

Article

Improving The Process of Developing Management Personnel Competencies Through Artificial Intelligence

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Abstract: The rapid development of artificial intelligence (AI) technologies has introduced intelligent approaches in various fields. In particular, these technologies play an invaluable role in modernizing the processes of training, retraining, and ensuring the continuous professional development of managerial personnel. This article presents the results of a survey conducted among more than 500 managers working in the public sector to assess the effectiveness of organizing continuous professional development courses and the use of AI technologies in this process. Based on the research results, taking into account the survey results and advanced international practices, an intelligent information system model is proposed. This system is designed to assess the competencies of managerial personnel and automatically recommend key competencies that they need to develop. In addition, the article offers suggestions for mechanisms to digitally manage the process of improving professional competencies, assessing its economic efficiency, and integrating AI tools into this area.

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1. Introduction

In the wake of globalization, special attention is paid to the development of public services by increasing work efficiency through the introduction of innovative technologies in all sectors and ensuring openness and transparency in sectors and industries. The major administrative reforms and trends of recent years require the recruitment, training, retraining and continuous professional development of highly qualified personnel in each sector. In the era of modern technologies, high efficiency can be achieved by implementing innovative approaches to improving the performance of officials. This is because digital technologies today provide many opportunities in public administration, medicine, business, agriculture and other priority sectors, including the management and organization of educational processes, distance and online teaching, the use of educational resources anywhere and at any time, the Integrate interactive methods and determine the learner's personal abilities. Establish a learning path and offer content based on their interests and abilities. This in turn creates convenience for civil servants through intelligent

systems to continuously assess and develop their competencies through interactive resources, simulations and virtual environments without leaving their workplace.

One of the most effective technologies of the industry 4.0 revolution is the integration of AI into various domains and networks, resulting in the widespread use of intelligent technologies in diverse societies. Of course, such technologies offer intelligent management in addition to the digital transformation of the system. In particular, AI technologies enable education to be adapted to the personal needs, potential, learning ability and interests of each individual student.

The use of AI technologies in the process of competency development of public sector managers offers significant benefits. First and foremost, this innovation assesses the professional competencies of managerial personnel and determines the competencies that each of them should master. With the help of generative AI, they can also create various content to continuously develop their skills and act as a virtual assistant. Based on the above capabilities of AI, the continuous training of professional competencies of civil servants, including the digital transformation of the processes to increase the potential of civil servants, as well as the assessment of competencies using AI technologies and the implementation of intelligent educational platforms is one of the most important solutions in one innovative society. Because currently, in the Republic of Uzbekistan there is no unified national educational platform for officials and managerial personnel to continuously improve their skills remotely or online. Existing platforms are mainly used for independent training or organizing some specialized courses. Against this background, the digitization of this area and its improvement through the implementation of an intelligent information system based on AI is an urgent priority.

2. Literature Analysis

A number of researchers are conducting scientific research on the application of digital technologies to the competency development process of managerial personnel, the acquisition of modern knowledge and skills anywhere and anytime through e-learning platforms and Massive Open Online Courses (MOOCs), as well as their effectiveness. At the same time, we can see that many scientists have published articles about the use of AI technologies in the educational process, their possibilities in the teaching process and independent development. Among other things, the academic article "Managerial Competencies and Development in the Digital Age", published in 2021, highlights the lack of development of research analyzing the digital and technology application skills of civil servants. The authors note that there is still little scientific literature on the connection between management skills and digital technologies in the process of digitalization. This increases the need for research to fully understand and develop managerial personnel skills in using modern technologies [1].

At the same time, an academic article published in 2024 examined the importance of digitizing the civil service training process. In this study, the authors analyze the benefits of the digitalization process for the public sector and, in particular, express their views on supporting the adaptation of organizations to digital transformation through quality management [2]. As well as, Brazilian researchers analyze the processes of using distance learning in the process of training, retraining and advanced training of civil servants in the state of Paraná. The authors express their views on the role and effectiveness of digital technologies in improving the skills of civil servants through distance learning. The study examined a master's degree in public administration implemented on a distance learning platform for civil servants in the state of Paraná. According to the results of a closed-ended, 12-question survey involving 670 civil servants, the majority of employees found distance learning convenient and effective. However, most of them preferred using printed books in the learning process, but also reported that they were willing to receive education through digital devices [3].

Additionally, a scientific article entitled "Role of AI in Education" published in 2023 by Alexander Harry, an independent researcher at the University of Washington, USA, states that AI has many possibilities in the process of receiving and providing education

has the potential to develop primarily person-centered education and to make educational content more interesting and effective. He argues that in addition to considering the benefits of using technologies such as machine learning (ML) and natural language processing (NLP) to provide educational content based on learners' teaching outcomes and interests, automatically assessment of their knowledge, digital management of examination processes, analysis of results and add other advantages. It is important to take into account the specific problems of using such innovative technologies in the educational process, namely the protection of personal data, ensuring transparency, fairness, and ethical aspects [4].

Since the beginning of the 2000s, numerous measures have been taken to reform and develop the state civil service in the Russian Federation. In this process, a federal program was developed that provides for the introduction of effective personnel technologies and innovative methods for improving the professional competencies of civil servants. The authors emphasize that measures for the professional development of civil servants can only be successful if they are appropriate to their profession and position. This means that every civil servant is obliged to acquire specialist knowledge and skills in accordance with their tasks, position and functional area. At the same time, it is also necessary to develop professional and personal qualities and it is important that this process is carried out using effective methods. This approach presented by researchers shows the importance of professional development of civil servants and effective teaching of the necessary skills in a modern management system [5].

In addition, many scientists and researchers have conducted scientific research on the use of innovative technologies in the educational process, including the development of ICT skills in the process of training civil servants through distance and online education [6] and the implementation of e-learning platforms in the process of training civil servants in China [7], the effectiveness of digital training in the continuous professional development of civil servants [8], the concept of using AI in distance learning [9], along with the development of intelligent, adaptive e-learning systems and their benefits for learners [10], intelligent adaptive e-learning model for learning management system that achieved an accuracy rate of 85% when integrated into distance learning [11], the widespread application of AI technologies in education, their current status and future prospects [12], the role of AI in the Education, the development of chatbots and personalized education [13], a system model for assessing student competencies based on machine learning models and making recommendations for each of these models [14], Generative AI, its possibilities in education [15], the transforming from Education 4.0 to Education 5.0 highlights the role of generative AI in fostering more advanced, learner-centered educational environments [16] as well as many other scientists and researchers have conducted scientific research on the use of innovative technologies in the educational process, including in the process of training and continuous development of personnel.

The analysis of advanced foreign experience and literature shows that the continuous improvement of the competencies of managerial personnel is now a requirement of the time and the digitalization of this process is one of the innovative solutions. However, it is important to conduct scientific research to assess the competencies of civil servants and to introduce intelligent information systems that, based on their knowledge and skills results, suggest the core competencies that each managerial personnel should master. At the same time, managing the process of training civil servants based on the competency model through digital transformation requires the development of mechanisms to improve this system. Against this background, the process of continuous development of the skills of public service managers and modernization through the use of AI technologies is relevant for shaping a digital society

3. Materials and Methods

As part of this research, advanced foreign experience in the digital transformation of the process of continuous development of the competencies of civil servants, including managers, was analyzed. In particular, the effectiveness of improving competencies in the public administration system using digital technologies and the importance of the

innovative methods used for this purpose were examined. The information from the platform for the continuous development of managerial personnel (<https://lifelearning.uz>) was compared with the TensorFlow model and how the information snippet works about which competencies they should master. At the same time, a SWOT analysis of the application of AI to the process of competency development of managerial personnel was carried out. Particular emphasis was also placed on the collection, grouping and analysis of data used in the formation of management competencies to teach personnel in a distance and traditional way on the basis of modern educational platforms. In addition, logical and comparative analysis methods were used to identify the most effective ways of training and competency development for civil servants.

4. Results and Discussion

On the one hand, the professional competencies of managerial personnel contribute to the efficiency and strategic development of the organization in which they work, and on the other hand, they support employees in their personal development and continuous growth. Taking these factors into account, almost all developed countries today have established competency models for entering the civil service, appointment or promotion to positions, continuous development of professional competencies, their assessment and personnel training. Table 1 below provides an overview of the competency models adopted by foreign countries for public officials, including managerial personnel, as well as the competencies required for effective performance of public functions.

Table 1. Competency Models for Civil Servants Across Countries (Data compiled by the author).

T/r	Country	Competency Model	Competencies
1	Great Britain	Success Profiles	1. Behavior 2. Focus on strengths 3. Competence (ability) 4. Practical skills 5. Technical skills
2	USA	Executive Core Qualifications	1. Managing conflict 2. Using diversity (design thinking) 3. Building a team 4. Professional knowledge 5. Collaboration competence 6. Strategic thinking
3	Canada	Key Leadership Competencies	1. Creating a strategic vision 2. Mobilizing people (teamwork) 3. Promoting integrity and respect 4. Communicating with partners and stakeholders 5. Driving innovation and leading change 6. Achieving results
4	South Korea	Korean Competency Model	1. Problem identification 2. Strategic thinking 3. Change management 4. Performance orientation 5. Customer satisfaction 6. Alignment and integration
5	Singapore	Public Service Core Competency Framework	1. Clear thinking and sound judgment 2. Commitment and dedication 3. Effective engagement with citizens and stakeholders 4. Public service values 5. Innovation and continuous improvement

			6. Learning and applying skills Additional resources for managers and leaders: 7. Planning the management system for today and tomorrow 8. Caring for, developing, and inspiring employees
6	Finland	Selection Criteria for Senior Management Posts	1. Human resource management 2. Improving and controlling efficiency and quality 3. Focusing on organizational needs 4. Influencing the environment and managing changes 5. General competencies in public administration 6. Continuous development ability
7	Russia	Model of Professional and Personal Competencies	1. Strategic thinking 2. Communicativeness 3. Personal effectiveness 4. Change management 5. Leadership 6. Decision-making in management
8	Malaysia	Leadership Competencies (INTAN)	1. Appropriate behavior and values 2. Professionalism 3. Result orientation 4. Project management 5. Innovation and communication technologies
9	Kazakhstan	Competencies of a Civil Servant	1. Activity management 2. Development of competence 3. Decision-making 4. Efficiency and flexibility 5. Self-development
10	Uzbekistan	Key Competencies for Management Personnel	1. Innovation orientation 2. Project management 3. Leadership 4. Civil servant ethics 5. Positive thinking 6. Teamwork 7. Building trust 8. Business communication 9. Result orientation

The professional competencies of civil servants play a dual role: they promote the effectiveness and strategic development of the organization while promoting the individual growth and continuous self-improvement of employees. Given this, most developed countries have established competency models to guide key aspects of civil service. These include entry into public service, appointments or promotions, ongoing development of professional skills, assessment of competencies and training of staff. For further context, Table 1 lists the competency models used in different countries for public officials, particularly managerial personnel, and describes the essential competencies required for effective public service performance.

Undoubtedly, the continuous development of managerial personnel competencies is crucial to the effectiveness of public administration. Today, this process is becoming increasingly efficient through the integration of digital technologies. Particularly when looking at experiences abroad, it becomes clear that effective initiatives are being implemented to digitize systems for training public officials and promoting their continuous professional development. Countries such as the US, UK, Canada and

Singapore have made significant progress in integrating digital technologies into public administration. For example, the Federal Employment Law Training Group (FELTG) in the United States has introduced digital learning platforms that not only expand leaders' technical knowledge but also improve their communication and decision-making skills. FELTG platforms provide tailored educational content that automatically adapts to each learner's individual needs and development levels. In addition, the U.S. federal government launched the USA Learning platform, which serves as the official distance learning and professional development platform for federal employees.

In the UK, the Civil Service Learning (CSL) platform was introduced as a digital education and training system for all civil servants. The main objective of CSL is to improve the professional skills of civil servants and to provide continuous opportunities to acquire knowledge essential for the effective management of the public service. This platform offers a wide range of resources including distance learning courses, online materials and personal training content for various areas of professional development.

In Canada, opportunities for continuous training for civil servants have also been digitized. For example, in 2022, the Canada School of Public Service launched a new digital learning platform to enhance the professional development of government employees. In addition, the Digital Academy platform was launched to ensure the continuous improvement of civil servants' digital skills. Through its Digital Accelerator program, the platform provides digital training resources that enable employees to apply digital technologies in real-world scenarios and gain practical experience. The platform also has micro learning capabilities that allow users to quickly acquire important knowledge in a short period of time. Likewise, Singapore places great emphasis on developing training programs based on digital transformation to continuously improve the skills of its public administration workforce. The Singapore Civil Service College uses digital learning platforms that integrate AI technologies to automate management processes and improve the efficiency of civil servants. Singapore's experience shows how AI technologies can significantly improve the monitoring and analysis of management activities and lead to significant improvements in overall effectiveness.

Another initiative by the Singapore government is the LEARN Digital Classroom, a digital education platform that aims to improve the knowledge and skills of civil servants in line with modern requirements. This platform allows government employees to access education electronically and improve their skills in various fields. The platform allows users to enroll in online courses, download resources and continuously acquire knowledge relevant to their respective sectors through a personalized learning approach. In addition, the United Nations Public Administration Network (UNPAN) Online Training Center provides high-quality, free online educational opportunities for civil servants and citizens worldwide on various public administration topics. The main objective of this training center is to support the achievement of global goals by improving modern knowledge and skills in the field of public administration.

On this basis, the *ilm.argos.uz* platform developed and implemented by the Agency for the Development of Public Service under the President of the Republic of Uzbekistan, which provides open resources to support the continuous capacity building of public officials. However, the platform does not currently integrate innovations that could assess the professional competencies of civil servants and automatically offer individualized content tailored to their specific needs.

In addition, the *Lifelearning.uz* platform launched by the Academy of Public Administration and enriched with important resources, aims to support the self-development of public servants. This platform includes a function for assessing the previous knowledge and skills of civil servants and recommending relevant professional development courses based on the assessment. There are currently over 10 online courses offered, with a diagnostic assessment system that assesses users' knowledge and skills for

each course. Based on the evaluation results, the platform recommends courses tailored to the specific learning needs of each officer. As an opensource system, the platform offers civil servants a sustainable opportunity to continuously develop their professional competencies. This approach not only increases efficiency but also achieves economic benefits by reducing the costs associated with traditional training methods. As well as, the platform enables continuous monitoring and digital management of learning outcomes, enabling the creation of modern, trend-driven training courses. As a result, this allows civil servants to improve their skills without interrupting their job duties, while providing data-driven insights for appointments and decision-making processes. Additionally, incorporating technologies such as machine learning (ML), deep learning (DL), and natural language processing (NLP) would further improve the interactivity and personalization of the platform. These technologies could expand its capacity for individualized learning by making the system more responsive to each managerial personnel's individual needs and adapting it to cutting-edge continuously professional development.

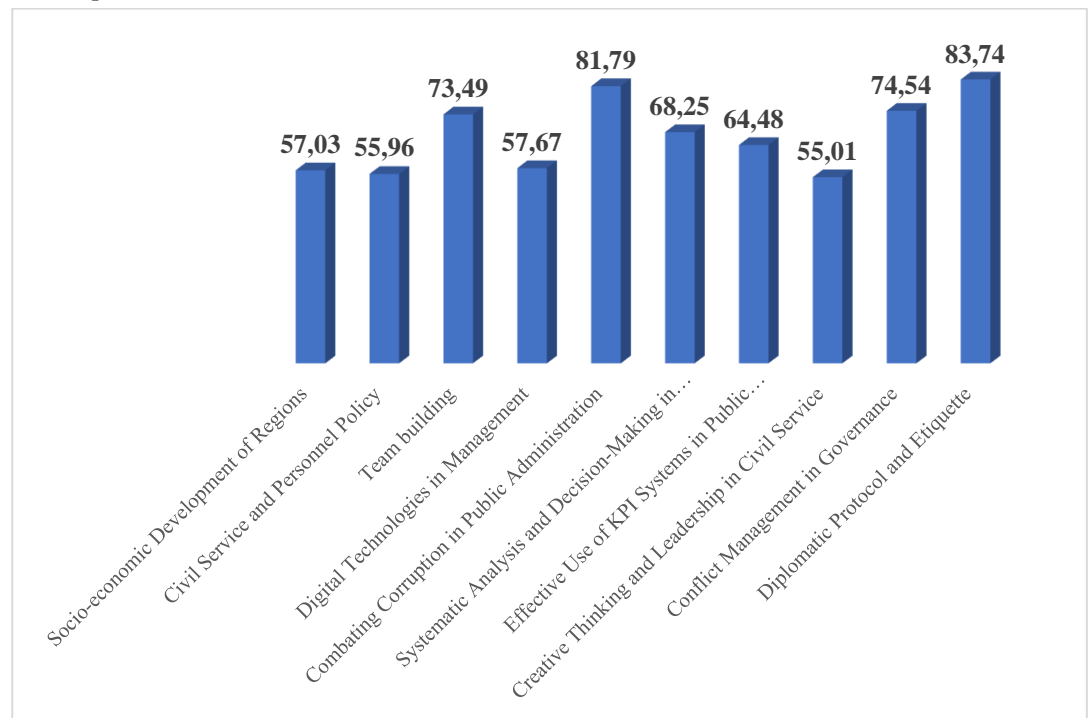


Figure 1. Results of an Independent Assessment of Knowledge and Skills Conducted via the lifelearning.uz Platform.

The results shown in Figure 1 primarily use methods to assess the hard skills of civil servants. However, integrating machine learning algorithms within AI into this process would enable the introduction of modern competency assessment methods. Based on the results obtained, it would be possible to implement a system that uses the Google TensorFlow model to recommend individual competencies that each civil servant needs to develop. This approach would play a crucial role in developing mechanisms to improve this area and provide a valuable basis for future management decisions. In order to digitally transform the process of continuous professional development for managerial personnel, a survey entitled "What formats of training do you think is most effective for developing the competencies of public servants?" was conducted. The participants included civil servants of specialized retraining courses at the Academy of Public Administration under the President of the Republic of Uzbekistan, including members of the "Future Leaders" and "School for Women Leaders" programs, as well as representatives of local government bodies, reserve personnel and managers of ministries,

agencies and organizations. The survey was conducted online via Google Forms, with nearly 500 senior-level public officials participating (as shown in Figure 2).

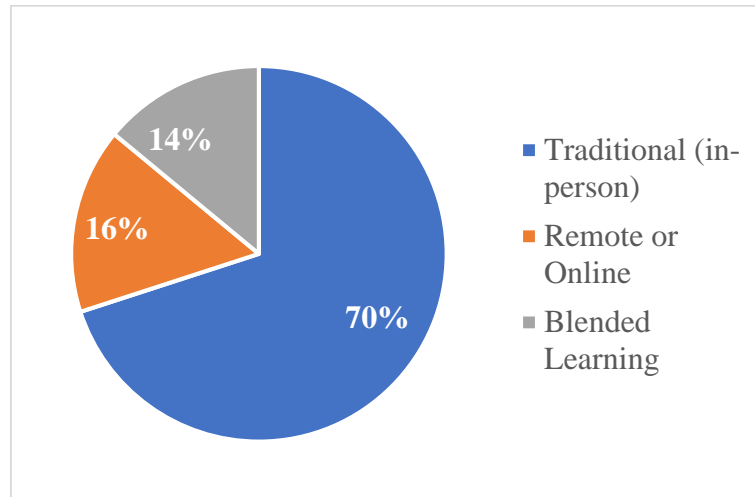


Figure 2. Online survey results on preferred format of competencies development training courses (Source link).

The results of the online survey illustrate that the majority of civil servants see traditional (in-person) formats as the most effective method for continuous competencies development. Furthermore, when asked “Do you think that integrating AI technologies into the continuous competency development process for civil servants would be effective?”, more than 80% of participants answered “yes”. This result highlights the importance of implementing intelligent platforms that save time and convenience and allow managers to expand their skills at any time. The integration of such platforms into practice represents a crucial direction in the digital transformation of this area. These advances are in line with the concept of digital governance and offer the following advantages: Facilitating digital competency management, Enabling the creation of tailored content, as well as to the needs core competencies by managerial personnel, supporting data-driven decision-making processes through big data analysis, promoting transparency and openness within the system. The use of AI technologies in the development of managerial personnel competencies not only modernizes the process, but also ensures greater efficiency and adaptability to current requirements.

At this point, it is important to highlight the key opportunities that AI technologies offer to improve the process of competency assessment and continuous development of managerial personnel. The following opportunities stand out as critical areas for development:

Automation of competency assessment. Using machine learning models to automate methods for assessing managerial competencies.

Competency recommendation systems. Develop systems that recommend specific competencies that civil servants should acquire using advanced models such as Google TensorFlow or PyTorch.

Content development with generative AI. Creating content to support competency assessment and development through generative AI models, enabling personalized learning materials and training resources.

Virtual assistants with GPT models. Implemented GPT-based virtual assistants to provide personalized guidance and on-demand support to managerial personnel during training and development processes.

Modernizing skills development. Modernize the civil service training, retraining and professional development process based on competency models to ensure training programs are aligned with modern educational practices and industry requirements.

Data-driven strategic decision-making. Enabling data-driven decision-making and digital management of training processes through the use of predictive analytics that enable strategic decisions in staff preparation, training and development.

Taking into account the growing potential of AI technologies in the education sector, it is crucial to establish an AI-based system for the continuous development of the competencies of public sector managers. This system is shown in Figure 3 and illustrates the key components and structure of the competency development process based on AI technologies.

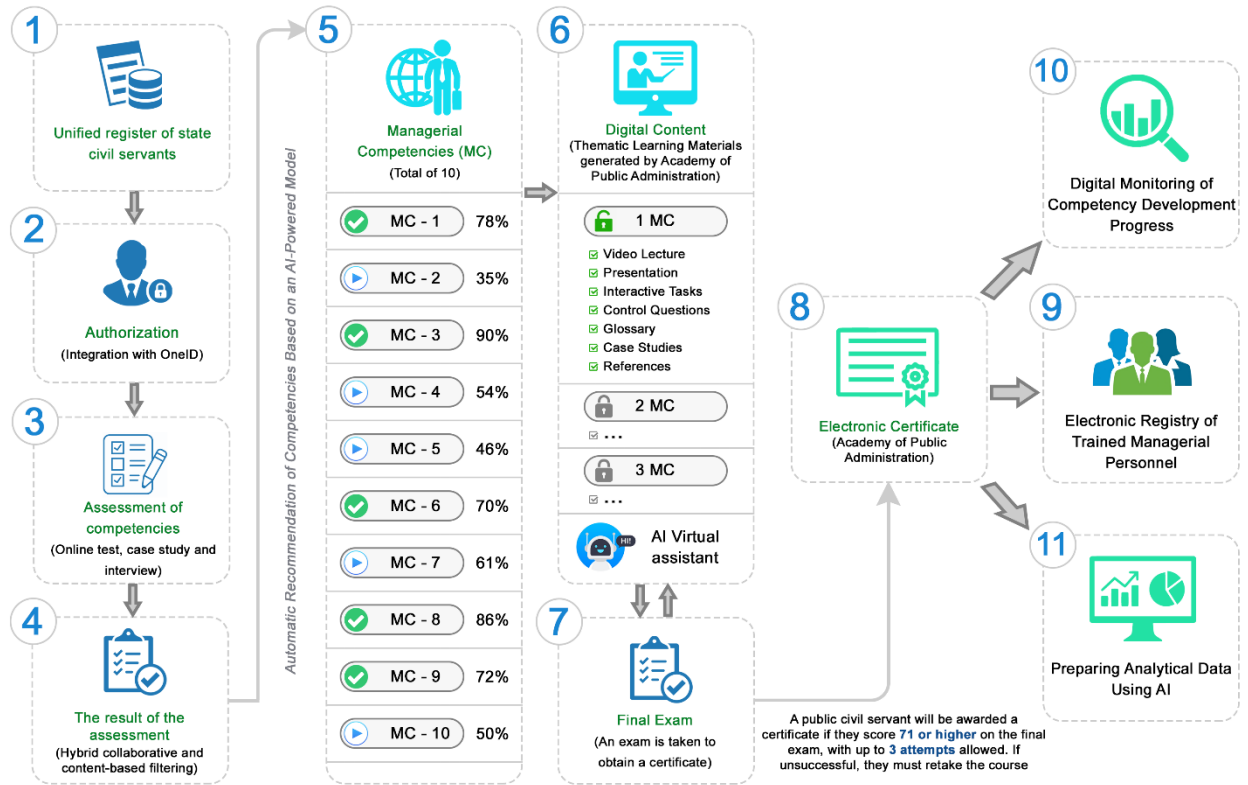


Figure 3. Model of the Intelligent Information System for the Development of Managerial Personnel Competencies (Model created by user).

The proposed mechanism aims to introduce an intelligent information system that creates a virtual environment in which public servants can learn at any time in a self-directed manner, assess their competencies and continuously improve their potential. By using modern digital technologies and innovative methods, the system enables officers to pursue self-directed, continuous professional development. By implementing this system, managerial personnel will be able to independently assess their knowledge and skills, while the system itself will analyze the areas that require improvement and recommend the development of core competencies. This will result in the launch of an AI-powered self-development platform for over 118,000 civil servants currently employed in the Uzbekistan public service. The system also supports compliance with legal requirements that require every civil servant to complete at least: one continuing education course every three years. This system enables continuous monitoring of compliance with this requirement while increasing profitability two to three times.

The Academy of Public Administration and its branches are currently offering training programs for around 5,000 civil servants in the 2023/2024 academic year, and this number is expected to increase to 8,500 in the 2024/2025 academic year. However, by digitizing the process and integrating AI technologies, it will be possible to facilitate the continuous development of civil servants' professional competencies through both traditional and distance learning formats, ultimately leading to significant improvements in economic efficiency. This transformation will enable the creation of a hybrid learning

approach where AI technology supports both face-to-face and online learning, optimizing the professional development process. The system's ability to recommend personalized learning paths, ensure continuous monitoring and promote efficiency is in line with global best practices for digital transformation in public administration.

Table 2. SWOT Analysis for Improving the Process of Assessing and Developing Managerial Competencies through the Application of AI (Data compiled by the author)

Strengths	Weaknesses
<p>High efficiency: AI automates the process of individual assessment and development and reduces errors caused by human factors.</p> <p>Personalization capability: It offers an individual learning and development program for each manager.</p> <p>Rapid decision making: Real-time analysis and skills recommendations are provided.</p>	<p>Digital infrastructure issues: Insufficient technological and resource (big data) support for the implementation of AI.</p> <p>Lack of qualified personnel: There is a shortage of employees with specialized knowledge and skills Manage and implement AI systems.</p> <p>Financial Constraints: Software development and maintenance requires significant financial resources.</p>
Opportunities	Threats
<p>Automated competency assessment: AI enables the assessment of managerial competencies without human intervention and enables role recommendations.</p> <p>Creation of an interactive information system: It provides personalized development recommendations based on the personal skills and potential of each manager.</p> <p>Digital governance: Through the competency model, it facilitates and supports the automation of personnel training processes strategic decision making for system improvement.</p>	<p>Data security and ethical guidelines: The growing need to protect personal data and the potential for ethical violations in the use of AI can lead to legal problems.</p> <p>Incorrect decision making: Errors in input data or system malfunctions can lead to incorrect decisions.</p> <p>Increased inequality: Misuse of AI in managerial personnel assessment and development can lead to unfair treatment and inequality.</p>

The SWOT analysis shows that although the use of AI technologies in the process of developing managerial personnel competencies offers several advantages, it also presents certain challenges. Therefore, before implementing such innovative technologies in any sector, it is essential to conduct pilot testing and ensure that human oversight is maintained over critical decision-making processes. Currently, systematic reforms are being carried out in the Republic of Uzbekistan to improve the processes training, retraining and continuous professional development of civil servants. Given these developments, using AI to improve the process of developing management skills can lead to significant efficiency and effectiveness. This approach enables personalized learning, continuous

assessment and data-driven decision making, ultimately supporting the broader goals of digital transformation in professional competency development process of civil servants.

5. Conclusion

In conclusion, it is important to emphasize that the digital transformation of the process of increasing the potential of managers, based on the possibilities of innovative digital technologies and interactive learning tools, not only saves time, but also opens up opportunities for them to continuously develop and acquire professional competencies without leaving their jobs. In addition, the integration of AI technologies into this process makes it possible to create a personalized environment for each managerial employee, allowing them to continuously improve their competencies throughout their career. This approach highlights the importance of creating an interactive information system on the proposed model of continuous competence development for civil servants. Such a system would enable an individualized approach to professional development and ensure that each senior employee receives ongoing feedback and recommendations for competency development.

One of the main expected results of the implementation of this interactive information system is the creation of a unified electronic register that tracks the professional development progress of civil servants. This register enables the collection and integration of information about managerial personnel' professional development activities, thereby supporting the creation of a reserve pool of high-potential managers. The system also enables the digital management of competency development processes, ensuring better control and transparency. As well as, the availability of digital data from the system will make it easier to conduct analytical research and predictive analysis. This, in turn, will support the continuous improvement of the intelligent information system and lead to the development of additional functionalities aimed at optimizing the performance of the system and supporting decision-making processes.

The following suggestions are recommended to improve the process of developing managerial personnel competencies through the use of AI technologies:

Effective organization and digital management of continuous competency development. Develop an approach to effectively organize and digitally manage the continuous development of managerial competencies for civil servants use AI technologies.

Applying machine learning to analyze learning outcomes. Improving the process of analyzing learning outcomes at the end of training for civil servants. This is achieved by applying a model based on TensorFlow machine learning libraries, which allow for more effective analysis of performance indicators.

Develop a self-learning (self-development) system. Improve the self-learning system by introducing a platform that allows civil servants to learn and develop themselves. This system is established through the implementation of lifelearning.uz platform that enables a diagnostic assessment of knowledge gaps and learning needs. Based on the results of this assessment, the platform recommends relevant learning content to support independent learning.

Implementation of AI-based "Intelligent Information System". Introduction of an AI-powered intelligent information system to improve the processes of competency assessment, continuous development and personalized learning. The system supports competency assessment, enables the continuous development of competencies and enables the determination of the individual learning of each employee.

Therefore, the digital transformation of the continuous competency development process through the use of AI technologies will enable the development of an individualized learning approach. This approach is based on each manager's personal abilities and provides guidance on which competencies need to be developed, supports

independent learning and encourages self-improvement. As well as, it leads to digital control of processes and an increase in profitability.

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