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CENTER for DIPLOMATIC AFFAIRS and POLITICAL STUDIES

ANALYSIS

LOCAL DEMOCRATIC PARTICIPATION PROCESSES FROM AN ENGINEERING PERSPECTIVE

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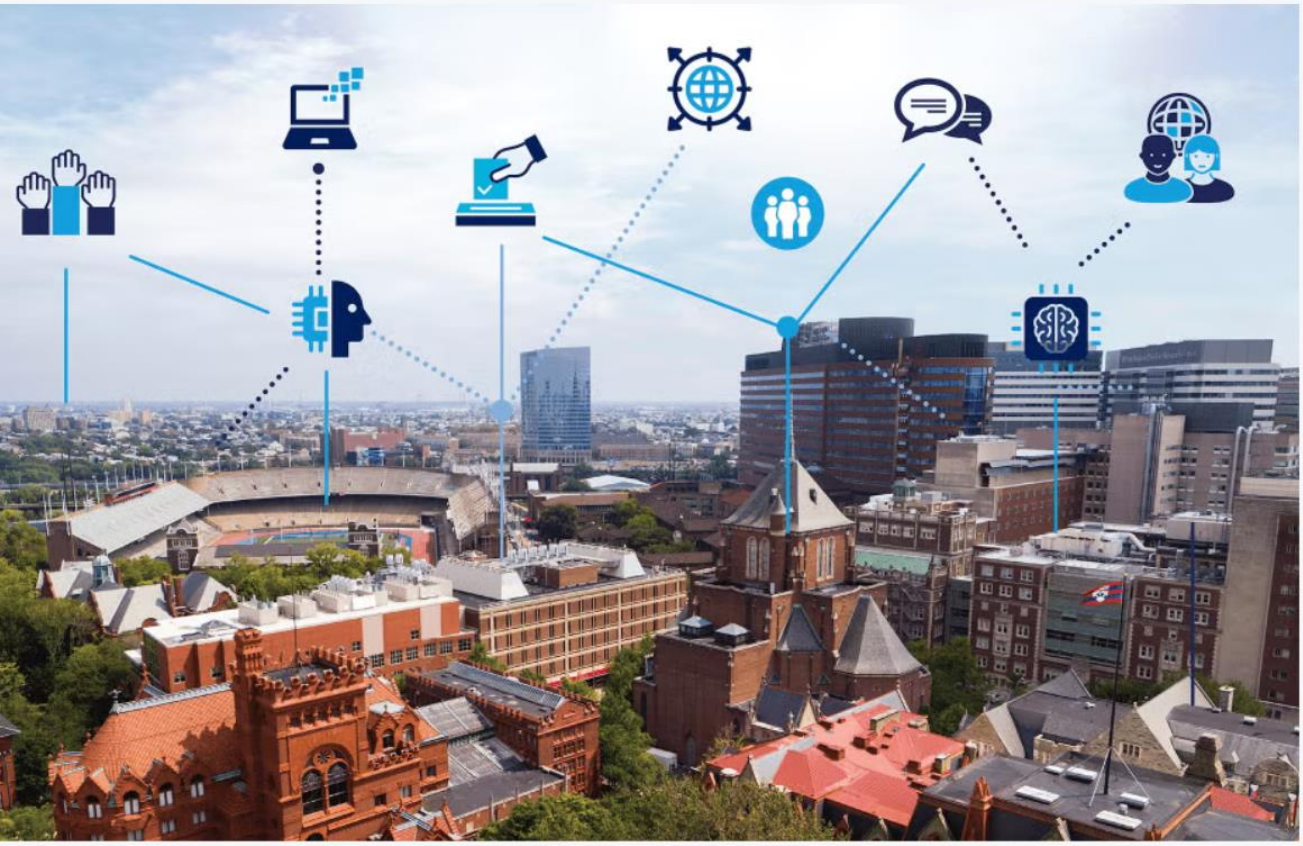

LOCAL DEMOCRATIC PARTICIPATION PROCESSES FROM AN ENGINEERING PERSPECTIVE

Local governments are among the most fundamental institutions established to meet the collective and local needs of citizens within national boundaries. In contemporary contexts, the problems encountered in the functioning of these institutions not only disrupt the natural and efficient operation of the system but also negatively affect citizens' ability to benefit from the services provided by public authorities. Moreover, these challenges adversely influence public participation in democratic governance processes. In the existing literature, such problems are predominantly approached from a political perspective. However, this study adopts a novel standpoint by addressing the challenges faced by local governments through an engineering-oriented approach, aiming to develop efficient and sustainable solutions.

Ensuring the principles of **accountability and transparency** in local governments increases citizens' trust in public administration. To establish such trust, it is essential to address the problems encountered in auditing and oversight processes. The application of engineering approaches to problem-solving can enhance the operational efficiency of local governments. The integration of engineering systems into the resolution of local governance challenges not only enables savings in time and budgetary resources but also strengthens citizens' confidence in the management of these processes.

The provision of data such as budget expenditures, financial reports, and public procurement information to citizens through open data portals represents a clear example of engineering-based methods employed to promote transparency in local governments. As highlighted in the *Türkiye Transparency Practices* report published by Transparency International (February 2023), examples of good governance based on such practices also exist in Türkiye. In this context, the "Open Data Portal" project developed by Balıkesir Metropolitan Municipality and launched in February 2020 aims to enhance transparency in local governance. The datasets made available through the portal cover areas such as transportation, environment, quality of life, demographic structure, and rural development, and are intended to be updated on a regular basis.

The **Şeffaf Ankara** platform developed by Ankara Metropolitan Municipality represents a notable example of good practice aimed at promoting transparency and openness by presenting tender, budget, and project information in a manner that is easily comprehensible to citizens. Through its capabilities in data collection, process monitoring, and integration across multiple information systems, the platform demonstrates strong parallels with process management and information systems approaches widely discussed in the industrial engineering literature.

This application corresponds to a localized and adapted version of the fundamental logic underlying **Enterprise Resource Planning (ERP)** systems, tailored to the scale and needs of local government. Furthermore, the platform employs data analytics and visualization techniques to present tender, budget, and project-related information in a clear and accessible format for the public. In

addition, processes are monitored on a regular basis, and a continuous improvement cycle is supported through citizen feedback mechanisms. In this respect, Şeffaf Ankara constitutes a pioneering implementation that successfully integrates systems thinking and efficiency analysis principles from engineering into local government processes.

Engineering methods can also be effectively employed to ensure the balanced and controlled management of local government budgets and expenditures. By developing resource planning, cost control, and budget optimization models, these processes can be significantly improved. Moreover, by analyzing operational workflows to prevent waste, inefficiency points can be identified and addressed through targeted solutions. During the resource planning phase, the use of **ERP systems**, **Lean Management**, and **Value Stream Mapping** methodologies can contribute to a more efficient and structured management of financial processes. For instance, many municipalities in Germany utilize **SAP ERP** systems to manage their resources effectively. As the number of such projects employing engineering methods increases and institutional support for them expands, the reinforcement of transparency principles is expected to foster higher levels of democratic participation within local governments.

In local governance contexts, public institutions, civil society organizations, and the private sector periodically collaborate around shared objectives to generate social value. To ensure the effective execution of such multi-stakeholder processes, the systematic application of **project management** and **supply chain management** approaches is essential. Project management provides a structured methodology for planning activities, identifying risks, allocating responsibilities, and ensuring the completion of processes within defined timeframes (Project Management Institute [PMI], 2021).

Supply chain management, on the other hand, enhances process efficiency through the coordinated management of flows of resources, materials, information, and services (Christopher, 2016).

The engineering-based approaches discussed above also contribute to strengthening the principles of transparency, accountability, and sustainability in local governments. In recent years, successful implementations of these models have attracted increasing attention in both Türkiye and Europe.

The **Smart City Project** carried out by Konya Metropolitan Municipality in collaboration with **ASELSAN** and **Sabancı University** aims to plan smart urban solutions in Konya, define strategic objectives in the field of smart cities, identify recommended actions for implementation, and prepare roadmap documents to guide related initiatives. Within the scope of the project, efforts were undertaken to enhance energy efficiency and strengthen data-driven decision-making processes. In addition, costs were reduced through the procurement of sensor-based systems from local suppliers (Konya Metropolitan Municipality, 2022). This project provides a significant example of how engineering-based approaches can be effectively implemented within local government practices.

Kocaeli Metropolitan Municipality, through the **Marmara ReNew Project (Marmara Yeniden)**, aims to protect the Sea of Marmara by removing and disposing of **8.5 million tons of marine sludge** from an area equivalent to **656 football fields**. Within the scope of reports prepared in cooperation with **TÜBİTAK Marmara Research Center (TÜBİTAK-MAM)** and **Istanbul University**, it was determined that, in the initial phase, approximately **3.8 million cubic meters of marine sludge** need to be removed from a **468-hectare** area in the Eastern Basin of the İzmit Gulf.

The **Sivas Kızılırmak Right and Left Bank Wastewater Collector Project** aims to reduce environmental pressure on the Kızılırmak River by ensuring the collection and management of wastewater in the city of Sivas without causing environmental harm, thereby protecting public health and improving quality of life. Implemented within the framework of the **European Union IPA II Environment Operational Programme**, the project seeks to strengthen Türkiye's alignment with EU wastewater directives and environmental legislation, while simultaneously enhancing the technical and institutional capacity of local administrations. By constructing wastewater collection infrastructure in accordance with international standards, ensuring quality through effective supervision services, and managing sludge generated during the wastewater treatment process in a sustainable manner, the project offers a comprehensive engineering solution aimed at establishing a long-term, environmentally friendly urban infrastructure system.

İzmir Metropolitan Municipality's **Sustainable Urban Mobility Plan (SUMP)** project, implemented with the support of the **European Union** and **TÜBİTAK**, constitutes a comprehensive urban transportation strategy. The project aims to make urban transport systems more sustainable, accessible, cost-effective, and environmentally friendly; to encourage a modal shift from private vehicle use toward sustainable modes such as public transportation, walking, and cycling; and to develop planned, data-driven policies through the systematic analysis of transportation infrastructure. To achieve these objectives, the project has adopted the **Agile project management** approach.

Agile project management is a methodology that emphasizes flexible and responsive planning and execution through small, iterative development cycles. Within the scope of this project, the integration of different transportation systems through data sharing has also provided a successful example of supply chain coordination. Furthermore, in alignment with the European Union's sustainable urban mobility objectives, the project has contributed to a reduction in carbon emissions (European Commission, 2021).

Within the scope of the **Women-led Green Neighborhood Initiative**, implemented by Gaziantep Metropolitan Municipality in cooperation with **UN Women Türkiye** and private sector stakeholders, women's cooperatives and local women producers operating in Gaziantep were brought together. Through this initiative, the project aimed to enhance the capacities of women producers across processes ranging from production to marketing, strengthen inter-cooperative collaboration, and support economic sustainability.

According to the **UN Women Türkiye (2022)** report, stages such as raw material

procurement, production, storage, distribution, and market access are addressed through a holistic approach, with particular emphasis on planning, coordination, and monitoring activities. It is assessed that this end-to-end process, extending from production to marketing, corresponds closely with the core processes defined in the supply chain management literature. Supply chain management encompasses the planning and control of all stages beginning with raw material sourcing and continuing through production, storage, distribution, and delivery to the final consumer. This approach is reported to contribute to more effective production planning and logistics operations, while simultaneously supporting women's participation in economic life (UN Women Türkiye, 2022).

Within the framework of the **"Circular City" strategy** adopted by the Municipality of Amsterdam, three priority areas have been identified: **biological and food-based waste**, **consumer products**, and the **built environment**, particularly construction and building materials, which are characterized by high levels of resource consumption. As these areas account for the majority of material flows within the city, they have been designated as focal points for circular economy practices.

In this context, the municipality does not approach waste management as an activity limited solely to disposal processes; rather, it systematically analyzes where, how, and at which stage materials used throughout the city become waste. This approach, as outlined in the *Amsterdam Circular 2020–2025 Strategy* report, aims to identify the potential for reuse or recycling of resources that emerge as waste through **material flow analysis**. Based on the findings of these analyses, waste streams are redirected toward processes that generate renewed value, thereby extending the resource cycle. Through this strategy, the Municipality of Amsterdam seeks to establish a city-scale sustainable resource management system that enhances resource efficiency and reduces environmental impacts (Amsterdam Circular Strategy, 2020–2025).

The **Smart Transportation Program** implemented through a collaboration between the **Municipality of Vienna** and **Siemens** has been structured around the objectives of analyzing activities that affect the overall project duration during the planning phase of transportation projects, identifying critical stages that may lead to delays, and prioritizing processes with limited time flexibility. Within this framework, the procurement of transportation infrastructure components was carried out under an integrated model in which the purchasing, delivery, and implementation phases were managed not as independent activities but in alignment with a shared plan and coordinated scheduling.

This approach is considered to have contributed to the development of urban transportation systems and to be aligned with objectives aimed at reducing traffic congestion and improving energy efficiency in public transportation systems (City of Vienna, 2020).

These examples demonstrate how the project and resource management dimensions of engineering disciplines can be effectively applied within local governance processes. While project management strengthens planning and coordination, supply chain management optimizes resource utilization and enhances the efficiency of public

expenditures. Consequently, projects implemented collaboratively within multi-stakeholder structures become both efficient and citizen-oriented. Expanding and institutionalizing such practices in local governments will strengthen the relationship between trust and participation, thereby enabling democratic processes to function more effectively for citizens.

Engineering-based approaches can also be employed to address administrative and technical problems encountered in local governments that directly affect citizen satisfaction. Issues such as lengthy and multi-stage service processes, bureaucratic barriers, increasing waiting times, and unequal access to public services undermine citizens' trust in local administrations and reduce their motivation to participate in democratic processes. Applying engineering methodologies to resolve such structural problems enables process optimization and facilitates faster and more sustainable solutions. A transparent, efficient, and responsive municipal administration constitutes one of the most fundamental factors in increasing citizen participation in decision-making processes.

Within this context, a study conducted by **Ayrancı and Efe (2024)** analyzed building permit processes within the Directorate of Zoning and Urban Planning of **Selçuklu Municipality** using a lean thinking approach. By applying the **Value Stream Mapping** method, a current-state map was developed to identify sources of waste within the process, and improvement proposals were formulated accordingly. Criteria weights were calculated using the **Entropy method**, one of the multi-criteria decision-making techniques, and the proposed improvement alternatives were evaluated through the **MABAC method**. In addition, simulations of both the current state and the post-improvement scenarios were carried out using the **ARENA simulation software** (Ayrancı & Efe, 2024).

Similarly, the city of **Rotterdam** in the Netherlands has implemented **Lean Management** methodologies in social assistance applications and unemployment benefit processes. Lean practices in public services aim to enhance citizen satisfaction by reducing bureaucratic complexity and inefficiencies within service processes (Radnor & Walley, 2008).

Six Sigma is a data- and statistics-driven methodology that aims to maximize service quality by reducing errors and process variability. It is typically implemented through the **DMAIC cycle**—Define, Measure, Analyze, Improve, and Control—and is increasingly applied in the public sector to enhance service quality (Antony, 2006). This approach provides a guiding framework for initiatives aimed at making municipal service processes more structured, efficient, and measurable. Although some process improvement initiatives in municipalities may not be explicitly labeled as **Six Sigma** projects, they closely align with its core principles in terms of reducing error rates, improving processes, and enhancing service quality.

Route planning in solid waste collection services represents an application in which municipalities utilize **Geographic Information Systems (GIS)** data for route and resource management. In a study conducted in **Trabzon**, data related to the road network, population distribution, and waste container locations were modeled using GIS, and route optimization was performed based on these spatial datasets within a GIS environment. This study

provides an illustrative example of how GIS-based spatial data analysis can be employed in municipal service processes to improve route efficiency (Apaydın & Gönüllü, 2007).

In the **United Kingdom**, local authorities (councils) have implemented **Six Sigma** projects to reduce error rates in processes such as tax collection and social housing allocation. These initiatives aim not only to prevent financial losses but also to mitigate citizen grievances and improve service fairness (Kung, 2012). Similarly, leading smart cities such as **Hamburg**, Germany, have developed intelligent traffic management systems that process real-time data and employ **Operations Research** models to optimize traffic flows (Gassmann et al., 2019).

Crowdsourcing and Citizen-Centric Design refer to the practice of leveraging, with the support of technology, the knowledge, ideas, and contributions of a broad population of citizens in solving problems or designing public services. This approach constitutes a fundamental pillar of **e-governance** and **digital democracy** tools (Brabham, 2013).

Within the framework of the **Local Support Program (YEDEP)** implemented by the **Kocaeli City Council** with the support of **Kocaeli Metropolitan Municipality**, the initiative aims to realize high value-added, more informed, and more participatory projects through collaboration with **non-governmental organizations (NGOs)**. The program seeks to strengthen civil society in Kocaeli, promote civic awareness, enhance social cohesion, foster a culture of social responsibility, and establish a participatory societal structure. This initiative, along with municipalities' "**Report-and-Submit**" type mobile applications and **Istanbul Metropolitan Municipality's "Askıda Fatura" (Suspended Bill)** project, represents effective examples of the use of **crowdsourcing** in addressing urban problems and promoting social solidarity.

Paris's **Participatory Budgeting** practice, in which urban investment decisions are made directly through citizen voting, is a globally recognized model. Such practices are regarded as among the most tangible examples of democratic participation (Sintomer, Herzberg, & Röcke, 2016). Similarly, cities such as **Helsinki** enable citizen participation in urban planning processes through **three-dimensional digital platforms**, thereby integrating digital tools into participatory governance frameworks (OECD, 2020).

Despite these developments, **conventional participation methods**—such as rallies, posters, leaflets, and telephone surveys—are still widely used in local governments. The continued reliance on these traditional approaches in democratic participation processes has become increasingly inadequate in light of contemporary technological and social dynamics. Tools such as public rallies, the distribution of flyers and posters, advertisements in local newspapers, telephone surveys, neighborhood meetings, and static information boards result in significant time and cost inefficiencies. Compared to scenarios in which digital and technology-based methods are employed, the use of such conventional approaches both limits the potential audience that can be reached and contributes to environmental pollution due to the waste generated by printed materials.

At this stage, effective **resource management and budget optimization** can be achieved through the application of

engineering methods. In particular, industrial engineering techniques such as **Process Mapping**, which visually represents the steps of a workflow in order to improve efficiency, identify bottlenecks, and support process improvement, and **Activity-Based Costing (ABC)**, which allocates costs based on specific activities to reflect actual resource consumption, can be employed to conduct a comprehensive cost analysis of existing participation processes (Kaplan & Cooper, 1998).

Through this analysis, it becomes possible to clearly determine how much budget each conventional method consumes, how many individuals it reaches, and what level of response or return it generates. By identifying process **bottlenecks** and **waste (muda)**, a concrete roadmap can be developed to reallocate budgets away from inefficient areas and toward technology-based solutions. Consequently, it becomes feasible to reach significantly broader audiences in a more effective and measurable manner, even with more limited financial resources.

The redesign of participation processes from an engineering perspective and their reinforcement through technology enable a transformation in which participation becomes **multidimensional and interactive**. The technological solutions that can be employed in this transformation primarily include the development of **comprehensive digital participation platforms** that manage multi-stage processes—such as idea generation, project proposal submission, deliberation, and voting—rather than relying on one-way surveys.

These platforms are complemented by **Geographic Information System (GIS)-based feedback systems** that allow citizens to report issues (e.g., damaged roads or infrastructure failures) by pinpointing their exact locations on a map and to transparently monitor the resolution process. To extend participation to broader segments of society, particularly younger populations, **gamification techniques** are also utilized. Through mobile applications incorporating point systems, badges, and reward mechanisms, citizens' motivation to participate is enhanced (Dixon, 2013).

In complex processes such as **urban planning**, **Augmented Reality (AR)** technologies are increasingly being employed. Through AR applications, citizens can experience proposed projects—such as new parks or public squares—in three dimensions within their own environments via mobile devices, enabling them to provide more concrete and informed feedback (Noor & πόλις, 2018).

In addition, **Artificial Intelligence (AI)-powered chatbots** enhance public service delivery by responding to frequently asked questions on a 24/7 basis and automatically directing citizen requests to the relevant municipal departments. This approach facilitates immediate communication while simultaneously improving the operational efficiency of municipal staff (Berry & Dauksevičiūtė, 2022). In both Türkiye and European countries, there are ongoing initiatives and projects that align with and exemplify these technological applications.

ANKABİS (Ankara Infrastructure Information System), developed by **ASKİ**, is an application that enables the digital management of water and sewerage infrastructure in Ankara through a **Geographic Information System (GIS)**-based platform. Through this system,

infrastructure data are visualized on maps, allowing fault detection, monitoring, and maintenance activities to be planned more rapidly and accurately.
Operating in integration with other internal digital systems, ANKABİS facilitates decision-making processes and enhances service efficiency. Such applications constitute significant examples demonstrating how local governments in Türkiye effectively utilize technology in urban planning and infrastructure management.

Rahvaalgatus.ee, a product of **Estonia's advanced e-government infrastructure**, is an e-democracy platform that enables citizens to submit legislative initiatives directly to parliament (Kalvet, 2012). Similarly, **Decidim**, Barcelona's open-source participatory platform developed by the city itself, has facilitated the participation of hundreds of thousands of citizens in complex processes such as strategic planning and has subsequently been adopted by numerous cities worldwide (Brugué, Martí, & Miralles, 2015).

In parallel, **Helsinki's 3D City Model**, combined with the use of **Augmented Reality**, allows new urban development projects to be opened to public discussion through detailed three-dimensional models, thereby making the planning process more transparent, comprehensible, and participatory.

In conclusion, as examined in this report, the use of **engineering-based approaches** in initiatives aimed at enhancing democratic participation in local governments has become a necessity when considering the needs and expectations of contemporary societies. Engineering methodologies offer concrete and systematic solutions to the persistent challenges faced by local administrations. The solutions proposed through these approaches not only enable citizens to exercise their rights more effectively but also allow them to play an active role in the governance processes of their communities, thereby contributing to the development of more effective, equitable, transparent, and sustainable outcomes.

As demonstrated by the examples from Türkiye and Europe, local governments that integrate technology and engineering methods into governance processes evolve toward more transparent, accountable, and inclusive structures. Ultimately, this transformation lays the foundation for an effective local democracy model that reaches broader segments of society with fewer resources, listens to citizens' genuine needs, and formulates sustainable policies responsive to those needs.

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