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PANDÉMIA – FENNTARTHATÓ GAZDÁLKODÁS – KÖRNYEZETTUDATOSSÁG / PANDEMIC – SUSTAINABLE MANAGEMENT – ENVIRONMENTAL AWARENESS

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Szerkesztette / Edited by: OBÁDOVICS Csilla, RESPERGER Richárd, SZÉLES Zsuzsanna

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The Impact of Artificial Intelligence on Leadership in the Corona Crisis

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Abstract
This publication researches the hypothesis: Artificial intelligence can support leadership in the Corona crisis. The purpose of the article is a literature review of the state of the art of artificial intelligence and research about the impact of artificial intelligence on leadership, based on human behavior in the Corona crisis. The result shows that artificial intelligence can have a significant impact on leadership in the Corona crisis. An application of the results could be an early warning system which, with the help of artificial intelligence, recognizes catastrophes and possible resulting crises in the early stages and shows ways of counteracting them.

Keywords: Leadership, Artificial Intelligence, Corona Crisis, Automotive Industry
JEL Codes: I15, F60, F61, H12, I12

1. Introduction

In 1988, when the world was still in order, Gary Kasparov won against the chess computer Deep Blue and one was sure that it would stay that way, because human would certainly also in future be able to makes decisions better than a machine. But it is well known what happened on 12 May 1997 after just 19 moves – the machine won!

Artificial intelligence (A.I.) has long since arrived in society's daily life and the applications are almost limitless! Mankind has long understood that the prejudice that A.I. cannot make decisions or that they are worse than human's have meanwhile been eliminated. But how can A.I. support leadership in crisis and can A.I. possibly avoid the next crisis?

In a former publication, the author already proved the "Leadership influence on employee's behavior in the automotive industry in the Corona crisis" (Solderits, 2021). This current research paper is now the logical "next step" to research how A.I. can support, how leadership and A.I. can complement each other and if there are already applications using A.I. in that field.

The methodology for this paper is literature research based on the behaviors in table 1, as well the state of the art A.I. in the field of leadership. In the course of this research it was found that the application of A.I. in this area is actually the supreme discipline – the ability to make logical, qualitatively reliable and fair decisions. The result of this scientific research is very clear and the hypothesis is supported: Artificial intelligence can support leadership in the Corona crisis. Furthermore A.I. can make most decisions better than humans and some new applications even would not be possible without A.I. e.g. decisions in real time with big data as basis – humans would never be able to either handle that big data nor at that speed.

2. The use of artificial intelligence

Since the first game against Kasparov in 1989, the programmers of IBM's Deep Blue have worked to improve the supercomputer's greatest strength: the ability to calculate as many moves as possible in advance. It was possible to search 300 million possibilities per second and evaluate more than 70 moves in advance as early as 1997. Very good chess players like Kasparov can think up to 10 moves ahead. Famous analysts and chess players, as well as Kasparov,

knew that computers have the advantage of large computing power, but they also knew that 99% of the many calculated chess moves were nonsense and, therefore, they still thought that humans had the advantage over computers in decision making – but they were wrong, the world champion Kasparov lost to the computer in less than 20 moves!

Nowadays examples of A.I. can be found everywhere. For example a hearing aid where the device not only amplifies what is heard to compensate the human handicap, but thanks to A.I., can translate into different languages in real time or is connected via Bluetooth to the smart phone and can transfer phone calls, read SMS or send reminders the calendar on the phone … all that integrated into a small device placed in the ear!

3. The impact of artificial intelligence on leadership

Many experts, especially managers and leaders, are convinced that their work requires judgment, which is supposed to be something that no machine, no matter how capable, can do, but the question „Can a machine exercise judgment?" is probably the wrong question to ask.

Daniel Susskind (2018) spoke about that in his speech at the IEDC conference 2018 and explained that question by addressing two other questions:

The first question is "Why do people need the judgment of experts?" The answer to that lies in uncertainty. When the facts are unclear because the available information is ambiguous, people do not know what to do. They need the judgment of experts, based on experience, so that they can make sense of uncertainty.

The second question is not whether a machine can exercise judgment, but whether it can deal with uncertainty better than a human being. The answer to that question is "Of course", in many cases. That is precisely what these machines are very good at doing. They can handle far larger bodies of data than human beings, and can make sense of them (Susskind, 2018, 13).

Susskind (2018) named an example from dermatology, where a computer can examine a snapshot of a freckle with the same accuracy as leading dermatologists. The mechanism behind this system is not to imitate a human doctor's decision as the machine doesn't know anything about medicine. Instead, it uses a database of 130,000 cases to run a pattern recognition algorithm searching for correlations between the images and the target image. This is a comprehensive review of more cases than any human doctor could possibly handle in a lifetime. It makes no difference if a human doctor is unable to describe how a patient is diagnosed; the computer is capable of doing so in a different manner (Susskind, 2018, 8-9).

The result, or better, the system in which the result is generated, refers to both questions above and is nothing else than experts are doing. Experts makes a judgment based on the extensive experience and, in case of the example, a freckle expert can do this because they have seen a lot of freckles in their "career". There is no reason a machine cannot do this; it just needs to be given the specific knowledge:

Show the machine a large sample freckles and it will be faster, more efficient, absolutely reliable to analyse whether or not that freckle is cancerous and, with intelligent financing (maybe done with A.I. software), it will also be cheaper than a dermatologist with 20 years of experience.

Teach the machine a wide range chess moves and it will beat a chess world champion, or feed it with different languages and a speech recognition software and a hearing device will be able to do real time translation. There is absolutely no reason why a machine should not be able to do leadership tasks as well as, or better, than humans – giving the machine the connection to the needed knowledge is the key!

To check the application of A.I. for leadership in the Corona crisis, reference is made to another publication from the author entitled „Leadership influence on employee's behavior in the automotive industry in the Corona crisis". In this paper the author did an economic-philosophical literature review to get a better understanding of people's behavior and consequences in the Corona crisis as well as of the state of the art leadership methods with the aim to prove

the correlation of "people's behavior and leadership". The result shows a clear connection between leadership and employee's behavior in the corona crisis (Solderits, 2021).

The left column of *Table 1* shows "Employee's behavior" the result of the literature research with 7 different behaviors of employee's in the automotive industry as a consequence of the Corona crisis. On the right side is the result of the literature research of leadership methods (in alphabetical order), fitting to each behavior are presented.

Every behavior listed in *Table 1*, caused by the crisis, can be influenced by leadership, supported by appropriate scientific research:

Table 1: Influence of leadership on employee's behavior in the corona crisis

Employee's behavior	Influence of leadership	Leadership research paper
Communication	yes	• de Vries, Bakker-Pieper and Oostenveld, 2009 • Ebner, 2020 • Harrison and Mühlberg, 2014
Social imagination and decision making	yes	• de Vries, Bakker-Pieper and Oostenveld, 2009 • Drucker, 1967 • Ebner, 2020 • Harrison and Mühlberg, 2014 • Kayode, Mojeed and Fatai, 2014
Social habits	yes	• Grant and Hoffman, 2011 • Kotter, 1997
Adaptation strategy	yes	• Blickhan, 2015 • Ebner, 2020 • Grant and Hoffman, 2011 • Kotter, 1997
Coping strategy	yes	• Blickhan, 2015 • Ebner, 2020 • Fook and Sidhu, 2010
Virtual work	yes	• Ebner, 2020 • Thomas, 2014 • Harrison and Mühlberg, 2014
Fairness	yes	• Blickhan, 2015 • Ebner, 2020 • Khaola and Oni, 2020

Source: Solderits (2021, 10)

The following chapters will verify the impact of artificial intelligence on leadership, based on the 7 economic-philosophical behaviors listed in the *Table1*.

3.1. The impact of artificial intelligence on communication

Fear mobilized people at the beginning of the Corona crisis, triggered by terrible pictures of hospitals, especially in northern Italy and scary warnings from political representatives e.g. the chancellor of Austria, who said: "In every family there will be someone who knows friends and family members who died because of the virus!" This was intentionally generated fear by communication that should force the people to stay at home (Solderits, 2021, 4).

Fear was and is also generated by the communication from the press. Headlines in newspaper like "VW, Audi, Daimler, BMW – one plant after the other closes, experts expect a wave of termination" (Parseval, 2020), or "Continental Deepens Restructuring Cuts With 30,000 Jobs at Risk" (Rauwald, 2020) and "Virus paralyzes the global auto industry, car companies and suppliers such as General Motors, Ford and Michelin are stopping production because of the pandemic" (Kinezle, 2020) are just a few of hundreds of bad news from the automotive industry, using the dramatic impact of the virus (Solderits, 2021, 4).

Mayank Kejriwal (2019), a researcher at the University of Southern California, specializes in knowledge graphs (KG), an exciting area of A.I. and data analysis science. He is a key player in the THOR (Text-enabled Humanitarian Operations in Real-Time) project, which aims

to build functions for lesser-used languages with limited resources. THOR is an open source situation awareness system that takes data from social media (such as Facebook or Twitter) and other externally created A.I. systems and converts it – tweets and text messages provide an immediate supply. Interdisciplinary A.I. research has developed a platform for extracting knowledge that can be used to recognize and address urgent situations (Kejriwal, 2019).

THOR was originally designed for earthquake crises, but as a "situation awareness system", the "situation" of the Corona crisis is the same – How does it work? – In a crisis, many people use social media channels for information exchange about their current situation and report on matters of urgent concern to their well-being via smart phone or tablet. Of course, certain messages are meaningless, even though they contain keywords, and vital information related to the case may be lacking. Other tweets or massages may be appropriate, but they're misspelled or contain idioms. The rapid delivery of help requires the identification and sorting of the available data into usable and unusable information in real time. Humans will obviously be overwhelmed to complete this mission, here A.I. enters the game!

Algorithm's extract „critical" signals or data relating to places and people's names and then forward resources to victims and emergency services – this could be the risk of a collapsing house in case of an earthquake or a cluster with a special virus mutation in case of the Corona crisis. The key factor and great advantage of this system from Mayank Kejriwal's research is that these messages can be categorized according to urgency, with support directed towards the areas where it is most needed.

If the technology develops, it will be able to have a long-term social effect and can collect data in previously unimaginable ways, thanks to readily accessible data submitted by mobile phones, laptops, and other related devices. The research team also using technology to aid law enforcement in the fight against sex trafficking. While human traffickers use emojis and misspellings in sex ads to mask details, A.I. is being created to help get ahead of this illegal activity by collecting information about phone numbers and locations. With further development in this area of time-sensitive social media data, A.I. can support a wide range of emergencies, such as mass shootings, explosions, major injuries, epidemics (e.g. Corona or Ebola), guidance for helping victims, and signaling the presence of threats (Kejriwal, 2019).

The THOR project is the perfect example how A.I. can solve the issue of communication in crisis situation to identify and sort the data, find usable and important information and forward the information to those responsible. The technology is compatible with existing A.I. It is up to the government to decide how it will be used.

With the use of A.I. in the THOR project the hypothesis of this research paper is supported, that A.I. can have a significant impact on communication and can be a great support for leadership in crisis.

3.2. The impact of artificial intelligence on decision making

In a crisis people are searching for facts they can be addicted to it well and truly. In case of the Corona crisis, heads of government made a considerable contribution to the formation of metaphors e.g. they spoke of an "invisible danger". In order to be able to act, prepare and defend ourselves, we tried to construct a "social representation", using about the phenomenon formulations based on facts, empirically validated evidence and speculative conspiracy theories, (Kirchler–Pitters–Kastlunger, 2020, 10-11).

Communication and information flow are most important in a crisis. Otherwise, especially in crisis situation, people start to imagine the invisible and decisions are made on the basis of assumptions instead of facts (Solderits, 2021, 5).

In the publication "Leadership and Decision-making: A Study on Reflexive Relationship between Leadership Style and Decision-making Approach" by Bakare Kazeem Kayode, A. Quadri Mojeed and Ismail Abdul Fatai, published 2014 a strong connection between leadership and decision making is proved. The paper discusses how important decision-making and leadership styles are related and that leadership strategies and hierarchical systems are linked to decision-making styles. The analysis used a qualitative research design where leaders from the

Institute of Education International Islamic University Malaysia in 2012-2013 were used to gather data from participants on both leadership styles and decision-making in a semi-structured interview. The study's results indicate that, while leadership and decision-making styles are opaque in theory, they are closely related in reality (Kayode–Mojeed–Fatai, 2014).

Researchers at the Mendel University of Agriculture and Forestry in Brno, Czech Republic, already wrote in 2005 in a scientific article "Decision making with support of artificial intelligence" that significant of data are collected as a result of the widespread use of information technology in many fields of human life. At the strategic decision-making stage, managers and leaders often require knowledge quickly in order to solve problems and to achieve a competitive advantage.

Business intelligence is the method of translating data into information and insights that can be used in decision-making. Many concrete examples from agriculture and the food industry help research regarding the possibilities of neural networks in decision-making (for example the assessment of food quality or the creation of the corresponding trend indicator). The problem of creating applications to support decision-making processes with modern methods in the field of A.I. was solved by the Institute of Computer Science as part of the research task no. MSM 6215648904 (Rabova–Konecny–Matiasova, 2005, 388).

Duan, Edwards and Dwivedi (2019) confirmed the great advantage of A.I. in decision making in the International Journal of Information Management (in particular, they highlight the possibilities of A.I. in the area of big data analysis) and identified twelve requirements related to conceptual and theoretical development, A.I. technology-human interaction and A.I. implementation, related to the use and impact of A.I.-based systems for decision making (Duan–Edwards–Dwivedi, 2019, 67-69).

Following the beginning of the success story of artificial intelligence presented in the introduction of this research paper with Deep Blue vs. Kasparov, decision making is exactly the big advantage of artificial intelligence.

The THOR project of Kejriwal (2019) as well the research papers by Kayode, Mojeed and Fatai (2014), Rabova, Konecny and Matiasova (2005) and Duan, Edwards and Dwivedi (2019) support the hypothesis – A.I. can have a big impact on leadership regarding the decision making process. There are already many applications where A.I. is used for the decision making process.

3.3. The impact of artificial intelligence on social habits

During the Corona crisis, the government implemented the measures washing hands, wearing mask and keeping distance, published in the federal legal information system.

But people prefer to stick to the behaviors they are used to. This behavior is named the status-quo-bias. There is confusion and the ability to build security again as familiar systems break up. In crisis situations, this tendency will increase. The prescribed codes of conduct have not been practiced long enough and it will be hard to suppress automated social scripts (Kirchler–Pitters–Kastlunger, 2020, 21-22).

The question whether A.I. can support leaders in changing social habits is possibly the wrong or not entirely complete question. What really matters is what the government wants to achieve with those measures – and this is to improve the healthcare in the pandemic. This means the correct breakdown of the research question should be: Can A.I. help improve the quality of healthcare in the Corona pandemic? Healthcare is the central factor in a crisis like the Corona pandemic. Increasing developments of A.I. and the acceptance in the area of healthcare does demonstrate that A.I. provides safer medical treatment and reduces costs significantly, but how?

Phelps and Cooper (2020), researchers from the Deakin University Medical School in Victoria in Australia, published the COVID-19 column "Can artificial intelligence help improve the quality of healthcare?" in the Journal of Hospital Management and Health Policy.

The problem of poor care was underlined by a 2016 paper that indicated that medical errors were the third leading cause of death in the United States. Despite significant efforts like

- improved training and system knowledge,

- combining the quality of care with medical professionalism,
- ensuring better provision of health care data,
- placing an increasing focus on the impact at the system level on security and quality.

It has become increasingly recognized that those compliance-based approaches to safety and quality have not had the expected impact (Phelps–Cooper, 2020).

The hypothesis is supported – the current understanding of A.I. suggests that it can assist in improving safety and quality of healthcare through maximizing the effectiveness of some current safety and quality tools/approaches.

A.I. can lead to safer and more effective care when integrated into routine practice and clinical governance approaches. It is also important to consider how A.I. approaches can have the potential to improve quality from a consumer perspective by enabling the entire patient journey e.g. appointment consultation, warning of missed medication, checking for conflicting advice, assistance with integration of documentation (Phelps–Cooper, 2020).

3.4. The impact of artificial intelligence on adaptation strategy

Home office has already been implemented in the automotive industry for years, but there came a problem on top for families in the private sector: supervision of the children and home-schooling had to be reconciled as well as the partner also doing home office with a full calendar, using a headset all day, despite the often limited living space (Solderits, 2021, 7).

In the Elsevier Journal of Business Research ten experts worked together and provide an account of the findings and implications of a multi-dimensional study of A.I., comprising ten case studies, five scenarios, an ethical impact analysis of A.I., a human rights analysis of A.I. and a technical analysis of known and potential threats and vulnerabilities: A.I. for human flourishing – beyond principles for machine learning (Stahl et al., 2021).

The aim is to answer the question of what precisely the key ethical issues are and how best to classify or categorize them. In the chapter "Purpose of A.I. and governance proposals" there are three purposes of making use of A.I. which can be used in connection to "flourishing" (Stahl et al., 2021):

- to improve processes and efficiency (for organizations using A.I., this translates into lower costs, higher productivity and, eventually, higher profits),
- for social control (voice and face recognition to be used for surveillance and tracking individuals e.g. Chinese Social Credit System),
- to promote human flourishing.

The scientific article by Stahl et al. (2021) proves in an impressive way that A.I. can support adaptation strategy and furthermore A.I. can improve processes and efficiency as well as improve and gain social control and increase the possibility of human flourishing – the hypothesis is supported!

3.5. The impact of artificial intelligence on coping strategy

The Corona virus hit the industry wholly unprepared and during the first wave of the crisis companies were forced to protect their workers'. New, innovative measures were implemented by the government, such as the short work policy and home office to promote jobs as well as e-learning, with the additional difficulty of knowledge delivery via digital tools.

Measures to deal with stress are known as emotional coping mechanisms such as relaxation, diversion and concepts of stress response (Kirchler–Pitters–Kastlunger, 2020, 13-15).

The 2010 study for the International Journal of Knowledge and Culture "The Relationship between Leadership Style, Stress and Coping Strategies" is research in educational leadership which confirmed the impact of positive school leaders' styles and the effects of stress on coping strategies as the result (Fook–Sidhu, 2010).

For those reasons, the investigation of the possible application of A.I. for coping strategy is divided into two areas – an A.I. government application and an A.I. education application.

3.5.1. Government application of A.I.

Tian (2020) analyzed in a research project for the Beijing Administration Institute and points out that governments at all levels must recognize and react to new social change. The State Council's "Next Generation A.I. Plan" strategy seeks to promote an economy and society-driven approach to A.I. and advancements in the next age of A.I. technologies. It is necessary to increase the abilities to ensure a successful environment, foster a resilient community, protect national stability, integrate diverse expertise and encourage technological progress and effectively address the possibility of change. Complexity-oriented knowledge that utilizes human resources comprehensively, contributes to social efficiency, along with other resources, helps drive the development (Tian, 2020).

3.5.2. Education application of A.I.

There are already several systems for e-learning platforms with A.I. support available on the market e.g. PresseBox (2020), Upwork (2021) and Learningbank (2021). What they all have in common is that easy access and improving the vast amount of information available is crucial in our modern information environment. The modern standards of education and the introduction of better and more up-to-to-date approaches have had an effect on conventional methods of teaching.

Tian´s research for government, as well as the available e-learning platforms in the e-learning and knowledge sector supports the hypothesis, that A.I. can have an impact on coping strategy.

3.6. The impact of artificial intelligence on virtual work

Wherever it was possible, short-time work and home office were implemented within a few days after the Corona crisis hit the industry. Home office, remote and intelligent work had already standard before the crisis. The automotive industry had already been used to working with laptops and headsets from home and the employees had been used to existing home office and flextime regulations.

In some companies even mobile working is already possible. While for home office, the workplace is defined with the home address of the employee, mobile working means that the location of the workplace is not defined. In case of mobile working, the employees can work at home, but also in a coffee shop or on the beach – they are free to choose their workplace.

Tunyaplin, Lunce and Maniam (1998) discussed "The new generation office environment: the home office" the development to promote workplace relocation of workers from the office in their research. The paper aims to look at variables which affect both, the employer and the employee, as well as cost and productivity. The study is not an advertisement for home office. Instead it focuses on various aspects that need to be examined more closely.

The methodology is a closed questionnaire consisting of 21 multiple choice questions with a total of 54 students at the southern state university and a chi-squared analysis of the connected variables (Tunyaplin–Lunce–Maniam, 1998).

They investigated the following propositions with the appropriate zero hypotheses, that there is no relationship between:

Table 2: X^2 test of the zero hypothesis

Commuting factors	X^2 statistic	Decision
H10 Productivity and employees comfort level	44.537	Reject H0
H20 Productivity and time commuting	31.474	Reject H0
H30 Productivity and more hours worked	32.848	Reject H0
H40 Faster completion and comfort level	47.096	Reject H0
H50 Faster completion and more hours worked	26.057	Fail to reject H0
H60 Comfort level and commuting time	23.696	Fail to reject H0

Source: Tunyaplin, Lunce and Maniam (1998, 182)

Table 2 shows that there is a relationship between the variables in propositions $H1_0$-$H4_0$, because the zero hypothesis was rejected. This means that productivity increases significantly

in home office. Even if $H5_0$ and $H6_0$ could not be rejected, the results were very close to the critical significance value of 26.3 and should be considered in the adaption of the home office concept in further research with possibly more people.

Tunyaplin, Lunce and Maniam (1998) outcomes, as well Daniel Susskind and Paul Claudel (Susskind, 2018) and the THOR project (Kejriwal, 2019) clearly show the productivity benefits and impact of A.I. on virtual work – the hypothesis is supported.

3.7. The impact of artificial intelligence on fairness

Health policies have caused significant economic costs and driven the self-employed and enterprises to the edge of disaster. Although the workload of some sectors has risen tremendously, workers have been sent to short-time work in other fields or have lost their jobs. As the primary priorities, wellbeing and work protection were chosen, the slogan of the Austrian government was: "Whatever the cost". Acceptance and frustration at various conditions for eligibility to assistance, bureaucratic obstacles to the application and the time it took for aid to flow were reasonably balanced among the population. A significant factor in the fairness of the interventions is the recognition of government assistance, the purposefulness and the processes to receive it (Kirchler–Pitters–Kastlunger, 2020, 26). Procedural justice relates to the implementation of laws and regulations which should be applicable to all in a fair manner. The rules should be straightforward and understandable. In addition, fair treatment of each other and true facts are sometimes cited as conditions for procedural justice (Kirchler–Pitters–Kastlunger, 2020, 27).

A.I. can gain access and handle big data (e.g. business operations) and process this data in real time. This is the reason A.I. is used also in the area of employee management and the integration into the decision-making process.

Hughes et al. (2019), published the article "Artificial Intelligence, Employee Engagement, Fairness, and Job Outcomes" and stated that it is essential to focus on best practices and tools in case of employee management. When A.I. is integrated into workplace, it brings a wide range of cognitive, emotional and physical energies to job the positions. According to this chapter – AI impact on fairness – the A.I. system needs to convince employees that it is fair (Hughes et al., 2019).

The researcher used three widely types of fairness which will be described in more details in chapter below.

3.7.1. Artificial Intelligence – Procedural Fairness

Procedural fairness is the perceived fairness of the processes used by the organization. These processes show up in employees' perceptions of how fair the A.I. management system's decision-making process is to each person.

When employees believe the A.I. management system decision processes are inconsistent or biased, and/or when employees are unable to express their concerns about such decisions, procedural fairness will be poor. Procedural fairness for employees managed by A.I. systems would represent the way complaints are handled, how their performance is evaluated, or their ability to voice their concern over new policies (Hughes et al., 2019, 65).

3.7.2 Artificial Intelligence – Distributive Fairness

In most cases, the result of distributive fairness is expressed in money or recognition. Distributive justice should be high when an employee assumes the A.I. management system contributes to equal pay for equal work. Distributive justice should be low when workers believe their use of the A.I. management system causes or exacerbates wage discrepancies (Hughes et al., 2019, 65-66).

3.7.3. Artificial Intelligence – Interactional Fairness

Interaction fairness refers to how employees are treated when decisions are made. That can be in interpersonal fairness (the level of respect that is shown to employees) and in information fairness (information about why procedures are being carried out and why results are being distributed).

In the case of A.I.'s impact on fairness, the interaction relates to the extent to which employees believe the A.I. respects them and provides an explanation for their decisions (Hughes et al., 2019, 66).

In the book "Research in Mathematics and Public Policy" (Chen et al. 2020) there is an interesting chapter "Transparency Tools for Fairness in A.I. (Luskin)" where three tools for decisions regarding fairness of A.I. algorithms are suggested (Chen et al. 2020):

- in terms of secure features, a new concept of fairness „controlled fairness",
- retraining algorithms for a given classifier to achieve „controlled fairness",
- algorithms for modify model parameters to achieve „classification parity".

"Controlled fairness" – The key issue is parity across protected groups when a machine learning algorithm is trained on data labeled with prior decisions rather than an objective "fact." A bank, for example, may use a classifier to predict whether someone would default on a loan and then use that information to decide whether or not to accept the loan. The key concern in this case may be that the classifier achieves parity across protected classes, as long as the bank's overall risk does not increase dramatically. Chen and his research colleagues could demonstrate on the evaluation of 7214 attendees the effectiveness of the proposed "fairness multilayer algorithm" (Chen et al., 2020).

Hughes et al.'s (2019) article "Artificial Intelligence, Employee Engagement, Fairness, and Job Outcomes" as well as Chen et al.'s (2020) "Transparency Tools for Fairness in A.I." support the hypothesis that A.I. can have an impact on fairness.

There are already tools to be used for decision making, including fairness in the decision making process with "Link for A.I. tools" at the end of that research paper.

4. Result and Interpretation

In the following *Table 3* "Influence of leadership and A.I. on employee´s behavior" with 7 different behaviors of employee´s in the automotive industry as a consequence of the Corona crisis, analyzed from the Micro- and Meso-Level is shown in the left column.

Table 3: Influence of leadership and A.I. on employee´s behavior

Employee's behavior	Leadership impact	Artificial intelligence impact
Communication	• de Vries, Bakker-Pieper and Oostenveld, 2009 • Ebner, 2020 • Harrison and Mühlberg, 2014	• THOR project • Kejriwal, 2019
Social imagination and decision making	• de Vries, Bakker-Pieper and Oostenveld, 2009 • Drucker, 1967 • Ebner, 2020 • Harrison and Mühlberg, 2014 • Kayode, Mojeed and Fatai, 2014	• Kayode, Mojeed and Fatai, 2014 • Rabova, Konecny and Matiasova, 2005 • Duan, Edwards and Dwivedi, 2019
Social habits	• Grant and Hoffman, 2011 • Kotter, 1997	• Phelps and Cooper, 2020
Adaptation strategy	• Blickhan, 2015 • Ebner, 2020 • Grant and Hoffman, 2011 • Kotter, 1997	• Stahl et al., 2021
Coping strategy	• Blickhan, 2015 • Ebner, 2020 • Fook and Sidhu, 2010	• Fook and Sidhu, 2010 • Tian, 2020
Virtual work	• Ebner, 2020 • Thomas, 2014 • Harrison and Mühlberg, 2014	• Susskind, 2018 • Kejriwal, 2019 • Hurst, 2020 • Tunyaplin, Lunce and Maniam, 1998
Fairness	• Blickhan, 2015 • Ebner, 2020 • Khaola and Oni, 2020	• Hughes et al., 2019 • Chen et al., 2020

Source: Authors results

On the right side of the table in the column "Leadership impact" is the result of the literature review of the state of the art leadership methods (alphabetical order), matching each behavior.

The middle column "artificial intelligence impact" is an update based on the results of this search paper with the impact of artificial intelligence on leadership according to the employee´s behavior in the automotive industry in the Corona crisis.

The hypothesis "Artificial intelligence can support leadership in the Corona crisis", is supported and the overview is shown in one picture in *Table 3*.

Furthermore there is now the big picture with all relations in one overview, validated by appropriate scientific research papers:

- behavior of employees in the automotive industry in the Corona crisis,
- leadership influence on that behavior,
- influence of artificial intelligence on leadership on that behavior.

5. Conclusion

The results of this scientific work supports the hypothesis: Artificial intelligence can support leadership in the Corona crisis.

Furthermore in *Table 3* two hypotheses are visualized:

- leadership is an effective method to influence employee´s behavior in the automotive industry in the Corona crisis,
- artificial intelligence can support leadership in the Corona crisis.

Based on this paper and the results, a possible application could be fluctuation retention strategies to keep key talents and key players in the company – driven by leadership and supported by artificial.

The THOR project can solve the issue of communication in crisis situation to identify and sort the data, find usable and important information and forward the information to those responsible. Another application, with just small update of the THOR project could be an early warning system which, with the help of artificial intelligence, recognizes Corona clusters in the early stages and shows ways of counteracting them.

The only big stone that now stands in the way are data protection regulations and it is up to the government to unlock the enormous potential of artificial intelligence.

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