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AI in sustainable Development

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Abstract : **Understanding the role of Artificial Intelligence (AI) is crucial to contribute to sustainable development including the most fundamental challenges of our society, such as climate change, healthy lives, and inclusive economic growth. As Information Systems (IS) research has a great tradition of investigating how technology and methods can be employed to foster sustainability, this study follows widely accepted expectations that AI will boost this. Against this backdrop, the present study aims at revealing how and what purposes IS researchers use AI for sustainability. on the other hand, it provides many challenges to comprehend. Therefore, our study's main objective was to examine the behavioral, cultural, ethical, social, and economic challenges of AI-enabled products and services in consumer markets and discuss how businesses might shape their approaches to address AI-related ethical issues**

IndexTerms **–crucial, sustainable development, Information system, foster.**

I. INTRODUCTION

One technological development that holds great promise for fostering sustainability is artificial intelligence (AI). AI will be a game-changer and 'mega-trend' that will shape numerous sectors and business practices which is why it has recently attracted interest from academia and practice alike .In broad terms, AI helps to face complex situations by integrating (computational) resources and facilitating or imitating human-like tasks, such as decision making, prediction of events, pattern recognition, and logical reasoning With these abilities, AI can also contribute to complex, dynamic, and interconnected problems concerning sustainability Following this, research has started on the path of employing AI for sustainability and has focused on advancements in diverse fields, including natural language processing (NLP) for investigating the public opinion on biodiversity based on social media, deep learning (DL) for monitoring conditions of forests based on satellite imagery machine learning (ML) for supporting cancer diagnostics based on large amounts of sensor data and AI -driven businesses for responsible consumption. AI, here in the great framework of Sustainable Development.

II. RESEARCH BACKGROUND

The computer science subfield of AI originated in the 1950s (McCarthy et al. 2006). In this decade, Samuel(1959, p. 535) already postulated that "a computer can be programmed so that it will learn to play a better game of checkers than can be played by the person who wrote the program." Now, although the technologyand idea of AI per se have been around for more than half a century, new advances and the availability of digital technologies have spurred its drastic evolution (Duanetal.2019).Today, several consumer products and services use AI in digital assistants through voice recognition, such as Alexa or Siri, or image recognition in smartphones (Brynjolfs son and Mcafee 2017; Taddeo and Floridi 2018). Because of its extensive capabilities, AI is predicted to have a major impact on almost all aspects of life, including business(Forbes.com n.d.) and research (Loebbecke et al. 2020). The phrase "artificial intelligence" comprises two terms. "Artificial" refers to all that is not of natural origins, made artificially by a human author, for a human purpose, and with a specific function (Baker 2008). "Intelligence" represents cognitive action, usually attributed to living organisms and meaning the capability to think (Simon 1995). As a composition, in broad terms, AI mirrors human cognitive functions, like reasoning, learning, and decision-making for computers (Rai et al. 2019). It can solve ill-structured problems by mimicking human behavior (Janiesch et al. 2021)and supporting complex tasks through self-learning and self-improvement (Brynjolfsson and Mcafee 2017).The dominant approach to implement AI-based systems is ML (Wanner et al. 2020), which implements capabilities to iteratively learn from data to solve tasks automatically (Tredinnick 2017). In doing this, ML—as a subfield of AI—supports to perform cognitive tasks, including decision making, object detection, or natural language translation. Depending on the particular task to be performed, ML can be employed in the form of regression models, support vector machines, decision trees, or k-nearest neighbor (Janiesch et al.2021). Typically, ML algorithms are divided into three main categories: In supervised learning, based on given input data and target values, algorithms search for the best function that maps the inputs and out puts to make predictions about them. This requires a training dataset, such as specified and pre-structured by humans. Unsupervised learning identifies structural information of interest, such as groupings and representations within datasets, without pre-structured inputs with labels or specifications. In reinforcement learning, given on the specification of a state of a system, allowable actions, and environmental boundaries, algorithms seek to find the best path to achieve a goal by itself. Following trial and error principles, the maximum of rewards is searched (Janiesch et al. 2021; Mirbabaie et al. 2021).If there is a demand to process large

datasets, such as with images, video, speech, or audio, the ML-sub field of DL is especially useful(Heinrich et al. 2020). DL can rely on supervised and unsupervised learning and thereby automates human activities like learning features from raw data. To do so, DL typically requires more data than traditional ML (IBM 2020). In general, DL draws on functions that seek to be closer to human brains and applies algorithms, including convolutional neural networks or recurrent neural networks (LeCun et al. 2015; Janiesch et al. 2021). Through the advanced ML capabilities provided by DL, other streams of systems are enabled and supported, such as computer vision (CV) which is "concerned with the acquisition, processing, analysis, and understanding of digital images to generate symbolic or numerical information" (Sager et al. 2021, p. 2) as well as NLP to automatically parsing of natural language chunks to, for instance, implement speech recognition (Young et al. 2018).

Although there are several definitions and views on AI, as well as different types of techno logical operation allegations, according to Vinuesa et al. (2020), the following capabilities are typically addressed(we use this distinction to code the articles, see Research Design): perception (e.g., of inputs like audio, video), decision making (e.g., medical diagnosis systems), prediction (e.g., climate change scenarios),knowledge extraction (e.g., health anomalies), pattern recognition (e.g., energy consumption, fake news),interactive communication (e.g., energy chatbots), and logical reasoning. As indicated by the examples, the AI capabilities open opportunities to face complex problems such as those faced in sustainability.

III. Behavioral, Cultural, and Psychological Issues

The evolution of technology provides many benefits in terms of work. Still, it raises incredible expectations and social challenges related to AI technologies, complicated by inconsiderable information about the value and benefits of implementing AI technologies Researchers have challenged the social implications of AI, particularly the potential job losses due to the emergence of AI machines. This topic has gotten much intentness from the media and other forums. The human workforce is changing and devloping as a result of AI. With humans losing occupations to machines, the true problem is identifying new obligation requiring specialized human skills. This adds to society's pressures, alters human behavior, and fource people mentally, forcing them to work even harder to survive .According to PwC, more than seven million current jobs will be replaced by machines in the only UK from 2017 to 2037. Benedikt and Osborne also examined 700 jobs facing the possibility of replacement and found that 47 percent of jobs are at danger of being entirely replaced by machines and algorithms. This workforce exchange will hurt individuals' social standing through unemployment This distressing situation would change people's way of living and could be very demanding .AI is becoming so accomplished in certain jobs that it may have a sage impact on society. Risse argued that AI could disturb working patterns, having an impact on the status of individuals as members of society Humans, on the other hand, are con-centrating on utilizing human attributes to advance in problem-solving and to bring in a new cycle of technology with a combined AI and human-centric workforce The current advancements of AI aim to help society by heartning advanced research in various domains, ranging from money and law to scientific concerns, such as security,confirmation, control, and validation. However, it might create trouble for users or even much of society if advice mazy in a major system gets hacked or crashes. As AI becomes more involved in our automobiles, planes, and trading, there will be serious proceddings .Managing lethal autonomous arms, for that matter, is a significant vexation regarding AI technology. I is evolving fast, and systems such as super-intelligence may glitter a wave of intellectual discovery that may leave human brains in the dust On the other hand, super-intelligence systems and such innovative technologies might help the world with diseases, scarcity, and warfare, so the advancements of strong AI might be the most notable in history. Aside from that, the main thing to mention about AI is that it is a system and does not have any human-like feelings, so there is no reason to consider that any AI might become malicious or benevolent in the future AI decisions are absolutely dependent upon programming and without access to feelings and emotions, but that is not a good thing: these decisions might have unexpected consequences for the humans involved Bill Gates, Stephen Hawking, Steve Wozniak, and other public figures in science and technology have started to stress the risks associated with AI development and are joined by many AI analysts. They feel that since AI technology is improving than any human, we have no idea how it will act in the future. There is a probability that humans will be constrained by their own made super-intelligence systems Sustainability 2022, 14, 3568 5 of 20 Data power AI algorithms, and as more data about each individual's demographics are collected, our privacy is jeopardized. Interactions with technology are a convincing problem for society, as they have already altered life. Using AI for everyday tasks, such as searching for information, navigation systems, and purchasing goods and services online with the help of virtual assistants, such as Siri or Alexa, has also become common .These positives might help drive acceptance of AI systems, but these changes could also lead to bias between humans and robots, and it may become impossible to differentiate between them. These communication systems (i.e., Siri and Alexa) might also source harm, as suggested by Nomura et al, who argue that such technologies tend to be highly polarized and can cause stress and anxiety, ensuring in avoidance behaviors towards machines. Negative attitudes and emotions emerge because some individuals might struggle to accept novelty in technology. Moreover, people wasting more time using these technologies tend to be more warmhearted. Some researchers consider the advantages of AI technologies but also course grained their concerns, since AI, intentionally or not, could cause heavy destruction if not man-aged and appropriately checked. Researchers disagree that existing research and development in AI would help improve understanding and preparation for potential adverse effects, thereby enhancing the positives of AI technologies while evading risks.

IV.AI for sustainability

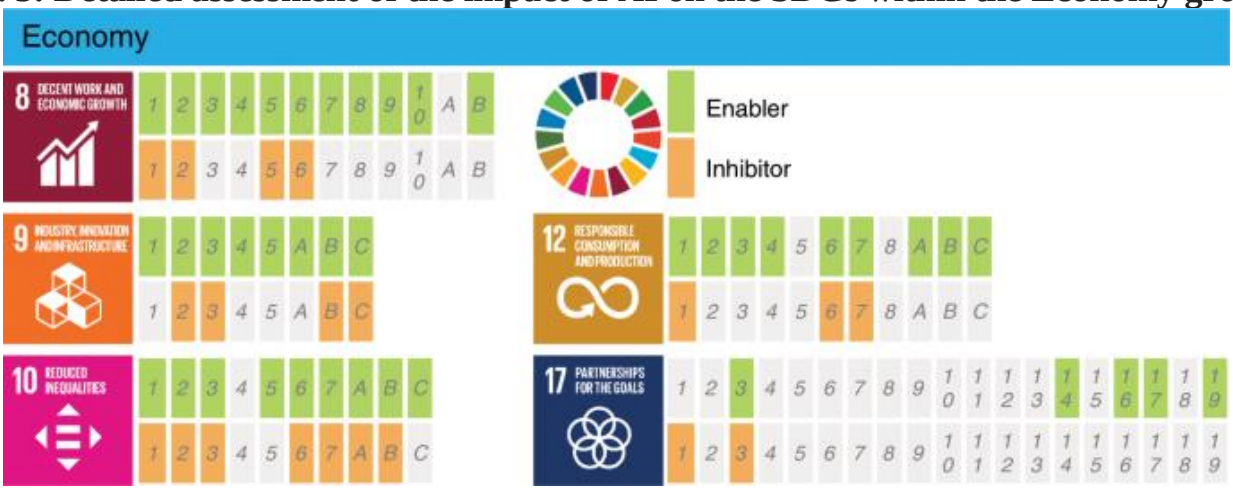
In view of the interconnectivity inherent in the different SDGs, as well as the spectra of Sustainable Development and its actors, it would not be wise to strictly separate this third part, which then preferably presents a general overview of the use of AI today by Sustainable Development actors, as well as more specific views on specific cases through the study of interviews with AI application experts conducted for the research of this work In this brief, we seek to explore how AI, in the hands of the different actors involved or able to get involved, knows, and can, advance progress towards the different SDGs, and ultimately Sustainable Development. The proposed hypothesis is that, by becoming aware of the potential precariousness of the resources, room for maneuver and other properties intrinsic to the nature of the actor, the business and industry sector, non-governmental organizations, the scientific and technological community, and local authorities, i.e. the State, are the actors best placed not only to impact generally on the progress towards the SDGs, but also to be the channels through which AI can most ideally, until then, impact beneficially on Sustainable Development and reach the SDGs. This would in particular be due, for my part, to the pyramidal effect then created, where these

actors with more favorable predispositions and greater opportunities and means of action than other actors, can impact, or equip, in a top-down dynamic the other strata and actors of society in a beneficial effort thanks to AI, here in the great framework of Sustainable Development.

V. AI AND ECONOMIC OUTCOMES

The technological advantages provided by AI may also have a positive impact on the accomplishment of a number of SDGs within the Economy group. We have articulate benefits from AI on 42 targets (70%) from these SDGs, whereas negative impacts are noted in 20 targets (33%), as shown in Fig. 1. Although Acemoglu and Restrepo1 report a net positive impact of AI-enabled technologies similar to elevated productivity, the literature also follow potential negative impacts mainly related to increased inequalities26,27,28,29. In the context of the Economy group of SDGs, if future markets expect heavily on data analysis and these resources are not equally available in low- and middle- income countries, the economical gap may be approximately increased due to the newly introduced inequalities 30,31 significantly impacting SDGs 8 (decent work and economic growth), 9 (industry, innovation and infrastructure), and 10 (reduced inequalities). Brynjol fsson and McAfee31 argue that AI can exacerbate dissimilarity also within nations. By substitution of old jobs with ones requiring more skills, technology disproportionately rewards the educated: since the mid 1970s, the salaries in the United States (US) salaries rose about 25% for those with graduate degrees, although the average high-school dropout took a 30% pay cut. furthermore, automation shifts associate income to those who own companies from those who work there. Such transfer of revenue from workers to investors helps justify why, even though the combined revenues of Detroit's "Big 3" (GM, Ford, and Chrysler) in 1990 were almost exact to those of Silicon Valley's "Big 3" (Google, Apple, and Facebook) in 2014, the latter had 9 times limited employees and were worth 30 times more on the stock market32. Figure 3 shows an assessment of the documented positive and negative effects on the various destination within the SDGs in the Economy group. Documented evidence of positive or negative impact of AI on the fullfillment of all of the mark from SDGs 8, 9, 10, 12, and 17 (https://www.un.org/sustainabledevelopment/). The study of the blocks and colors is as in Fig. 2. (The content of of this figure has not been reviewed by the United Nations and does not reflect its views).Even if the identified linkages in the Economy group are mainly positive, trade-offs cannot be neglected. For example, AI can have a negative effect on social media usage, by exhibit users content specifically suited to their preconceived ideas. This may lead to political polarization33 and affect social cohesion21 with consequences in the context of SDG 10 on reduced inequalities. On the other hand, AI can help identify sources of inequality and collision 34,35, and there with potentially reduce inequalities, for instance, by using simulations to appraise how virtual societies may respond to changes. However, there is an critical risk when using AI to evaluate and predict human behavior, which is the built in bias in the data. It has been reported that a number of inequitable challenges are faced in the automated targeting of online job advertising using AI35, actually related to the previous biases in selection processes conducted by human recruiters. The work by Dalenberg highlights the need of modifying the data build up process and explicitly adapting the AI-based algorithms used for selection processes to avoid such biases.

Fig. 3: Detailed assessment of the impact of AI on the SDGs within the Economy group.



VI. Core elements of sustainable development:

The three basis elements of sustainable development arein short discussed below:

Environmental Conservation: The primary target of sustainable development is to protect the environment so that the resources determined by it do not get destroyed.

Social Development: It intent to attain the well-being of an individual and society at large. It involve the availability of necessary resources, proper healthcare, and good aspect of life for people.

Economic Progress: It boost people to invest in sustainable efforts by alluring them through its long-term benefits and supporting both the environmental and social elements of the source

VII.FROM SUSTAINABILITY TO SUSTAINABLE DEVELOPMENT

In biological systems sustainability means long life. Systems components clout each other and the balance of the whole system is the condition to survive. Human activities have affected the balance of natural ecosystems Sustainable development is a principle that many people claim to have invented. The definition of the European Union is following: "Sustainable Development stands for meeting the needs of present generations without jeopardizing the ability of futures generations to meet their own needs – in other words, a

improved quality of life for everyone, now and for generations to come. It offers a vision of advance that incorporate immediate and longer-term objectives, local and global action, and regards social, economic and environmental issues as inseparable and interconnected components of human progress." "Sustainable development will not be brought about by policies only: it must be taken up by society at large as a principle guiding the many choices each citizen makes every day, together with the big political and economic decisions that have to be taken. This requires profound changes in thinking, in economic and social structures and in consumption and production patterns" Sustainable development can be seen as a process for meeting human development goals while maintaining the ability of natural systems to provide the required natural resources and ecosystem services upon which the current. economy and society depend. The greedy economic system is not compatible with sustainable development. In this context sustainable development is oxymora – it is impossible to be sustainable without deep understanding of our natural ecosystems (multidisciplinary knowledge) and without essential change of behaviors, objectives, values, political and economic system. Sustainable development is an attitude to learn and tend. Various actions aiming in changing the approach of acting and doing things are engaged, mainly by individuals and organizations. Many of them are supported by social networks and have future to influence behavior's. For example, Uber platform (and some others) connects people offering services with those who demand them. It is quick and effective, but out of the current economic practices (taxes, companies…) and raise conflicts between "old" and "new". Genuine games try to push people to act. Introducing the environmental principles into a design of products and services is a step forward. However the traditional PLM tools should evolve to take into attention a new way of doing by using simulators and optimizers. Technology is able to provide a considerable help, but the way of reasoning should evolve to global, holistic and system .For example, aeronautic and automotive industries focus on lightening weight and reducing carbon footprint, while other condition can also be considered. Corporate Social Responsibility requires the integration of environmental form into design. While it constraints companies to take care about social and environmental impact, they should also focus on economic performance. Environmental norms (ISO 26000) are very heavy; it is impossible for a small company to check and respect all these norms without clearing business. The intelligent technology can help checking and optimizing things; such systems are model . To remain sustainable, development requires the intensive use of available knowledge – individual and collective, from related domains, from the past and currently accomplished from experience.

VIII.CONCLUSION AND FUTURE WORK :

Only few examples of what can be done on city level were given here. The main rule is to apply suitable knowledge management access, involve the end users from the beginning and use the bestbecoming techniques. The principle of modularity, reusability and generality is still profitable for defining and building an effective and replicable system that really support city management and offer conventional services to citizens, organizations and companies being a part of the city (holistic approach). The evaluation of the impact of city activities may facade to right metrics for measuring progress and leadership. However the balance between the use of technology and human capacity should be preserved. Technology producers have habit to produce software and devices that think instead of the human and take decisions for him/her. This kind of applications may replace human at the long run and reduce his cognizable capacity. That's why we have to produce the applications that enhance human intelligence without switching it off

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