Challenges of implementation of artificial intelligence program in the state electricity system of Georgia

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Annotation. *The field of artificial intelligence offers many opportunities and challenges. A revolutionary transformation is taking place around the world and is changing established processes and traditional models. The energy sector is not an exception. Today, conventional power grid is used in Georgian State electro system and is planned to introduce a smart grid in the future. Also, the company considers to replace the existing remedial action scheme with an artificial intelligence-based, "Autonomous RAS" program. It is important to reveal the views of the employees of Georgian State electro system and discuss their attitudes towards artificial intelligence programs, as well as to determine the factors that affect the implementation and development of the mentioned programs.*

According to results most of the employees have a positive attitude towards artificial intelligence programs and believe they will be beneficial for both the industry and the country in the future. The reasons for the positive attitude were considered to be knowledge of digital technologies at the basic level, perceived benefits by the staff, such as improved efficiency and forecasting capabilities, also reliability and accuracy of artificial intelligence programs. The reasons for the negative attitude were considered to be the fear of losing jobs, the use of artificial intelligence programs for undesirable purposes, the violation of confidentiality. The results also revealed that employee attitudes can significantly affect the implementation of artificial intelligence programs. A positive attitude can lead to enthusiastic acceptance of programs and increased productivity, the negative one will cause resistance, delays, or non-optimal use of artificial intelligence programs.

Introduction

There are significant changes in the power industry related to energy generation, distribution, storage and sales methods. These changes aim to increase the flexibility of this process, reduce costs and environmental pressure (Serban AC, Lytras MD, 2020). Recently, in terms of energy consumption, attention has been focused on renewable energy sources, also the issue of continuous protection of the environment and human health has been emphasized (Puri, V et.al., 2019). Universal access to reliable, acceptable and sustainable energy is one of the goals of sustainable development, however, to achieve this goal, it is necessary to use innovative solutions and modern technologies that can overcome insufficient energy generation, faulty transmission and distribution infrastructure, accessibility and contradictions caused by weather-related

problems (Dewangan et.al, 2023). Artificial intelligence programs can reduce losses and costs, promote the use of clean renewable energy sources worldwide improve the planning, operation and control of energy systems. (Serban AC, Lytras MD, 2020). In the power sector of developed countries, the use of artificial intelligence and related technologies has already been introduced or started, which allow communication with smart grid and smart metering. In the future, the Georgian State Elctrosystem plans to introduce artificial intelligence programs. In particular, replacing conventional power grid with smart grid and replacing the remedy action scheme with an artificial intelligence-based program.

Groumpos notes that despite the benefits of artificial intelligence programs, there is doubt and fear in society about their influence. In the past, mathematical models and algorithms were created by humans, but now machines can do all this, independently of humans, which has caused some concern in terms of reliability and control. Another threat Groumpos cites is what happens when artificial intelligence ends up in the hands of an unscrupulous person. Strict security measures need to be introduced to prevent the use of artificial intelligence against humanity. Another negative attitude is caused by the fact that the widespread introduction of artificial intelligence may lead to job cuts. (Groumpos 2023)

The purpose of this research is to determine the attitude and acceptance of employees working in Georgian State Electrosystem towards artificial intelligence programs; identify the factors that lead to the acceptance of artificial intelligence programs in the electric power system; determine the impact of employee set[2] on the pace of implementation and development of AI programs.

Artificial intelligence programs in the energy field

A conventional power grid is a centralized system in which electricity flows in only one direction. Electricity flows from the station to the end user through transmission and distribution systems. In the case of a conventional power grid, the power generation station may or may not be located in the same geographic area as the consumption points. Therefore, conventional grids generally require the transmission of electricity from long distances.

The smart grid is the next-generation energy system that combines the existing energy infrastructure with information and telecommunication technologies. One of the advantages of a smart grid is the possibility of two-way power flow and data exchange in the form of communication signals. It is characterized by a mixture of distributed and renewable energy resources. A smart grid based on artificial intelligence programs can respond appropriately by means, such as distributed energy management, forecasting renewable energy generation, accurate network monitoring and fault detection. (Rhatrif AE; et. al., 2024).

In Georgian State Electrosystem (GSE), a remedial action scheme (RAS) has been introduced. Due to the change in the topology of the GSE grid, it is necessary to update and expand the RAS. To avoid disconnection of the electric power system, it is necessary to expand the grid along with

[2] Term used by Dimitri Uznadze in his "Theory of Set", where he identified set as a psycho-physical state of readiness that arises upon a specific coincidence of individual's need with the situation and operational capacity and which determines his or her purposive behavior

the expansion of remedial action scheme. Expanding the grid leads to the creation of a very large number of possible scenarios in the RAS, the preliminary analysis of which and the determination of the dosed shutdown power, only with human resources, are associated with great difficulties. Therefore, it is advisable to develop artificial intelligence based remedial action scheme ,,Autonomous RAS". (GSE, 2024)

Determining attitudes towards artificial intelligence programs

Determining society's attitude towards artificial intelligence has become a subject of great interest. Neudert studies (Neudert et al. 2020) have shown that many people worry about the threats of using artificial intelligence. 154,195 representatives of 142 countries were interviewed. Park and Wu (Park and Woo 2022) noted, that the acceptance of applications with artificial intelligence was due to both psychological factors, such as inner readiness, optimistic attitude towards science and technology; also technological factors such as perceived practicality, ease of use, complexity of technology and relative advantage. It was also noted that user experience, use-related costs, risk-benefit perception and trust in the state were significantly linked to the adoption of smart technologies. Kaya (Kaya et al. 2022) also mentions subjective norms, culture and the threat of job loss as influencing factors in AI technology adoption. Gillespie (Gillespie et al. 2022) studies, in which 6,054 representatives from the US, Germany, Great Britain, Australia and Canada participated, showed that people's trust is low and the latter is of great importance in the acceptance of artificial intelligence. Gerlich's (Gerlich 2023) studies, where 1,389 representatives from the US, Germany, Switzerland and Great Britain were surveyed, also found that trust has an important role in the adoption of artificial intelligence. It is the trust factor that affects the attitude of society. These studies strengthen the views of Lewicki (Lewicki et. al. 1998) and Mayer (Mayer et al 1995) on technology acceptance, explaining that trust takes the central role. Gerlich also cites that perceived risk associated with the use of AI programs plays an important role in public attitudes and affects the acceptance of AI programs. This view coincides with Davis Technology Acceptance Model, which takes into account ease of use and perceived benefits as key variables (Davis 1989).

Research methodology

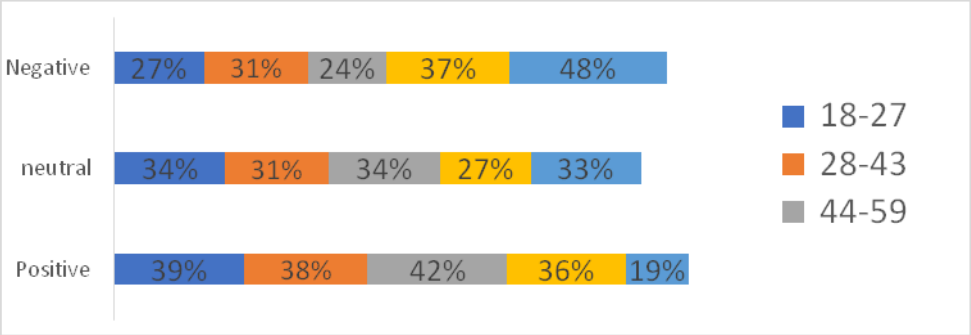
Quantitative and qualitative research methods were used as research methodology in the GSE. For quantitative research, the questionnaire was compiled based on „The General Attitudes Towards Artificial Intelligence Scale (GAAIS)" questionnaire, created according to Likert 5-point scale. The questionnaire was sent to 496 employees of the department of operational modes and dispatching issues, the department of organized markets development and electricity accounting, the service of technical safety and inspection, of which 105 (21%) respondents answered. In addition, in-depth interviews were conducted with experts in the management and field of the GSE, Enguri HPP, Parvus Consulting. All respondents answered, of which 11 were representatives of top management and 7 were experts in the field. Ethical norms are protected and all respondents have agreed to the public use of their data.

Results

As a result of the quantitative research, it was determined that 52% of respondents have a positive, 31% neutral and 17% have a

negative attitude towards artificial intelligence programs in general. Diagram 1 shows the mood of the respondents according to age.

Diagram 1. Respondents' attitudes according to age



Source: Author research

According to the quantitative study, the majority of surveyed employees neutrally assessed their attitude towards working with an artificial intelligence program, both during routine and complex tasks.

Proposition 1 – For routine activities, I prefer to work with artificial intelligence programs than with humans– 38.10% of respondents evaluate this provision as neutral.

Proposition 2 – In my opinion, artificial intelligence programs need to be used when making complex decisions. – 36.19% of respondents evaluate this provision as neutral.

The attitudes mentioned above can be explained by the fact that employees are not yet fully aware of the capabilities of artificial intelligence programs and are therefore skeptical. This view is strengthened by the results of a qualitative study, where respondents noted that employees have basic knowledge of artificial intelligence programs, but need to deepen them. Qualitative research analysis revealed that the higher the awareness of artificial intelligence programs, the higher the acceptance. All respondents share the view that employee awareness needs to be raised before implementing AI programs. A neutral attitude can be explained by the following factor: employees did not have the opportunity to compare the results of work performed by human resources and the results obtained by artificial intelligence programs, therefore, they refrained from a specific answer. In addition, employees may prefer to communicate with people and believe that without human resources, it is not advisable to work only with artificial intelligence programs, even if the latter gives better results.

The attitude of the employees was discussed in terms of age. According to qualitative research, the readiness of young people, who have experience and good skills in working with new generation mobile phones and computing electronic machines, is high for the introduction of artificial intelligence programs. However, it is interesting that the quantitative research revealed their neutral attitude. Diagrams 2 and 3 show the attitude towards artificial intelligence programs in terms of age during routine activities and making complex decisions.

Diagram 2. Attitude - routine activities

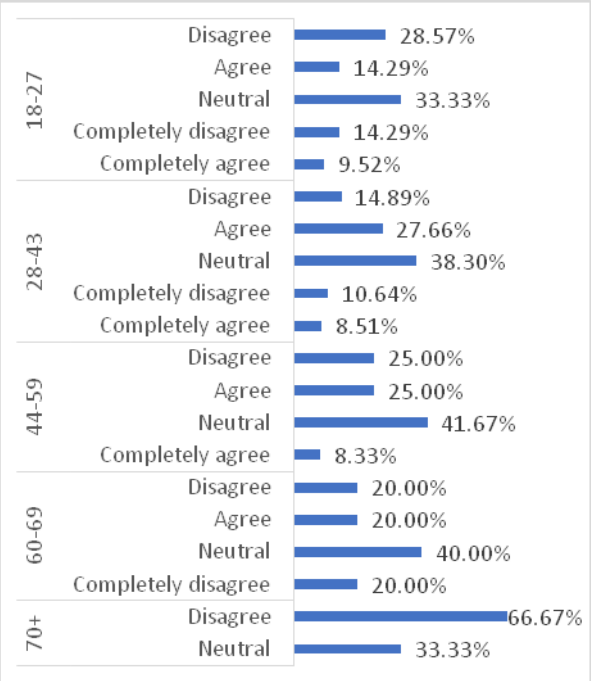
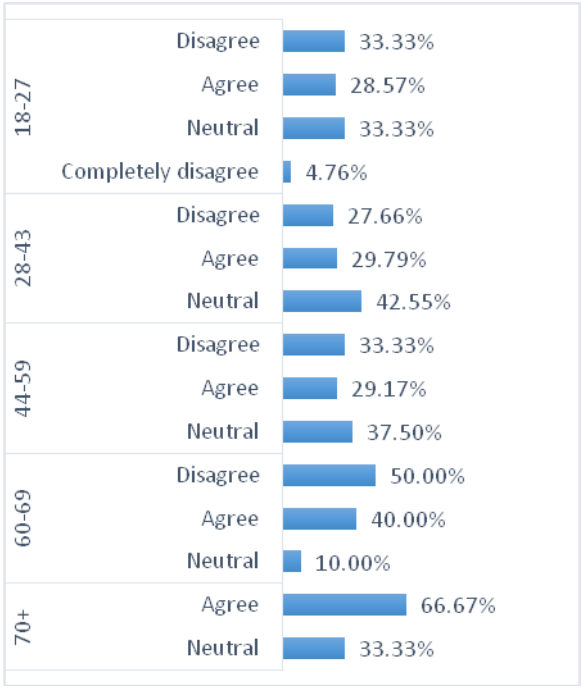


Diagram 3. Attitude - complex decisions



Source: Author's research

Respondents aged 44-59, 28-43 and 18-27 took a neutral position towards routine and complex activities. Respondents aged 60-69 have different attitudes. They are more likely to agree to the use of artificial intelligence programs in making complex decisions, compared to routine activities. Respondents aged 70+ have a positive attitude towards the use of artificial intelligence programs in complex decision-making.

Attitudes change when the use of artificial intelligence programs refers to the personal daily activities of respondents - 51% are positive and 34% are neutral. It is worth noting that when employees are no longer responsible to the company and colleagues, they are more positive and agree to the use of AI programs in their daily activities. The mentioned data provide a reason to assume that one of the factors determining the attitude towards artificial intelligence programs in the work environment is the employee's **responsibility** regarding official duties. One of the reasons may be the fear of **job loss**. This opinion is strengthened by both quantitative and qualitative research, where the respondents note the following: the desire to make tasks easier and minimize the mistakes caused by the human factor is everyone's will, but this process is accompanied by a feeling of slight fear that employees will lose their jobs. It is also noted that some employees are skeptical about the introduction of artificial intelligence programs, because they believe this action can lead to a reduced demand for human resources. According to the results of the quantitative survey, 50% of respondents agree and fully agree with the provision that as a result of the introduction of artificial intelligence programs, many people will remain unemployed.

Another factor determining employee attitudes may be the factor of **trust.** The

analysis of the quantitative research revealed the following situation: 50% believe that artificial intelligence programs may threaten privacy protection; 48% think AI programs can control people; 63% say they may be used for undesirable purposes. These factors identified in quantitative research are shared by respondents of qualitative research and believe that excessive dependence on forecasts without human supervision can lead to critical errors. Qualitative research has revealed another factor, such as **perceived benefits**. Respondents believe, if an employee realizes that an artificial intelligence program can provide accurate and reliable results, perform assigned tasks smoothly and flawlessly, minimize human error, then acceptance will be high. If the relevant AI program confirms the advantage of its use, a positive attitude among employees will increase. One example was considered to replace task that threatens human health with artificial intelligence program. Although qualitative research respondents see threats such as security risk, technological and software gaps, inaccuracy in algorithms and regulatory challenges when implementing AI programs, they remain positive and believe that these threats are manageable, faults can be corrected and if used correctly and thoughtfully, programs will greatly benefit the power system. They also believe that the work performed by the artificial intelligence program should be verified by a specialist.

Based on the qualitative research, AI programs will bring positive results to people. Specialists in the field see wide opportunities when using artificial intelligence programs, which have a positive impact on the country's economy and people's standard of living. These views are also shared by the respondents of the quantitative survey. According to 65% of respondents, artificial intelligence programs can create new economic opportunities for our country, 67% mention that AI programs can improve living standards and 51% consider artificial intelligence programs to bring positive results in the future.

Qualitative research revealed that employees with a **positive set** will receive innovations with enthusiasm. If he/she finds any gaps in the implemented program, he/she will try to correct them; He/she will be focused on self-development, formation of appropriate skills and strengthening engineering knowledge, which he/she will later use to improve the processes of the field and increase productivity. An employee with a **negative set** will try to criticize the new AI programs, resist the introduction of innovations because believes that his/her position at work may no longer be needed. Such an attitude will lead to delays in processes, non-optimal use of artificial intelligence tools and reduced productivity. To encourage a positive attitude, there is a need for proactive involvement in AI-related initiatives and projects, cooperation and knowledge sharing among colleagues, as well as a clear expression of the need for human resources.

Conclusion

Based on the research, the following situation was revealed: 52% of employees have a positive attitude towards the introduction of artificial intelligence programs in general, although human control of AI programs remains a necessary condition for them. A certain negative attitude towards artificial intelligence programs in the work environment was revealed.

Based on the analysis of the research, the following factors determining attitude and set were identified:

Intellectual factor – It is important to know the capabilities and applications of artificial intelligence programs and their use. The more information employees have about artificial intelligence programs, the more receptivity they will have. It is possible to conduct relevant training to raise awareness.

Time factor – The more employees realize that they will save a lot of time with the help of an artificial intelligence program – will perform the assigned work faster, better and with less effort – the more receptivity they will have.

Trust factor – If an employee realizes that an artificial intelligence program can provide accurate and reliable results, perform given tasks flawlessly and minimize human errors, then acceptance will also be high. It should be noted that before the implementation of a program in the system, it is first checked in a simulation environment, then applied in a real one. Only after that, it is put into operation. Such circumstances will contribute to the formation of the trust factor.

Perceived benefit – The relevant artificial intelligence program must confirm the advantage of its use, in which case the attitude is reflected with maximum acceptance.

Fear factor – If employees identify that artificial intelligence programs will not replace human resources, but help them, then acceptance will be high.

Responsibility factor – The higher the employees' responsibility for the assigned duties, the more critical they are towards the introduction of artificial intelligence programs.

Risk factor – If work that causes a threat to human health is replaced by artificial intelligence programs, then acceptance will be very high. Cyber security policies should also be strengthened.

Technical factor – A lot depends on the accuracy and completeness of the algorithms used in the programs. In this case, it will be necessary to be careful, for example, to take into account long trial-test modes can be taken into account.

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