Automation and Computers and Their Contribution to Human Well-being and Resilience

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Abstract: By tradition, automation has been defined as a process that controls a number of functions or tasks without direct human intervention. In the mid '80s, some doubts about the opportunity and technical feasibility of full automation were expressed and influential scientists such as Peter Drucker and Umberto Eco viewed the computer as a "moron" and as a "stupid tool that functions only in the hands of intelligent people", respectively. Over the years, the technology has evolved and, consequently, the knowledge and skills of the people who use the computers and automation devices in their professional and private life have been continuously improved. At present, the meaning of automation together with the division of work between human and automation devices have dramatically changed and the early vision of Joseph Licklider about the "man-computer symbiosis" appears to be almost fully brought to life. The evolution is even more accelerated by the adaptation efforts that people make nowadays with a view to mitigating, to the extent possible, the unfavourable impact of the current pandemic on our lives and returning to a normal situation. The paper contains a brief historical account about how the computers and automation have enabled and stimulated new working styles and, at the same time, contributed to improving the quality of people's life.

Keywords: Artificial intelligence, Digital clone, Cognitive system, DSS, Trustworthy computing, Digital humanism, Dataism.

1. Introduction

In a previous early paper (Filip, 1995) three questions were formulated about the impact of automation and computer-based information systems on people:

1. "How does the computer serve the human (process/plant manager) perform his tasks better?

2. What is the impact of the man-machine system on the operational performance of the managed process/plant?

3. How the human status and working conditions are affected by the presence of computer?"

Forty years ago, Briefs (1981) stated that the computerization of human work will seriously affect the technical white-collar workers in industry and lead to unemployment. In his view, the process seemed to imply "a major threat against the human creativity and conscious development" because of a tendency to polarise humans into two categories. According to Briefs, there was a small 'elite' group of people, which included the IT (*Information Technology*) professionals, who had the opportunity to deploy their knowledge and creativity in designing ever more sophisticated tools. There was a larger second group that included communities of users who performed their jobs in a faster and easier manner without getting deep insights into their comfortable but informationally opaque production means. In addition, Johannsen (1995) noticed that excessive and technology-oriented automation may cause de-skilling the operators in charge with supervising industrial processes and, possibly, lead to boredom under normal conditions and to making catastrophic decisions in crisis situations, thus affecting human's resilience when facing adverse situations. Several answers have been previously given to above questions and concerns, and suggestions have been made on how to mitigate the possible undesirable impact of technology on professional and private life of people. In particular*, anthropocentric automation* approach was proposed (Filip, 2008; Filip & Leiviskä, 2009).

This paper is meant to give a general view about the contribution of computers and automation to enabling new working styles and, at the same time, to improving the human resilience and making the quality of life of the people ever better. The rest of the paper is organized as follows. The first section sets the stage for the following ones and reviews several concepts such as *digital well-being* and *human resilience.* The current developments in automation and human-machine collaboration in modern SCPS (Social Cyber-physical Systems) settings are described in the next section. The concept of computer supported collaboration of humans (Filip et al., 2017), humans and machines

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(Nof et al., 2015), and combination of various technologies are described as enabling factors for evolution, possibly leading the *digital* cognitive systems meant to be largely used within a wise service-oriented setting (Spohrer et al., 2017). Several governmental and scientific institutions, such as the European Commission (EC, 2020) and the US National Security Commission on Artificial Intelligence (NSCAI, 2021), and companies propose rather similar approaches aiming at creating a Trustworthy AI ecosystem with a view to avoiding/attenuating the possible adverse impact of extended automation and AI (Artificial Intelligence). A central idea of all approaches apparently is ensuring human agency and oversight. A comparison of two concepts namely digital humanism, coined by Gartner's people (Hofkirchner, 2021), and dataism (or *data-ism)* advocated by Harari (2016) is made. Several scenarios concerning the possible evolution of people and societies under the influence of technology progress are eventually reviewed.

2. Wellbeing and Human Resilience

2.1 Definitions

Wellbeing (sometimes called *wellness*) is a concept meant to describe the human's state of being comfortable, healthy, and even happy. It is sometimes used for good *quality of life* in all its facets: physical, material, social, and emotional ones (Felce & Perry, 1995; Radulescu et al., 2019). In this paper, the view of Dodge et al. (2012), who define wellbeing as "the balance point between a human's pool of individual resources and the challenges he/she faces", is preferred and adopted.

Carlsson & Walden (2017) identify several dimensions of wellness such as social, emotional, spiritual, environmental, occupational, intellectual, and physical. In the context of this paper, the occupational, intellectual, and physical dimensions are of primary interest. They are defined by Carlson and Walden as follows:

- "*Occupational Wellness*: to get personal fulfilment from our jobs or career fields while still maintaining balance in our lives;

- *Intellectual Wellness*: to open our minds to new ideas and experiences that can be applied to personal decisions, group interaction, and community betterment;

- *Physical Wellness*: to maintain a healthy quality of life that allows us to get through our daily activities without undue fatigue or physical stress".

Human resilience is a complementary concept of interest in the present paper. According to *Oxford Dictionary of English,* resilience is somebody's ability "to recover quickly from difficulties" (Stevenson, 2010). In the paper, we will adopt one of the views presented by Windle (2011): "Resilience is the ability to overcome difficulties and move on". The American Psychological Association (APA, 2014) identifies ten ways to build resilience. Several of them could serve for setting the stage for the information contained in the rest of the paper:

- "Avoiding seeing crises or stressful events as unbearable problems;

- Developing realistic goals and move towards them;

- Taking decisive decisions and actions in adverse situations;

- Keeping a long-term perspective and considering the stressful event in a broader context."

2.2 Digital Wellbeing

A specific form of wellbeing is the *digital wellbeing* which is related to the use of automation devices and IT tools and reflects their impact on human's professional and private life. The term was coined by Google's people and its launching is associated with Tristan Harris' presentation entitled "Call to Minimize Distraction & Respect Users' Attention" in 2012 (Pardes, 2018). A list of 29 definitions of the term can be found in (Marsden, 2020). In the paper, one may use two perspectives to look at digital wellbeing:

- Feeling comfortable and saving human's resources such as time, personal physical condition and/or intellectual resources when using the current I&CT (*Information and Communication Technology*) – the passive view;

- Choosing/developing and using I&CT tools with a view to make the human to feel comfortable and to get at a better quality of life- the proactive view.

Dertouzos (1997), Ciurea & Filip (2019), and Fitzgibbons (2020) identify several objectives to be achieved in order to make somebody feeling comfortable when using I&CT:

- Limiting screen time to a certain number of minutes or hours over a certain time period, say or week, and reducing eye strain;

- Making the user aware of possible mental health impacts caused by the I&CT and avoiding any possible addiction;

- Supporting healthy sleep patterns;

- Supporting *electronic proximity* to enable easy access to cultural goods (as virtual exhibitions, tours, and events), and various services (for example, health care).

Plenty of technical means have been designed and are available on the market to enable attaining the above objectives. A few examples of applications for mobile phones, the most largely used I&CT devices (TNW, 2018; Tillman, 2018; Dempsey, 2019), are:

- *Usage dashboards* to track how many hours a user spends on different applications or websites and a*pp timers* designed to limit how many minutes or hours a user can spend on certain websites or applications per day or to restrict access after a certain time of day;

- *Website blockers* that enable users to block certain websites, to decrease distraction. Examples: *Stay Focused, Limit, WasteNoTime* and so on;

- *Google Shush* and *Wind Down* on Android OS to keep the phone switched off when it must be off;

- *Face Time* on Apple's IOS.

Roffarello & De Russis (2019) analyse the impact of 48 applications on the users of smartphones and empirically find out that no addiction or serious change in the users' manner to use the devices can be noticed even though the applications are viewed as useful.

3. Evolutions

3.1 Various Views on Automation and Computers Some Decades Ago

In early 50's, when automation started to take ground, ever more functions previously carried out by humans were taken over by electrical, hydraulic or even mechanical devices. The process was based on the better performance of the automation devices when compared with humans in carrying-out functions during activities such as sensing, making decisions, and issuing control signals. Fitts (1951) proposed his famous MABA_MABA (*Men Are Better At-Machines Are Better At*) list that served for the design decisions concerning division of work between humans and automation devices, called "machines". In a quite optimistic manner, Fitts envisaged that there is still place for further advances in technology and ever more performant machines could be built, but, nevertheless, caution is recommended and the presence of the human in the loop is quite often necessary:

"The listing of those respects in which human capabilities [still] surpass those of machines must, of course, be hedged with the statement that we cannot foresee what machines can be built to do in the future. […] We suggest that great caution be exercised in assuming that men can successfully monitor complex automatic machines and 'take over' if the machine breaks down"

It is also worth noticing that, in spite of the ever more numerous successful applications of automation, some doubts were expressed about the opportunity and technical feasibility of full automation (Bainbridge, 1983).

Over the years, a special 'machine', namely the computer, has become an ever more important constituent of automation schemes. Some 25 years ago, Umberto Eco (1986), a well-known semiotician and writer, expressed his view about the computer in a book preface:

"The computer is not an intelligent machine that helps the stupid people, but is a stupid tool that functions only in the hands of intelligent people"

A similar opinion was articulated, even several years earlier, by Peter Drucker (1967), a guru in

management literature, who viewed the computer as "the dumbest tool we have ever had that makes no decisions; it only carries out orders" and, in the same time, compels and stimulates its 'master', the user, be brighter and act in a smart way. However, Drucker also foresaw the 'Information Age' and made assumptions about the future, when the information would become very cheap and abundant, and the 'kindergarten stage' of the computer usage would be over. In those early days of the computer usage, there were other optimistic and influential voices from the computer scientists' side. For example, when Douglas Engelbert (1962) proposed a conceptual framework of SRI (*Stanford Research Institute*), he thought that the computer could be a good supporting tool in solving hard problems by augmenting human intellect, and stimulating one to adopt new styles of work:

"…By 'augmenting human intellect' we mean increasing the capability of a man to approach a complex problem situation, to gain comprehension to suit his particular needs, and to derive solutions to problems […] We see the quickest gains emerging from (1) giving the human the minute-by-minute service from a digital computer […] and (2) developing new methods of thinking and working that allow the human to capitalize the computer's help."

3.2 The Present Situation

Over the years, the industrial and nonindustrial plants to be controlled have become more and more complex with respect to technologies used, the pace of change has been accelerated, and the crises one has to face, including the current pandemic, have become ever more frequent and unexpected (Filip, 2020). The calm, clear blue waters of the good old times are over. Moreover, nowadays, the automation is present in almost all sectors of the economy, society, and human life. Andrew Ng (2016), a well-known Sino-British scientist, stated that the technology enables many various activities which have been traditionally carried-out by humans, such as examining a security video record with a view to detecting a suspicious behaviour, or finding and eliminating abusive online posts, to be "ripe enough" for being automated. In particular, Ng (2017) was fascinated by the role of AI (*Artificial Intelligence*) and compares it with the transformations enabled, a century ago, by electricity in many sectors such as manufacturing, transportation, healthcare, and even entertainment and, consequently, contributing to improving the quality of life.

In the specific context of manufacturing, Romero et al. (2016) describe the evolution of human-machine interaction over the last three centuries. The authors start with the definition of *Operator 1.0*, who performed manual and dexterous works in Mathew Bolton's Soho Manufacture, viewed as one of the first modern factory in the mid-1700. Then the authors continue by describing the classes of *Operators 2.0,* and *Operators 3.0,* that are characterized by the usage of numerical control machines and enterprise information system assisted operations, and co-operation with robots, respectively. The authors eventually describe the class of *Operators 4.0* who carry-out their tasks in a more comfortable way and demand less physical energy consumption in the context of H-CPS (*Human - Cyber Physical System*s). In the same line of thought, Kassner (2017) defines the *social factory* that should be able, among other, to support humans under any working conditions, engage and stimulate them to contribute to new knowledge creation, treat all its constituent entities, such as humans, machines and software as equal partners. Consequently, a new revised edition of MABA-MABA list was proposed (Flores et al., 2020).

The presence of automation and computerized devices is ever more noticeable in the private life of people. The anticipatory of views Dertouzos (1997) have been already overcome by the current developments. For example, the *personal assistant* applications, nowadays available on current mobile devices, such as *Oracle's SIRI, Microsoft's Cortana, Amazon's Alexa, Google's Assistant* and so on*,* are designed to capture user's characteristic attributes and intentions and consequently help him/her to be more effective in attaining the aimed objectives and to consume less time resources to carry-out the assigned tasks. We can easily add many applications that are already in common usage to make the life more comfortable. *Google Maps* and *Google Translator* that help one to find

Table 1. MABA-MABA List revised (Flores et al., 2020)

"Humans are better at:	Machines are better at:
• Performing flexible and improvised procedures; • Understanding the situation and exercising judgement; • Creating solutions (tools and services); • Perceiving patterns, planning, looking at a bigger picture; • Exercising and applying common sense/intelligence; • Experiencing fulfilment.	• Performing faster, stronger and precisely; • Storing large amounts of information; • Sensing and perceiving environmental conditions; • Analytical thinking and predictions; • Generating data basis of knowledge."

his/her way easier and understand texts written in foreign languages, respectively, are only two examples of wide usage.

As for the future, the prospects about the impact of automation and computers on people's professional and private life, were ever daring. For example, Lenat (2016) predicted evolutions that could bring into life several phenomena as: a) *weak telepathy* (when the algorithms understand what and why one has intended to do and acts to attain the pursued objectives) , b*) weak cloning* (the person's attributes are duplicated so that he/she will seem to be ubiquitous, and act in an apparently 'multitasking manner'), and even c) *weak immortality* (which means that the artefact is able to continue to interact with family members, colleagues, and friends and complete the undertaken or assigned tasks of late user).

Various types of digital clones such as *AV clones, mind clones, consumer clones*, or *human thought clones* have been already developed and reported (Truby & Brown, 2021). The above-mentioned authors notice, however, that there are still several legal and ethical aspects to be cleared. It is not yet obvious what the overall impact of such advanced issues on people will be. However, it is apparent that the life will be more comfortable and the consumption of resources such as time and intellectual energy will be lower.

From the above developments, it is rather obvious that automation and information technology contribute to digital wellbeing by improving the ratio between the human's pool of individual resources (especially time and physical and intellectual efforts to be spent) and the tasks and challenges one faces. It goes without words that one of the most significant contributions of automation and computers to wellbeing can be noticed in the field of healthcare (Băjenaru et al., 2020; Ianculescu & Alexandru, 2020; Belciug & Gorunescu, 2020), including physical rehabilitation (Precup et al., 2020). In the specific context of the current pandemic, the AI technology have been intensively used in Covid 19 prevention and control in areas such as: virus protein molecular research, medical diagnosis and treatment, infectious disease propagation prediction and early warning, social public opinion analysis and rumor recognition (Pan, 2021). At the same time, the cited author noticed that there are several legal and ethical problems in the application of AI in pandemic prevention and control: personal privacy and data protection, intellectual property rights, and network security risks. At the same time, as in several other domains, caution is recommended in order to avoid the possible fallacies of inappropriate and overconfident usage of information technology in healthcare (Karsh et al., 2010).

The discussion about the contribution of automation and information technology has been held so far in the paper in general terms. Two questions may need answers:

1. Will the information technology be used to replace human or they will become a partner in a 'team'?

2. Who will be the master and who will be the slave in the team?

In the next section several possible answers will be provided.

4. Towards Cognitive Teams

4.1 Digital Cognitive Systems

While the early advanced usages of information technology aimed at augmenting human intellect, the more recent ones have envisaged developing new forms of hybrid augmented intelligence, consisting in intense human-machine collaboration and fusion. The idea was articulated many years ago by Licklider (1960). He forecast a 'man-computer symbiosis' as a cooperative interaction between men and his/her partner, the computer. This partnership was expected to enable both parties to cooperate in making-decisions and controlling complex situations in a flexible manner, without any dependence on previously established program.

Some twenty years later, Hollnagel & Woods (1983) defined the *cognitive system* through a set of characteristic features: a) a goal orientation behaviour, b) adaptivity and ability to view situations or problems from several perspectives, and c) deciding the planning or/and replanning the actions by using the knowledge about the environment or its own state. Perhaps, one of the most appropriate definitions of the [computer-based] cognitive systems was articulated by Kelly (2015):

- "Cognitive computing refers to systems that a) learn at scale, b) reason with purpose, and c) interact with humans naturally;

- Rather than being explicitly programmed, they learn and reason from their interactions with us and from their experiences with their environment;

- They are made possible by advances in a number of scientific fields over the past half-century and are different in important ways from the information systems that preceded them. Those systems have been deterministic; cognitive systems are probabilistic. They generate not just answers to numerical problems, but hypotheses, reasoned arguments and recommendations about more complex – and meaningful – bodies of data;

- They can make sense of the 80 percent of the world's data that computer scientists call "unstructured." This enables them to keep pace with the volume, complexity and unpredictability of information and systems in the modern world."

IBM Watson, which is viewed as "a first step into cognitive systems, a new era of computing" (Peralta Pinedo, 2012), was introduced and demonstrated in February 2011. The above-mentioned author notices that the system is a combination of several existing information technologies such as: a) NLP (*Natural Language Processing*), b) advanced analytics used for hypothesis generation and evaluation, and c) dynamic learning techniques that define the new type of digital tool and make it effective. There are several possible domains of the deployment of digital cognitive systems (Noor, 2015). The high deployment potential of the new class of systems has been quickly perceived by industry circles and consultancy companies (Kelly, 2015; Schatsky et al., 2015). Among many existing and envisaged systems, the interest for the paper are cognitive *digital assistants*, called *cogs* by Noor. They are designed to interact with various entities such as people, other cogs and services, that exist in *cognitive environments.* One can notice several successful companies that are already providing software products which deploy cognitive computing such as: *Vantage Point AI* (for investment domain), *Welltok* (in healthcare), S*park Cognition* (to support optimizing operations, avoiding disasters and mitigating losses) (Hager, 2021).

4.2 Cognitive Teams

Artificial Intelligence has had a decisive contribution in the advancement of modern automation and in creating cognitive systems. However, in order to ensure a 'safety net' in case of possible rare events or automation device failures, several functions will be still kept, at least for the near future, to be carried out by the humans. (Rouse & Spohrer, 2018) enumerate several reasons. The computers "cannot take responsibility for things they were not designed for. In addition, they do not have consciousness, and are not capable of reflection and cannot have feelings". Consequently, several new concepts and practical solutions have been proposed. One is *human centred AI* which is proposed by

Shneiderman (2020). Practical schemes that combine AI and human agents have been also devised. A new collaboration technology and software product named *Swarm*® inspired from biology and meant to overcome the limitations of AI when facing the *known unknowns* was proposed by Rosenberg (2015). A related concept meant to ensure a balanced and synergic evolution of human and digital intelligence is IA (*Intelligence Augmentation*) (Zhou et al., 2021). The authors emphasise the difference between the [human] IA and AI even though the technologies utilised overlap:

"IA and AI have fundamentally different goals and foci. IA focuses on making people smarter, whereas AI focuses on making machines smarter. Unlike the traditional view that sees AI as autonomous systems that can fully automate tasks, workflows, and/or business processes and operate without human involvement, IA focuses on AI systems that work with humans to outperform either one alone"

Rouse & Spohrer (2018) recommended adopting a new perspective to the *automation-augmentation* continuum and creating the best *cognitive team* or *cognitive organization* to address the current situations and associated problems. The computer-based party of the team, which is denoted in the sequel *digital cognitive system* to differentiate it from the human party is expected to continuously evolve with a view to diminish the effort of the human and improve his/her resilience when he/she faces unexpected events and has to mitigate the losses or recover from unpleasant situations. Siddike and Spohrer (2018) identify several evolution phases or roles a digital cognitive system can play such as; a) *tool* (meant to provide the human with plenty of necessary data and information), b) *assistant* (designed to provide the requested knowledge), c) *collaborator* (that can understand a person's situation and help him/her to make decisions), d) *coach* (meant to provide the human part of the team with the wisdom necessary to recover), and e) *trusted cognitive mediator* (designed to enable smooth interactions and facilitate value co-creation). Also, a *boss* role cannot be overlooked (Fischhaber & Klassen, 2015; Helbing, 2019).

The digital cognitive system can be viewed as a *digital clone* of a human assistant, collaborator, or mediator that provides his/her services to the human part of the team in a *cognition as a service* (CaaS) scheme. As mentioned in a previous section, the *digital clones* of humans deployed in various domains have already been the subject of more than one reported result. An interesting example is presented by Terziyan et al. (2018) who propose *Pi-Mind* technology that is meant to capture, clone, and patent the characteristic features of a particular human expert in order to make a decision-making model which can be automatically and effectively used in several different places.

It is worth mentioning a precursor of such digital clones used to work in tandem with human decision-maker. DMKDM (the *Declarative Model of a Knowledgeable [and ambitious] Decision-maker)* (Filip, 1992) was proposed in the context of developing and deploying *DISPATCHER*®, a family of DSS (*Decision Support Systems*), designed to be used in the process industry and related domains (Filip, 2008). DMKDM was meant to stimulate user's creativity and quest for new skills. Its mission was supporting model building and experimenting, and solution evaluation for both normal and crisis /not previously met situations. The list of its functions included:

- Problem feasibility testing and proposing possible corrective actions;
- Automatically building the internal model (represented in computer terms) of the controlled object from the external one (expressed in user's terms) and choosing the appropriate model solver (optimizer);
- Experimenting the model by recursively creating a series of alternatives (by modifying model parameters) following the user's qualitative assessment of the simulated solutions provided by the DSS (Filip, 2002).

Nowadays, one can notice that *human enhancing/augmentation* beyond the biological capabilities intended to increase resilience and other capabilities of people is a domain where advanced automation solutions are getting traction (Gaebelein & Amison, 2021).

5. Open Problems and Recent Approaches

5.1 Several Cautious Views

In spite of all developments designed to improve the quality of human's professional and private life and increase his ability to face adverse and unpredictable situations, the tight connection with computers is a subject of numerous debates, in particular referring to the uncontrolled evolution and/or possibly malicious usage of Artificial Intelligence. Several well-known examples are provided by Helbing (2019) and Girasa (2020) who quote the cautious views of several influential scholars and industry leaders such as Stephen Hawking, Elon Musk, Bill Gates, and Steve Wozniak. All of them viewed the possible uncontrolled developments in AI as an existential threat for human being because of the clear huge difference between the learning capacities of people and those of digital artifacts. In order to set the stage for the next section, a statement that Elon Musk made during his comments on AI delivered to MIT students at *Aero Astro Centennial Symposium* is quoted bellow:

"I am increasingly inclined to think that there should be some regulatory oversight, maybe at the national and international level, just to make sure that we don't do something very foolish" (Gibbs, 2014).

Needless to say that, over the years, there have been many voices that accused computers of affecting the quality of life by deteriorating humans' mental health condition and evolution (Spitzer, 2015), stimulating undesirable phenomena in the social life (Keen, 2012), or surveillance of the people (Power, 2016).

5.2 Trustworthy Computing

In order to overcome the possible adverse evolutions in developments and malicious use of AI, in 2020, a white paper of the European Union proposed the "key elements of a future regulatory framework for AI in Europe that will create a unique *ecosystem of trust*" (EC, 2020).

Idea of trustworthiness is not quite new and has been around for a few decades in the world of information technology. For example, Gates (2002) defined the *four pillars of trustworthiness*: a) security, b) privacy, c) reliability, and d) business integrity. The US National Research Council examined in detail the topics of *Trust in Cyberspace* (Schneider, 1999). The properties of *Trustworthy computing* are enumerated by Wing (2020):

- *"Reliability*: Does the system do the right thing?
- *Safety*: Does the system do no harm?
- *Security*: How vulnerable is the system to attacks?
- *Privacy*: Does the system protect a person's identity and data?
- *Availability*: Is the system up when I need to access it?
- *Usability*: Can a human use it easily?"

The same author enumerated the characteristic features of *Trustworthy AI:*

- "*Accuracy*: How well does the AI system do on new data compared to data on which it was trained and tested?
- *Robustness*: How sensitive is the system's outcome to a change in the input?
- *Fairness*: Are the system outcomes unbiased?
- *Accountability*: Who or what is responsible for the system's outcome?
- *Transparency*: Is it clear to an external observer how the system's outcome was produced?
- *Interpretability/Explainability*: Can the system's outcome be justified with an explanation that a human can understand and/or that is meaningful to the end user?
- *Ethical*: Was the data collected in an ethical manner? Will the system's outcome be used in an ethical manner?

Similar views have been proposed by the governments, NGOs, and business sector. For *example*, Deloitte defined six *key dimensions* of a *Trustworthy AI framework* such as: a) fair/impartial, b) robust/reliable, c) privacy, d) safe/security, e) responsible/accountable,

f) transparent (Saif & Ammanath, 2020). *LF AI* & Data Foundation proposed similar principles (Cardoso, 2021). A view that also explicitly considers people's wellbeing was presented in the report meant to define the *Ethics Guidelines for Trustworthy Artificial Intelligence of the High-Level Expert Group of European Union on AI* (AI HLEG, 2019). "AI should be: a) *lawful* - respecting all applicable laws and regulations, b) *ethical* - respecting ethical principles and values, and c) *robust* - both from a technical perspective while taking into account its social environment". According to the report, there are seven key requirements for a Trustworthy AI: a) human agency and oversight, b) technical robustness and safety, c) privacy and data governance, d) transparency, e) diversity, non-discrimination and fairness, f) societal and environmental well-being, and g) accountability. From the expert group perspective, the human agency and oversight mean that "AI systems should empower human beings, allowing them to make informed decisions and fostering their fundamental rights. At the same time, proper oversight mechanisms need to be ensured, which can be achieved through human-in-the-loop, human-on-the-loop, and human-in-command approaches." (AI HLEG, 2019).

5.3 Digital Humanism and Dataism

Some 30 years ago, Engelbart & Lehtman (1988), who were preoccupied by the evolution of the people in contact with the new digital technologies, clearly stated that the optimal design of new computer supported collaborative work is dependent on the match between the technical and human sides. The cited authors noticed that, in their time:

"The society encourage and rewards progress in technological and material sense and often ignores the human and social implications of that progress in contact with digital technology."

Consequently, they highlighted the co-evolution of both sides as a necessary condition for the success of the designed system. More than 15 year later, Norman (2014) had a similar perception of the technology driven evolution in a society that:

"has unwittingly fallen into a machine-centered orientation to life, one that emphasizes the needs of technology over those of people, thereby forcing people into a supporting role, one for which we are most unsuited."

Nowadays, the digital devices are almost in very domain of the economy and society and continue to spread as wildfires. New concepts related to human wellbeing have been the subject of study and preoccupation for both the business leaders and academia circles. In the sequel, two of the apparently opposed concepts, namely Digital humanism and Dataism, will be addressed.

Digital humanism is a concept coined by Gartner's people. In the famous manifesto-type report entitled *Digital Humanism Makes People Better, Not Technology Better,* released on April 15, 2015, it was stated that "Digital humanism is the recognition that digital business revolves around people, not technology" (Meehan & Prentice, 2015). The Gartner manifesto was mainly meant for CEOs and business leaders and the emphasis was on making products and services around humans needs in a more effective way. Apparently, it did not have too much in common with the meaning of traditional concept of humanism.

A rather different view of digital humanism was proposed by Nida Rumälin & Weidenfeld (2018) who think that the emphasis should be put on using digital technologies to improve people's quality of life and preserve ecosystems with a view to saving the interests of future generations. Apparently inspired by Nida Rumälin's perspective, a manifesto for digital humanism was launched in 2019 at TU Vienna and it was meant for a large class of actants, members of the nowadays society (TU Wien, 2019):

"We must shape technologies in accordance with human values and needs, instead of allowing technologies to shape humans. [...]. We call for a Digital Humanism that describes, analyses, and, most importantly, influences the complex interplay of technology and humankind, for a better society and life, fully respecting universal human right."

The concept of *Dataism* (or *Data-ism*) was coined by Brooks (2013) who viewed it as a term to name "the raising philosophy of the day". It means in substance the unconditional and strong belief that the data can decide, instead of humans,

Table 2. Number of scientific documents containing *Digital humanism* and *Dataism*

Year→ ↓Concept	2021	2020	2019	2018	2015	2010	2005	2000	2000-2021
Digital humanism	93	90	62	68	26	14	4	1	569
Dataism	413	583	421	376	50	1	1	3	2250

what is good for people's wellness. According to Harari (2016), a well-known advocate of the concept, the Dataism:

"has the potential to replace humanism and its worship of the individual with the 'information flow' as the ultimate goal to which all other activities, efforts and desires will become subservient".

Consequently. the human being's role becomes feeding the algorithms with data based on his/her experiences. There are opinions that Dataism might be a successful narrative in several countries (Larsen, 2021).

Digital humanism and Dataism have become a subject of study of various circles in the society. For example, Table 2 contains the results of a *Google Scholar* search made on November 1st, 2021 for the scientific documents containing references made to the concepts. One can notice that the interest in both concepts has been increasing over the interval of recent years.

6. Instead of Conclusions

From the facts presented above, one can think that automation and computers are beneficial for people wellbeing, especially with reference to improving the rate between the ever-increasing complexity of the present-day tasks and the ever more reduced consumption of human's resources. At the same time, the resilience of people to face adverse situations and recover from losses with the support of information systems, with particular emphasis on DSS, is ever more improved.

There is no doubt that the technology will continue to evolve. It will impact on human's quality of life and resilience. However, could anyone predict how the future human life and the society will look like and which model is the most likely? Will the people be only the data feeders, as described by Harari in his history of the future? Will the wellbeing be accompanied by the excessive human augmentation to increase his/her capabilities and resilience? One can add the two opposite scenarios inspired from Presley Noble (1997) review of Dertouzos' (1997) book. In the first one, the human nature and behavior will not significantly change even though the life will become very comfortable as one can notice in *The Jetsons*, the cartoon series of W. Hanna and J. Barbera. The second scenario could show an evolution towards the super intelligent creatures but defenseless when confronted with bacteria, like the Martians of *The War of The Worlds* of H. G. Wells.

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