able to work safely from home, with great effort on the part of ICT technicians who have upgraded or enabled new remote working tools. But a large proportion of FCA workers, being employed in different jobs in the plants, did not have the opportunity to work remotely.

For this reason, the Health & Safety department together with Human Resources and Job Analysis and Planning have put in place a whole series of safety procedures and modified the work processes to allow all these workers, as soon as the governments gave their permission, to return to work safely.

### Without going into details, the main safety procedures are inspired by the following pillars:

- Access to the plants only in good health conditions (T<37,5°C and absence of flu symptoms attributable to COVID-19)
- Daily self-cleaning of the workstation and frequent sanitation
- Frequent hand hygiene
- Compulsory use of the surgical mask
- Maintaining social distancing at the entrance and the exit, during breaks, in the canteen, and on the workstation.

### The sustAGE system aims to develop a person-centred smart solution to support wellbeing, wellness at work and productivity and promote the concept of “sustainable work” for European industries through three main dimensions:

- Occupational safety & health: with the aim to improve occupational health and safety on workplace through a person-centred health surveillance monitoring
- Personalized recommendations: with the aim to improve physical and mental health, to enhance motivation and to promote wellbeing

- Workforce productivity: with the aim to optimize the workforce productivity providing support decision making related to task/job role modifications

## The sustAGE system is developed so that it will be able to reach its objectives by:

- Monitoring the user states and actions via an IoT ecosystem in an unobtrusive and privacy preserving way
- Analysing user's activities, extracting important episodes - micro-moments and processing the short-term and long-term aspects of symbiotic interaction for multi-aspect profiling
- Providing advanced recommendations at three different levels (physical, mental and workforce) according to the dynamic situation (space, time, activity)
- Promoting a safe work environment, good physical and mental health and social engagement for individuals.

The sustAGE system has been designed as a tool to help improve health, safety and wellbeing in the workplace and outside, during leisure time. Thus, it can provide a valid support also and above all in times of pandemic emergency.

In fact, some of its functions can be exploited or enhanced in order to help implement and follow the safety procedures required in emergency and post-emergency times.

In addition, it could also be thought of integrating one or more functionalities within the sustAGE system dedicated in particular to the management and implementation of security procedures and recommendations regarding the behaviour to be followed to protect oneself and to contribute to the containment of the spread of the virus.

### In general:

In the time of emergency, social distancing is required in the workplace, but also at the entrance and exit from the plant, during the pauses and in the canteen. sustAGE could exploit the location of the workers, already under development, to give a warning when interpersonal distances are reduced below the security threshold (1 mt).

Moreover it could help to manage the breaks in order to avoid the gathering in the refreshment areas by suggesting (through the recommendation system) to postpone the break if the number of workers in the refreshment area has already reached the maximum number allowed. In a similar way it could suggest doing some relaxation exercises while waiting for the time to go to the canteen (whose shifts have been reorganised so as to provide meals to a reduced number of people in less time, in order to increase the number of shifts).

In addition, the indications of the safety procedures implemented during this period, provide for the prohibition of access to production sites (and offices) if the body temperature is higher than 37.5° C, as well as the obligation to go to the infirmary immediately if fever or other related symptoms occur during the shift.

The sustAGE system could give a recommendation to the worker to measure their temperature when he wakes up or before leaving home to go to work. This will prevent them from moving from home and help reduce contagion during the journey.

Moreover, as there is a documented correlation of (low) HR variability values with the presence of viral infections, included COVID-19, that increases with regard to their severity<sup>7</sup>, we may investigate the possibility to find a threshold for low HR variability, when to send a recommendation to the user to measure their own temperature via a thermometer. This can help the worker to monitor their feverish state while working to avoid possible contagious situations in the workplace.

### Finally:

Between the safety indications highly recommended during this pandemic period, one of the most important is to wash our hands frequently, in order to protect ourselves and others. This indication is valid not only for work environments but also and mostly for all our daily routines. For its importance and simplicity, it has been included in the company safety procedures.

One of the abilities that are under development for the sustAGE system is the capability to infer some type of workers activity from smartwatch's accelerometer information. We would like to evaluate the possibility to include the hand-washing detection between the human activities inferred by the system, to allow it to remind the user to wash his/her hand when the system has not detected such activity for a certain period of time.

Seshadri DR, et al (2020). Wearable Sensors for COVID-19: A Call to Action to Harness Our Digital Infrastructure for Remote Patient Monitoring and Virtual Assessments. *Front. Digit. Health* 2:8. Doi:10.3389/fdgth.2020.00008

## WORKINGAGE

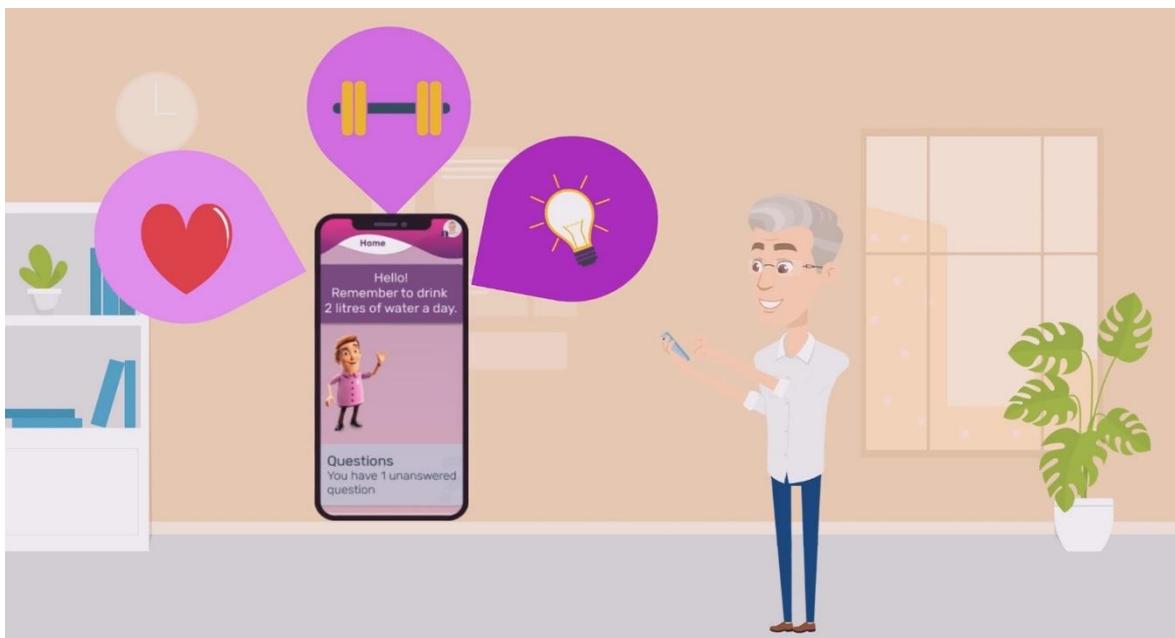


WORKINGAGE

Smart Working Environments for All Ages

<https://www.workingage.eu/>

By: M<sup>a</sup> José Hernández & Rosa Almeida (INTRAS), Marteyn van Gasteren (ITCL), Hatice Gunes (University of Cambridge), Hesam Sagha (Audeering)



The WorkingAge project is developing the WorkingAge Of Well-being (WAOW) tool that shall improve the working experience and the work-life balance. Whilst working, the working person faces various stressors, leading to individuals experienced mental and physical strain. For this reason, the system will be capturing the working persons' strain via physiological and physical indicators, in a first step. This information will further be evaluated by through the system. Therefore, the system requires the interaction of different components, such as sensors, interfaces, data collection, a central processing unit, and the WAOW tool itself, which is an interface. The technical requirements include components and functions with regards to the project's theoretical background, project's objectives and limitations. Finally, the system will provide workers assistance in their everyday routine in the form of reminders, risks avoidance and recommendations.

## How can technology applied to the work environment be leveraged to respond to the emerging challenges raised by COVID-19?

In a society where employment is prolonged to higher ages, the WorkingAge project studies and promotes healthy habits in working environments focusing on people aged over 45. Gaining a better understanding of well-being at work and of factors that may inhibit or deteriorate prolonged employment, desirable living situations at an older age are pursued, focused on autonomy and quality of life.

The project is developing an integrated digital solution, the WorkingAge of Well-being (WAOW) tool, that shall improve the working experience and the work-life balance, by studying 3 types of working environments: Office, Teleworking and Manufacturing. These environments are being made fit for workers over 45 and validated in extensive pilots.

Whilst working, the working person faces various stressors, leading to individuals experiencing mental and physical strain. For this reason, the system will be capturing the working persons' strain by physiological and physical indicators, in a first step. This information will further be evaluated through the system. Therefore, the system requires the interaction of different components, such as sensors, interfaces, data collection, a central processing unit, and the WAOW tool itself, which is an interface.

It is an apparent fact that the COVID-19 pandemic has changed the way we currently work, whether we go to our usual workplace or work from home. The COVID-19 epidemic is causing many workers feelings of isolation aggravated by the measures of lockdown and social distancing, and psychological distress due to having to juggle many roles and responsibilities (e.g., home schooling, caring, teleworking) in a constrained home environment. This necessitates out-of-the-box solutions and much needed revisions to the Occupational Safety and Health (OSH) policies starting from in-company level.

In the current challenging COVID-19 climate, highly charged negative emotions such as fear, anxiety and distress can be overwhelming, and work-related stress can lead to mental exhaustion and burnout.

Not being able to effectively cope with these emotions can negatively impact the wellbeing of the worker, the wellbeing of the people they care for, their colleagues at work, and their wider communities.

Therefore, it is crucial to recognize the signs of distress, and early signs of depression, and take prompt action to manage these effectively and build resilience. In this new work context caused by the COVID19 pandemic, technologies such as the WorkingAge Of Well-being (WAOW) Tool developed in the framework of the WorkingAge project (<https://www.workingage.eu>) are of utmost relevance.

The aim of the WAOW tool is:

- To recognize negative and unhelpful emotions and strain level of the worker by using (wearable) sensors as well as self-reporting,
- To monitor environmental variables such as noise and luminance, and
- To reduce psychosocial stress based on an intervention model focused on monitoring worker's health as well as issuing appropriate recommendations.

Different working conditions (home-office, manufacturing, call centre) are considered for this project. This tool is being developed with the final goal of implementing an intervention program with older workers to prolong their work ability and autonomy, and promote well-being throughout all areas of their lives. This is especially useful in effectively responding to the challenges raised by COVID19.

## Are there changes to the actual priorities and needs, considering the pandemic situation?

The COVID-19 pandemic has highlighted the need to reinforce the health and social services systems, make them more resilient and equipped with technological capability and knowledge to more readily face similar situations. In the field of OSH in particular, strengthening the occupational health and safety of workers, but not only physical health, also mental health, which is one of the major aspects neglected by companies.

Most companies have focused on implementing organizational and personal measures to avoid or minimize exposure to the new Coronavirus (SARS-CoV-2). Stress, anxiety and other strong emotions have also been considered important aspects to address by companies, and in some cases tailored plans have been developed and tools have been used to try to improve the mental health of workers.

## Is this an opportunity for projects such as SmartWork to underline the needs to introduce a digital revolution in the workplace?

The COVID-19 outbreak and subsequent lockdown measures have paved the way for the acceleration of digital transformation as companies shift operations to cope with office closure, restricted mobility and supply disruption.

Experts caution that this collective response should focus not only on immediate actions, but also on transformative actions to enable sustained resilience. The crisis caused by COVID-19 has made it clear that, in many organizations, digitization or business continuity were not mature enough.

However, the prospect of long-term economic paralysis will lead organizations to prioritize investments in long-term resilience over daily operational needs. Basic trends, like teleworking, will continue.

As for the safety and security requirements that were already key, they will continue to gain importance and have an impact on sustainable development. Companies will further invest in the use of technologies to improve their production processes and improve the occupational health and wellbeing of their workers (one of their main assets).

Therefore, the COVID19 pandemic will act as a driver of the digital revolution in the workplace across many levels. The WorkingAge pilots will be deployed during the next couple of months within this new context of COVID19 threat.

The Large-Scale Pilot activities will be executed in various deployment sites by establishing and consolidating the local IoT ecosystems for aging well. This activity will cover the operation of the Use-Cases under load and constraints conditions targeted to a large number of heterogeneous devices and systems and a large number of real users.

The current work environment characterized by COVID19 provides a unique opportunity to analyse the goodness-of-fit of the WAOW Tool developed by the WorkingAge project.

We expect to learn valuable lessons in this process and share them with the relevant parties to create more purposeful technologies that are better able to support their workers' well-being.



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**CONCERTED PAPER BETWEEN THE PARTNERS AND PROJECTS:**

