Implementation of AI in program-based governance in Azerbaijan

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Abstract.
In contemporary governance, program-based governance has gained widespread adoption across various sectors. However, the increasing demand for human labor in data management, transmission and analysis poses challenges to efficient administration. As societies grapple with increasingly complex challenges, the need for efficient and adaptive governance mechanisms becomes paramount. In response, the intersection of artificial intelligence (AI) technologies and program-based governance presents a way for enhancing overall managerial efficiency. This article provides a comprehensive overview of program-based governance within the framework of the monitoring and evaluation process using the insights of Azerbaijan. The exploration of case studies and practical applications—a personalized chatbot model created using advanced natural language processing such as GPT, the article identifies key functionalities where strategic AI integration can optimize and strengthen programmatic management. In the first implemented solution, users can swiftly obtain a summarized results on the progress reports, including details on goal achievement, challenges, and other pertinent information in Azerbaijani language, through the personalized bot on the portal.

Keywords:
Program-based governance
Artificial Intelligence
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Introduction

Program-based governance emerges as crucial within governmental structures due to its capacity to furnish a systematic and strategically oriented framework essential for effective public administration. This strategic alignment stands as an element, ensuring that governmental efforts are purpose-driven and effectively directed toward the achievement of strategic goals and overarching priorities. This is achieved by organization of diverse initiatives into cohesive programs, thereby ensuring that governmental endeavors directly contribute to achieving specific outcomes and broader visions delineated in policy agendas. This framework serves as a comprehensive platform equipped with precise metrics, facilitating a rigorous assessment of outcomes, impact, and the effectiveness of implemented policies. This, in turn, enables governments to engage in systematic performance measurement and evaluation. The consolidation of all data within a centralized platform, in turn, empowers the government to conduct systematic and result-based monitoring and evaluation. During this period, there is a notable augmentation in the transparency, trust and accountability in government activities afforded by program-based governance. Furthermore, it facilitates inter-agency cooperation, fostering a more integrated and coordinated approach to problem-solving. Another pivotal function of program-based governance lies in its data-centric nature, offering a structured framework for the timely identification and management of risks. This approach encourages governments to make evidence-based decisions taking into consideration incorporating data, identified challenges and risks.

The primary objective in the upcoming phase is to infuse renewed vitality into this data-centric program-based governance by harnessing the capabilities of artificial intelligence. In the context of program-based governance, the transformative potential of artificial intelligence empowers governments to utilize data-driven insights, enhancing decision-making processes and overall efficiency and effectiveness.

The initial segment of this article delineates the execution of the monitoring and evaluation process within the
paradigm of program-based management, illustrated through the case study of Azerbaijan. Subsequently, in the second section, we scrutinize extant challenges and examine strategies for the application of artificial intelligence in this context.

**Program-based governance in Azerbaijan**

In 2022, through a Presidential decree in Azerbaijan, the "Socio-economic Development Strategy of the Republic of Azerbaijan for 2022-2026 [1]" (hereinafter referred to as the Strategy) was ratified. This strategic initiative aims to attain sustained and robust economic growth, enhance resilience to both internal and external influences and improve a dynamic, inclusive, socially just society. The strategy also aims to develop competitive human capital, foster modern innovations, and position Azerbaijan as a "green growth country" over the next decade. The strategy outlines five national priorities, with a prominent focus on the great return to the liberated territories, identified as a key priority for Azerbaijan's 2030 goals. Consequently, to facilitate the reintegration into economic activities and establish a high-quality ecological environment in these areas, the "I State Program on the Great Return to the liberated territories of Azerbaijan [2]" (hereinafter referred to as the State Program) was approved, by the Decree of the President of the Republic of Azerbaijan. Furthermore, to expedite the socio-economic development of the Nakhchivan Autonomous Republic, in 2023 "The State Program for the Socio-economic Development of the Nakhchivan Autonomous Republic for 2023-2027 [3]" has been approved. The responsibility for results-based monitoring and evaluation (M&E) of the efficient implementation of measures has been delegated to the Center for Analysis of Economic Reforms and Communication (hereinafter referred to as the Center), a Think Tank in Azerbaijan, as mandated by the order of the Cabinet of Ministers.

The Center has established monitoring and accountability portals for the socio-economic development strategy in 2022-2026 (azerbaijan2030.gov.az), the "State Program on the Great Return to the liberated territories" (boyukgayidish.gov.az) and the "State Program for the Socio-economic Development of the Nakhchivan Autonomous Republic for 2023-2027" (nakhchivan2027.monitoring.gov.az). The primary objective
behind establishing the portals is to guarantee effective oversight of work progress, M&E of the implementation of measures outlined in both the Strategy and State Programs on a semiannual and annual basis within the framework of program-based governance. The portals streamline all accountability-related processes, organizing them into four-tiered pyramids representing national priorities, activity directions, measures and output and outcome impacts. These indicators align with the quantitative and qualitative objectives set by the executive institutions in the Strategy and State Programs and are automatically integrated into the accounts of executive institutions on a monthly, semi-annual and annual basis. Information on indicators incorporate both structured and unstructured data, presented in the following formats:

- Textual information outlining the work accomplished up to the current period;
- Various file data (pdf, image, word, etc.) associated with the specified performance indicators;
- Indicators detailing implementation quantity (digital data) and quality (yes - full implementation, no - implementation not initiated, partial - incomplete implementation).

After undergoing diverse approval processes in the workflow of the portals, the recorded data is systematically entered into the account of the monitoring and evaluation institution, CAERC. Following this, CAERC conducts a comprehensive analysis of the data, meticulously verifying its accuracy. In conjunction with the information available on the especially boyukgayidish.gov.az portal, various electronic tools are employed to support not only the analysis but also the future decision-making process. This dataset encompasses:

1. Each indicator, representing physical objects, is integrated into a dynamic map. This map enables the execution of a comparative analysis over a specified time period, allowing for the measurement of distances and areas between the depicted objects.
2. The portal incorporates live services and interactive maps seamlessly connected to other institutions through an Application Programming Interface (API). This location
intelligence encompass an digital map of water, a map of geographical features, a cadastral system, a construction control map, a mine clearance map, and a railway map.

3. The portal features also thematic maps organized into sectors based on regions. These sectors encompass urban planning, agriculture, natural resources and geomorphology.

4. Real-time monitoring [4] of extensive infrastructure objects has been facilitated through the deployment of video cameras.

Accurate, actionable, and predictive [5] analyses can be conducted using extensive data from a centralized portal. Following analysis, data validation is achieved through meticulous annotations and corrections. Confirmed information facilitates automatic reporting on the portal. Furthermore, CAERC generates summarized progress reports outlining the accomplishments, challenges, risks and recommendations pertaining to the work completed in alignment with the priorities of the Strategy and State Program. This monitoring and evaluation system, characterized by its operational efficiency, data-centric approach and results-based methodology, not only supports program-based governance but also integrates medium-term expenditure frameworks and output based budgeting. Such program-based governance further expands possibilities for innovative management practices.

**AI application in program-based governance**

Numerous challenges were encountered during the automation of processes on the boyukgayidish.gov.az portal, prompting the consideration of employing artificial intelligence (AI) as a suitable solution. The primary objectives of integrating AI into the monitoring and evaluation process and progress report preparation encompass the following:

- Analysis of structured and unstructured data. Analysis of given both structured and unstructured data - textual information and preparation of summarized content;
- Data analysis from various sources. Analyzing data derived from diverse sources [4], including live surveillance cameras, images, interactive and thematic maps and aiding in the determination of project activity indicators;
- Aggregation of Information from Official Web Resources.
Collection of information not only from the designated institutions but also from other official web resources, enriching the dataset used to assess indicators;


Key perspectives into the influence of artificial intelligence on M&E were elucidated in the "Next Generation Professional" [5] survey conducted in 2018 by Devex (a media platform and network center for professionals in the international development sector dedicated to achieving the SDGs) and DAI (an international development consulting company specializing in project implementation and technical assistance to address development challenges in various countries). In a survey encompassing over 2,500 development experts, approximately 25% of participants indicated that artificial intelligence is poised to exert a significant impact on M&E in the future, potentially transforming it into a global development field. The swift evolution of artificial intelligence has spurred diverse innovations in methods for data collection, structuring, validation and processing, all aimed at bolstering M&E processes. Considering the data available in the portal, the application of artificial intelligence for various purposes during monitoring and evaluation is deemed feasible. AI has the capability to analyze data [6] across various sectors such as education, health, and social welfare, enabling an assessment of government program performance and informed decision-making. Furthermore, AI can anticipate future trends and outcomes by leveraging input data, playing a crucial role in decision-making processes and optimizing resource allocation strategies.

Leveraging natural language processing (NLP) [7] in both syntactic and semantic analyses will enable the swift processing, validation, and analysis of text data entered
into the portal. Harnessing the capabilities of NLP unlocks the potential for processing and analyzing extensive volumes of textual data. It excels in extracting structured information from unstructured text, adeptly identifying key entities and transforming data into a more organized and accessible format. This model substantially augment the portal's search functionality, streamlining the efficient retrieval of pertinent information.

Moreover, NLP plays a pivotal role in document summarization, presenting users the essential points without the need for exhaustive content exploration. The dynamic functionality of NLP extends to powering personalized chatbots [8] and virtual assistants, fostering natural and engaging interactions with users. A standout feature lies in NLP's support for language translation, enabling the portal to deliver content in multiple languages.

Computer vision (CV) [9] empowers the automated scrutiny of images and videos, offering the capability to discern and distinguish objects and patterns within visual data. This functionality significantly contributes to a more profound comprehension of the information housed in the portal. In the realm of interactive and thematic maps, CV proves instrumental in scrutinizing geographical features, identifying landmarks, and extracting pertinent data. This augmentation enhances map functionality by introducing additional layers of information through the automated analysis of visual elements.

CV algorithms play a pivotal role in the automatic tagging and categorization of images and videos based on their content. This automated organizational system streamlines user accessibility, facilitating the retrieval of specific information through visual queries. Furthermore, CV's application extends to the identification of potential security threats and the surveillance of infrastructure projects. Additionally, CV [12] automates critical processes such as attendance monitoring and supply chain tracking, offering a multifaceted solution to enhance operational efficiency and security measures within the portal.

Given the extensive volume of reports accessible on the centralized boyukgayidish.gov.az portal, obtaining detailed information efficiently becomes a challenge. In the present
case, a customized chatbot [13] model, leveraging advanced natural language processing like GPT, was developed. Specific data is meticulously fine-tuning to enhance the chatbot's [10] customization and the model underwent fine-tuning to increase its accuracy in generating relevant responses. Continuous monitoring, analysis, and updates to the chatbot's performance ensure ongoing improvements. Consequently, users can swiftly obtain a summarized results on the progress reports, including details on goal achievement, challenges, and other pertinent information in Azerbaijani language, through the personalized bot on the portal.

**Conclusion**

In this research paper, we introduce a novel artificial intelligence approach aimed at addressing challenges encountered in program-based governance, particularly within the context of the monitoring and evaluation process. Initially, we introduce a distinctive instance of program-based governance implemented in Azerbaijan, specifically focusing on the digitalization of the monitoring and evaluation process. This example delves into the outcomes and budget-based monitoring and evaluation procedure within a centralized database framework. Subsequently, we purpose the integration of artificial intelligence models leveraging the current database. This methodology seeks to enhance the efficiency of the monitoring and evaluation process by harnessing the database, minimizing reliance on human labor, improving user experience, enhancing accuracy and augmenting the portal's functionality in identifying risks, challenges and conducting predictive analysis. In our future endeavors, we plan to subject the proposed artificial intelligence models to conduct testing on the portal, aiming to explore diverse opportunities for enhancing governance functionality.

**References:**


INFORMATION AND WEB TECHNOLOGIES