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REVIEW PAPER

The application of a gamification approach in promoting citizen engagement in Tehran's urban policy-making process

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ABSTRACT

Contemporary urban centers, including Tehran, the capital of Iran, are grappling with complex challenges such as institutional fragmentation, data scarcity, and a decline in citizen engagement, which underscore the need for innovative approaches to urban governance. This article explores the potential of gamification—the application of game design elements in non-game contexts—as a strategic tool to enhance citizen participation in Tehran's urban policymaking and management processes. By leveraging elements such as points, competition, progress levels, and rewards, gamification can transform traditional, often opaque and formal, policymaking into a more appealing, transparent, and accessible experience for a broader public. The primary objective of this study is to elucidate the foundational concepts of gamification, analyze its impact on the quality of urban policy decisions and implementation, and propose practical, context-specific strategies for its successful application in Tehran. Through a detailed examination of successful global case studies, including CityScopeAR in the United States, ParmoSense in Japan, and Game.UP in Germany and Austria, this research analyzes the potential for local adaptation and alignment of these approaches with Tehran's unique socio-cultural needs and existing infrastructure. The findings suggest that a well-designed gamification framework can not only significantly increase citizen participation rates but also generate valuable data for evidence-based policymaking, foster a stronger sense of community belonging, and empower citizens to assume a more proactive role in shaping their city's future. Ultimately, this research provides a comprehensive and actionable set of recommendations for Tehran's urban management to strengthen smart and participatory governance in the Iranian capital.

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INTRODUCTION

Urban governance is undergoing a fundamental transformation globally, driven by the increasing complexity of urban issues, the rise of new information technologies, and growing citizen demands for active involvement in decision-making processes (Tappert et al., 2024; Chamoso et al., 2020). Traditional top-down, non-transparent policymaking models are no longer sufficient to meet the dynamic needs of modern cities. In this context, meaningful citizen participation has emerged as a cornerstone of good urban governance, essential for enhancing the effectiveness of policies, ensuring spatial justice, and establishing institutional legitimacy (Alhassan, 2025; Arnstein, 1969; Fung, 2006). Despite the clear benefits, engaging citizens in a meaningful and sustained manner remains a significant challenge (Choo et al., 2023). This is particularly true in large metropolitan areas like Tehran, where institutional inconsistencies, data scarcity, and a lack of public trust can hinder effective collaboration. Recognizing this, urban policymakers are seeking innovative tools to bridge the gap between citizens and the government (Alshahrani, 2025). One of the most promising and novel approaches is gamification. Gamification uses the engaging and motivating aspects of games—such as points, rewards, leaderboards, and challenges—to encourage voluntary and creative participation in non-game contexts (Tóbiás and Boros, 2025; Deterding et al., 2011; Hamari et al., 2014). In the urban context, gamification can serve as a powerful interactive tool for a wide range of applications, from urban planning and waste management to sustainable transportation and civic education (Venturi et al., 2025; Sgueo, 2019; Thiel, 2016). By making complex and formal processes more enjoyable and accessible, gamification has the potential to fundamentally change the relationship between citizens and their city's management (Fig. 1). Figure 1 provides a bibliometric visualization illustrating the weighted value and interconnectedness of “gamification,” “play,” and “serious games” within the broader interactive digital landscape. This visualization serves to contextualize the core concept of the study by demonstrating its central position and strong linkage to related concepts like “virtual reality,” “crowdsourcing,” and “behavior change,” thus justifying the selection of gamification as the innovative tool under investigation. This manuscript aims to address a critical gap in the

existing literature on urban gamification, specifically concerning its practical application in the context of developing countries. While successful examples exist in smart cities worldwide, the approach has not yet been widely adopted or formally established in Iran's urban management framework, particularly in Tehran. Therefore, the paper will propose practical, context-specific strategies for its successful application in Tehran. The study has been carried out as a literature review and comparative case study with a focus on Tehran, without a specific date mentioned. This manuscript seeks to bridge this gap by:

- Analyzing and evaluating successful international experiences of gamification in urban policymaking.
- Analyzing the specific context and challenges of implementing gamification in Tehran's urban management.
- Developing practical and context-specific recommendations for implementing this approach in the Iranian capital.

Theoretical foundation: Review of gamification and its application in urban settings

To provide a robust analytical foundation, this framework is structured around the concept of Motivational Affordances, which posits that the success of gamification is contingent upon the design elements' ability to fulfill users' psychological needs for competence, autonomy, and relatedness (Hamari et al., 2014). This perspective moves beyond simple feature enumeration (e.g., points and badges) to analyze the underlying mechanisms that drive sustained behavioral change and civic engagement. To understand how gamification can be applied to urban policymaking, it is crucial to first define its core concepts and distinguish it from related terms:

Defining gamification, play, and games

The most widely accepted definition of gamification refers to “the use of game design elements in non-game contexts” (Fox et al., 2022; Deterding et al., 2011). Its main objective is to motivate and engage users, promote learning, or encourage specific behaviors by leveraging the inherent fun and motivational aspects of games (Kapp, 2012; Zichermann and Cunningham, 2011; Werbach and Hunter, 2012). This is distinct from play, which is a spontaneous and flexible activity often driven by intrinsic motivation (Lebed, 2020; Pellegrini,

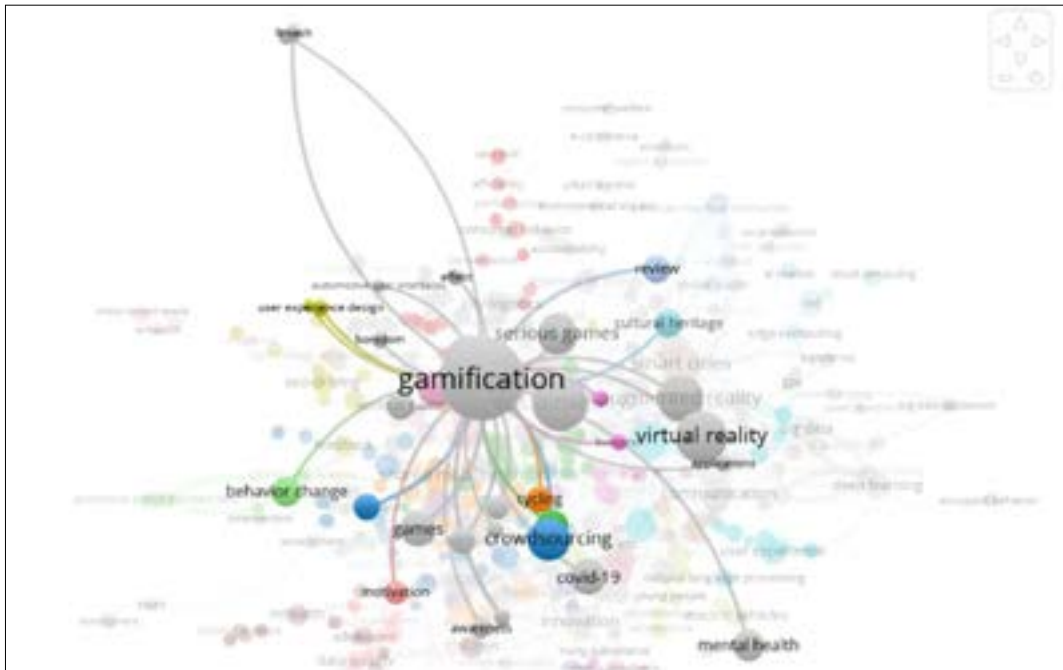


Fig. 1: A demonstration of the weighted value of gamification, play, and serious games in the field of civic engagement

2010; Buijs-Spanjers *et al.*, 2019), and a game, which is a structured activity with explicit rules and goals (Lebed, 2020; Pellegrini, 2010; Buijs-Spanjers *et al.*, 2019; Frasca, 2009). Think of the difference between children playing freely in a playground (play) and a structured game like soccer or SimCity (game). Gamification strategically borrows specific elements from game design, such as points, badges, leaderboards, challenges, and rewards (Huotari and Hamari, 2017; Zichermann and Cunningham, 2011), to influence behavior and improve user experience in various domains, including education, healthcare, and business (Parra-González *et al.*, 2021; Kasurinen and Knutas, 2018). Importantly, gamification is not about creating a full-fledged game; rather, it's about applying these mechanics to enhance motivation in non-game activities (Ryan and Deci, 2000; Seaborn and Fels, 2015).

Types of games

Categorizing games based on their underlying mechanisms and objectives is instructive because different genres lend themselves to various planning challenges. Games can be categorized into various genres (Buijs-Spanjers *et al.*, 2019; Mora *et al.*, 2017; Bharathi *et al.*, 2016; Seaborn and Fels, 2015) based

on their gameplay mechanics and objectives (Fig. 2):

- Action Games: These games emphasize physical challenges, including hand-eye coordination and reaction time (Michael and Chen, 2005; Zyda, 2005; Frasca, 2009; Djaouti *et al.*, 2011).
- Adventure Games: They focus on storytelling, exploration, and solving puzzles (Michael and Chen, 2005; Koster, 2013; Lebed, 2020). For urban planning applications, their exploratory nature can be beneficial.
- Role-Playing Games (RPGs): These allow players to take on the roles of characters in a narrative setting and make choices that affect the game's outcome (Caillois, 2001; Michael and Chen, 2005; Steinkuehler, 2012; Lebed, 2020). RPGs are particularly relevant for fostering social empathy, allowing participants to experience the city from different perspectives, which directly supports enhancing participatory policymaking.
- Simulation Games: These mimic real-world activities such as city building or flight simulation (Michael and Chen, 2005; Zyda, 2005). Along with Strategy Games, they can effectively model the complex trade-offs of city management.



Fig. 2: Types of game genres based on gameplay mechanisms and objectives

- **Strategy Games:** These require players to use decision-making skills to achieve goals, often involving resource management and tactical planning (Michael and Chen, 2005; Koster, 2013; Djaouti et al., 2011). Complex participatory processes often draw upon the logic of Simulation and Strategy Games to model urban challenges.
- **Sports and Racing Games:** These simulate physical sports competitions or car races (Michael and Chen, 2005; Bharathi et al., 2016; Pellegrini, 2010).
- **Puzzle Games:** These challenge players with problem-solving tasks (Koster, 2013; Michael and Chen, 2005; Frasca, 2009; Pellegrini, 2010; Djaouti et al., 2011).

The application of these genres to urban settings is typically realized through serious games. Serious games are a specialized subset of games designed for non-entertainment purposes, which provide the content-rich platforms often leveraged by urban gamification strategies (Oliveira et al., 2024).

Urban gamification

Urban gamification integrates principles of game design—such as reward systems, interactive visualization, and scenario development—into urban planning practices to strengthen citizen engagement and enhance planning processes (Muehlhaus et al., 2023; Sgueo, 2019; Chamoso et al., 2020). Research identifies gamification as an approach that renders planning more attractive and educational, while empowering citizens by redistributing decision-making processes (Kavouras et al., 2025; Iulia et al., 2020; Devisch et al., 2016). In a more specific sense, urban gamification refers to the application of game design elements within urban environments, processes, systems, and challenges (Yao et al., 2025; Naranjo-Zolotov et al., 2019). Such elements are mobilized within urban governance frameworks to promote civic participation and support urban management (Muehlhaus et al., 2023; Romano et al., 2022; Sgueo, 2019). The scope of this concept is broad, encompassing urban problem-solving, planning scenarios, political interaction, and information dissemination (Sergeyeva et al., 2019; Iulia et al., 2020). Gamification features

may include the use of sensors, data collection mechanisms, and interactive technologies designed to foster more efficient and inclusive cities (Sgueo, 2019; Papaioannou *et al.*, 2018). These activities influence how citizens perceive, interpret, and interact with their urban surroundings (Thibault, 2019). Applications also extend into education, where virtual reality systems are employed to assess motivational, social, and spatial competencies in architecture and urban design curricula (Cho and Suh, 2023; Fonseca *et al.*, 2017). Overall, urban gamification constitutes a rapidly expanding field with diverse applications across urban management, civic participation, and education (Miao *et al.*, 2022; Hassan and Hamari, 2020). Within the framework of this research, the focus lies on employing gamification elements in urban planning processes to increase citizen participation, collect feedback, facilitate co-creation, raise public awareness of urban issues, and encourage pro-social and environmentally responsible behaviors.

Key characteristics of urban gamification

Several core attributes have been identified for different forms of urban gamification, including:

- Integration with place: Linking digital interactions to urban spaces or planning proposals (e.g., location-based tasks, AR overlays) (Sengupta *et al.*, 2020; Gnat *et al.*, 2016).
- Civic purpose: Aimed at public outcomes such as improved planning, social capital, or civic literacy (Park and Fujii, 2023; Al-Kodmany, 2020).
- Data production for planning: Generating spatial and preference data from citizens to inform decisions (Kavouras *et al.*, 2023; Poplin *et al.*, 2017).
- Addressing complexity: Simplifying issues like budgeting or zoning trade-offs for wider audiences (Mora *et al.*, 2017).
- Collective action: Encouraging collaboration among citizens and planners (Gordon and Manosevitch, 2011).

Additional features of urban gamification may include:

- Real-time interaction: Immediate feedback to urban actions.
- Contextual alignment: Adapting game elements to local cultural and social contexts.

Key typologies of gamification

Gamification can be categorized in several ways. Two prominent typologies are:

- Structural vs. Content Gamification (Kapp, 2012; Werbach and Hunter, 2012; Seaborn and Fels, 2015; Mora *et al.*, 2017; Fraternali and Gonzalez, 2019):
 - A) Structural gamification applies game elements to an existing process or content without changing the content itself. For instance, awarding points for completing a survey or attending a workshop (Fig. 3).
 - B) Content gamification, on the other hand, modifies the content itself to make it more game-like, such as presenting a planning scenario as a story-driven quest where citizens' choices have visible consequences within a game-like environment.
- Meaningful Gamification: This approach criticizes the over-reliance on superficial rewards like points and badges. Meaningful gamification, as proposed by Nicholson (2015), focuses on fostering intrinsic motivation by incorporating deeper mechanics such as reflection, narrative, meaningful choices, and social interaction. This approach is particularly relevant for civic engagement, where intrinsic motivation is a key driver (Zhou *et al.*, 2025; Nicholson, 2015; Seaborn and Fels, 2015).

Urban gamification and its evolution

Urban gamification specifically applies game design principles to urban planning, processes, and systems to increase citizen participation. It is described as a method that makes urban planning more engaging and educational, while empowering citizens by redistributing decision-making processes. The evolution of urban gamification can be broadly categorized into three phases (Fig. 4):

- Early conceptualization (pre-2015): This period saw the use of analog board games and physical simulation tools to engage stakeholders in complex urban planning concepts (Reinart and Poplin, 2014; Poplin, 2011; de Heer *et al.*, 2010; Mayer, 2009; Arnstein, 1969).
- Technology integration (2015-2018): With advancements in technology, urban gamification began to integrate digital platforms, mobile applications, and location-based services. This phase focused on promoting sustainable urban

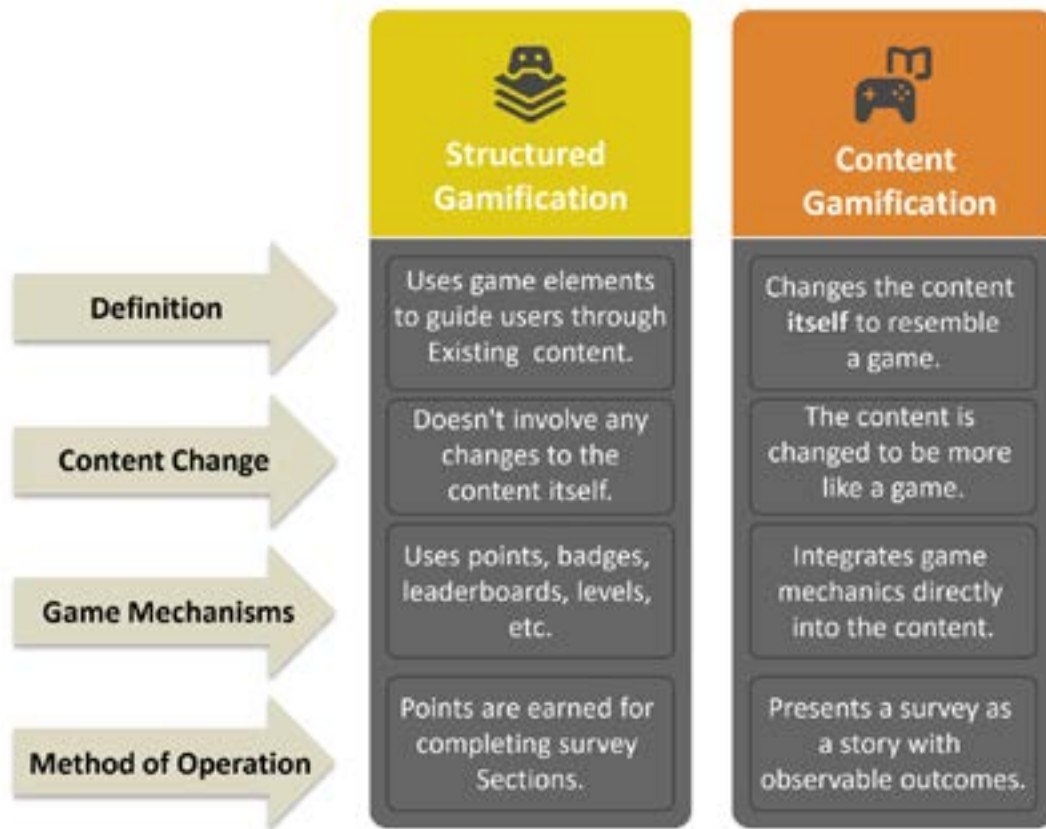


Fig. 3: Structured gamification vs. content gamification

mobility and accessibility mapping (Kawanaka et al., 2020; Pajarito and Gould, 2017; Thiel and Fröhlich, 2016; Prandi et al., 2015; Kazhamiakin et al., 2015).

- Contemporary applications (2019-present): The most recent phase has seen a diversification of applications, incorporating AI and pandemic response tools to address emerging challenges in smart cities. This includes using gamification for public health initiatives, environmental sustainability, and smart city projects (Zhou et al., 2024; Guerra et al., 2024; Nourian et al., 2024; Lifelo and Ding, 2024; Özden et al., 2023; Bijlani, 2023; Muehlhaus et al., 2023; Cavada, 2023; Thibault and Baer, 2021; Thibault, 2020; García-Retuerta and Corchado, 2022).

These approaches demonstrate that urban gamification has evolved from a focus on efficiency to a more inclusive, citizen-centric approach.

Methodology

This research employs a qualitative approach with an analytical and comparative nature. This methodological choice is best suited for the study's objective, as a systematic review and cross-case comparison provide the necessary rigor to synthesize diverse global implementation strategies and extract transferable design principles for a novel policy context (Oliveira et al., 2024). Specifically, the methodology of the present study is based on documentary analysis and comparative case studies. The main objective is to analyze successful global experiences in the application of gamification in urban management and policymaking, and then to adapt and localize the key findings to the specific characteristics and needs of the Tehran metropolis. The research steps are as follows (Fig. 5):

1. *Literature review and theoretical foundations:*
This initial step involved a systematic search

Features	Early Conceptualization (Before 2015)	Technology Integration (2015-2018)	Contemporary Applications (2019-Present)
Key Innovations	Analog Games, Participatory Approaches	Mobile Applications, Location-based Services	Integration of Artificial Intelligence (AI), All-in-one Response Tools
Main Applications	Urban Planning, Civic Engagement	Sustainable Mobility, Accessibility Mapping	Public Health, Smart City Initiatives
Influencing Factors	Physical Limitations, High Interaction Potential	Increased Data Collection Capabilities, Real-time Interactions	Adaptability to Challenges, Large-scale Implementation

Fig. 4: Evolution of urban gamification

of indexed academic databases (ISI Web of Science and Scopus) to establish a robust theoretical framework defining “gamification,” “serious games,” and “citizen participation” in the urban context, which informed the analytical categories for the case study analysis.

2. *Selection and analysis of global case studies:*

Based on the research objective and the breadth of application, a purposeful sample of 13 successful international experiences in urban gamification was selected and analyzed comparatively. The comparative analysis followed a structured protocol, examining each case across key analytical dimensions: Key Technology/Tool, Gamification Elements, Kind of Participation, Subjective Domain, and Target Groups. These experiences were chosen from various parts of the world, including the USA (CityScopeAR), Japan (ParmoSense), Germany and Austria (Game.UP), and Spain (Smart Recycling App). The criteria for selecting these cases were the success of the projects in achieving their predetermined goals, the innovativeness of the approach, and the broadness of their application scope.

3. *Adaptation and localization:* This critical qualitative step involved thematic synthesis of the cross-case findings to identify the core mechanisms (e.g., real-time feedback, narrative-driven missions) that satisfied key motivational affordances (competence, autonomy,

relatedness). Subsequently, considering the current situation and the specific challenges of urban management in Tehran (such as data scarcity, weak participation, and institutional fragmentation), an operational framework was developed to localize and implement these experiences within the cultural and institutional context of Iran.

4. *Proposal of operational solutions:* Finally, based on the localized framework, a set of practical proposals and tangible projects for applying gamification in various domains of Tehran’s urban policymaking and management (including citizen reporting, participatory budgeting, collaborative urban design, and neighborhood competitions) was presented.

This analytical and comparative methodology allows for the extraction of successful mechanisms and principles from global experiences, enabling the development of a practical and operational model to address specific problems related to citizen participation in Tehran.

Findings

A global perspective: comparative analysis of gamification in urban policy

The global application of gamification in urban policymaking offers a rich and diverse set of examples, each tailored to its specific institutional, social, and cultural context. This section presents the synthesized analytical findings from the thirteen



Fig. 5: Mind map- study implications of urban gamification research

comparative case studies (see Appendix for detailed tables). This section provides an analytical overview of thirteen successful international experiences, drawing from the provided document to identify key trends, mechanisms, and outcomes that can inform a framework for Tehran. The analysis is presented in a comparative table format in the original document, which is summarized here to highlight its key findings.

Synthesis of global experiences

The cross-case analysis demonstrates that successful urban gamification is fundamentally a strategic mechanism for fostering citizen self-determination, rather than a mere mechanism for gathering attention (Hamari et al., 2014). The analyzed case studies, ranging from North America and Europe to Asia, reveal that gamification is not merely a tool for attention-grabbing but a strategic mechanism for redefining the relationship between citizens and public policy (see Devisch et al., 2016; Klamert and Münster, 2017; Prilenska, 2019). These projects have been implemented across a wide range of thematic areas, including urban design, participatory budgeting (see Baiocchi and Ganuza, 2014), waste management, sustainable transportation, and civic education. A key takeaway is the impressive diversity in the type of participation fostered by these projects. Some, like *Game4City* in Barcelona (Redondo et al., 2020; Game4City Consortium, 2020), defined participation as an educational experience to engage younger generations with urban design concepts. Others, such as *Budget Games* in San Jose (Every Voice Engaged Foundation, 2018), treated participation as

a means for citizens to make real, impactful decisions on policy, where their resource allocation choices directly influenced the local budgeting process. Meanwhile, projects like *FixMyStreet* in the UK (FixMyStreet Pro, 2023; mySociety, 2021) provided a model for everyday, on-the-ground participation, empowering citizens to act as observers and reporters of urban infrastructure issues. The common and critical thread in these successful experiences is the strategic use of core gamification elements—points, real-time feedback, social competition, badges, missions, and tangible or social rewards—to cultivate sustained motivation and a sense of genuine ‘impact’ in citizens, thereby fostering long-term trust and engagement (see Werbach and Hunter, 2012; Zichermann and Cunningham, 2011; Deterding et al., 2011; Seaborn and Fels, 2015). Furthermore, the analysis shows a convergence in the macroscopic outcomes (see Sgueo, 2019; Vanolo, 2018; Deterding et al., 2011; Buijs-Spanjers et al., 2019; Hamari et al., 2014) of these projects. Nearly all were successful in increasing real participation, improving public awareness, modifying individual and collective behaviors, and regenerating a sense of civic responsibility. Projects integrated with data-driven infrastructure, such as *ParmoSense* in Japan (Arakawa and Matsuda, 2021; Kawanaka et al., 2020) and *Smart Recycling App* in Spain (Briones et al., 2018; Chamoso et al., 2018), were also able to generate valuable local data on citizen preferences and action patterns, which served as a basis for evidence-based policymaking (Table 1). This global transition from passive, bureaucratic models to interactive, people-centered, and responsive structures (Devisch

et al., 2016; Ampatzidou *et al.*, 2018; Gordon and Baldwin-Philippi, 2014; Thibault, 2020) is a crucial lesson for cities like Tehran, which face challenges

of public distrust, limited participation, and lack of transparency.

Discussion: Localizing gamification for Tehran's

Table 1: A comparative analysis of 13 global experiences in applying gamification to urban policy-making and management from a participatory perspective.

Project Title and City/Country #1				
CityScopeAR in Cambridge, USA				
Kind of Participation	Subjective Domain	Key Technology/ Tool	Gamification Elements	Target Groups
Interactive Crowdsourcing	Urban Design and Spatial Modeling	Augmented Reality, Physical Block, Real-time Analysis	Real-time Feedback, Team Challenge, Multi-level Scenarios	Citizens, Students, Urban Managers
Achievements:				
Enhanced Spatial Understanding; Improved Feedback Quality; Policy Testing				
Reference: (Landa Oregi <i>et al.</i> , 2025; MIT Media Lab, 2019; Noyman <i>et al.</i> , 2019; Alonso <i>et al.</i> , 2018)				
Localizability in Tehran:				
Very high – Suitable for participatory education in urban neighborhoods.				
Project Title and City/Country #2				
ParmoSense in Osaka, Japan				
Kind of Participation	Subjective Domain	Key Technology/ Tool	Gamification Elements	Target Groups
Voluntary Environmental Measurement Participation	Environmental Monitoring, Urban Data Collection	Mobile Application, Participatory Sensors	Scoring, Daily Mission, Competitive Leaderboard	General Citizens, Elderly, Schools
Achievements:				
Increasing Data Coverage; Enhancing Environmental Awareness; Validated Data				
Reference: (Arakawa and Matsuda, 2021; Kawanaka <i>et al.</i> , 2020)				
Localizability in Tehran:				
High – Applicable for strengthening grassroots environmental data collection.				
Project Title and City/Country #3				
Game.UP in Germany and Austria				
Kind of Participation	Subjective Domain	Key Technology/ Tool	Gamification Elements	Target Groups
Decision-making Simulation	Urban Planning, Interactive Design	Digital Platform, Virtual Reality, Cognitive Assessment	Rewards, Mission, Instant Feedback, Data Modeling	Students, Citizens, Decision-makers
Achievements:				
Enhanced Qualitative Participation; Understanding Causal Relationships; Policy Transparency				
Reference: (Muehlhaus <i>et al.</i> , 2023; Gordon and Manosevitch, 2011)				
Localizability in Tehran:				
Medium to High – Very useful for local plans.				

Project Title and City/Country #4				
Digital Co-Design in the UK				
Kind of Participation	Subjective Domain	Key Technology/ Tool	Gamification Elements	Target Groups
Digital Co-creation	Participatory Urban Design, Digital Governance	Web-based Platform, Scoring System	Levels of Participation, Real-time Feedback, Ranking	General Citizens, Consultants, Urban Institutions
Achievements: Enhanced Participation Rate; Reduced Cost; Design Creativity				
Reference: (Ng et al., 2024 ; Kavouras et al., 2023 ; Ampatzidou et al., 2018 ; Gordon and Schirra, 2011)				
Localizability in Tehran: Very high – Suitable for low-cost and participatory virtual sessions.				
Project Title and City/Country #5				
Participatory Chinatown in Boston, USA				
Kind of Participation	Subjective Domain	Key Technology/ Tool	Gamification Elements	Target Groups
Interactive Role-playing	Neighborhood Planning, Social Empathy	Three-dimensional Narrative Game	Narrative-driven, Mission, Role-playing, Team Collaboration	Immigrants, Low-income Groups, Local Residents
Achievements: Fostering Empathy; Participation of Marginalized Groups; Participatory Data Analysis				
Reference: (Gordon and Baldwin-Philippi, 2014 ; Engagement Game Lab, 2010 ; Shareable, 2010)				
Localizability in Tehran: High – Implementable in deteriorated and multicultural contexts.				
Project Title and City/Country #6				
Unlimited Cities in Rennes, France				
Kind of Participation	Subjective Domain	Key Technology/ Tool	Gamification Elements	Target Groups
Visual Scenario Building	Participatory Urban Design	Visual Web and Mobile Platform	Visualisation, Sharing, Liking and Voting	Local Residents, Users with Low Literacy, Youth
Achievements: Enhanced Visual Literacy; Multiplied Participation; Input for Detailed Design				
Reference: (Poplin, 2014)				
Localizability in Tehran: Very high – Suitable for underprivileged urban areas.				

Project Title and City/Country #7				
Game4City in Barcelona, Spain				
Kind of Participation	Subjective Domain	Key Technology/ Tool	Gamification Elements	Target Groups
Educational – Experiential Participation	Urban Design Education, Youth Participation	3D Simulation, Virtual Reality	Points, Team Competition, Educational Levels, Rewards	Students, University Students, Teachers
Achievements: Enhanced Spatial Literacy; Fostering Responsibility; Sustainable Participation				
Reference: (Redondo et al., 2020 ; Game4City Consortium, 2020 ; Fonseca et al., 2017)				
Locaizability in Tehran: Very high – It is implementable for participatory education in schools.				
Project Title and City/Country #8				
GreenApes in Italy (Florence, Rome)				
Kind of Participation	Subjective Domain	Key Technology/ Tool	Gamification Elements	Target Groups
Behavior-based Environmental Participation	Environmental Sustainability, Civic Behavior Change	Mobile Application, Reward System	Points, Badges, Challenges, Tangible Rewards	General Citizens, Organizations, Local Businesses
Achievements: Reduced Energy Consumption; Increased Environmental Awareness; Stakeholder Engagement				
Reference: (GreenApes, 2021 ; Sgueo, 2019)				
Locaizability in Tehran: Very high – Compatible with Tehran's environmental policies.				
Project Title and City/Country #9				
Smart Recycling App in Barcelona and Seville, Spain				
Kind of Participation	Subjective Domain	Key Technology/ Tool	Gamification Elements	Target Groups
Behavioral – Committed	Urban Waste Management	QR Code, Smart Bins	Points, Leaderboard, Badges, Instant Feedback	Households, Schools, Recycling Companies
Achievements: Enhanced Sorting Rate, Family Education, Data-driven Decision-making				
Reference: (Briones et al., 2018 ; Aguiar Castillo et al., 2018 ; Chamoso et al., 2018)				
Locaizability in Tehran: Very high – Implementable with local applications.				
Project Title and City/Country #10				
Budget Games in San Jose, USA				
Kind of Participation	Subjective Domain	Key Technology/ Tool	Gamification Elements	Target Groups
Participatory Budgeting	Local Financial Resource Allocation	Role-playing Game, Group Facilitation	Notional Budget, Prioritization, Negotiation	Neighborhood Residents, Minorities, Urban Managers

Achievements:				
Increased Public Trust; Preference Analysis; Budgetary Transparency				
Reference: (Every Voice Engaged Foundation, 2018 ; Baiochi and Ganuza, 2014)				
Localizability in Tehran:				
Very high – A practical model for district budgeting.				
Project Title and City/Country #11				
FixMyStreet in the UK				
Kind of Participation	Subjective Domain	Key Technology/ Tool	Gamification Elements	Target Groups
Reporting Urban Issues	Civil Oversight, Urban Infrastructure	Mobile Application, Interactive Map	Points, Badges, Feedback, Neighborhood Competition	General Citizens, Youth, Schools
Achievements:				
Increased Reporting; Enhanced Responsiveness; Urban Monitoring Index				
Reference: (FixMyStreet Pro, 2023 ; mySociety, 2021)				
Localizability in Tehran:				
Very high – Developed for the 137 system.				
Project Title and City/Country #12				
EcoCrowd in Germany				
Kind of Participation	Subjective Domain	Key Technology/ Tool	Gamification Elements	Target Groups
Green Crowdfunding	Environment, Neighborhood Micro-projects	Digital Platform, Participation Profile	Badges, Group Challenges, Results Feedback	Green Citizens, Environmental Institutions
Achievements:				
Enhanced Motivation; Implementation of Grassroots Projects; Policy-makers' Use of Data				
Reference: (EcoCrowd, 2023 ; Resek et al., 2022 ; OECD, 2020 ; Sgueo, 2019)				
Localizability in Tehran:				
High – Suitable for neighborhood-based innovation ecosystems.				
Project Title and City/Country #13				
Urban Treasure Hunt in Helsinki, Finland				
Kind of Participation	Subjective Domain	Key Technology/ Tool	Gamification Elements	Target Groups
Place-based Cultural Participation	Urban Identity, Public Spaces	Map-based Application, GPS, Content Creation	Points, Missions, Team Competition, Participatory Content	Youth, Tourists, Schools, Low-identity Neighborhoods
Achievements:				
Interaction with Spaces; Local Content; Intergenerational Participation				
Reference: (City of Helsinki, 2020 ; Thiel and Fröhlich, 2016)				
Localizability in Tehran:				
Very high – Suitable for the revitalization of historic and forgotten neighborhoods.				

urban management

The present studies demonstrate that gamification, as a novel strategy, holds significant potential for increasing citizen participation in urban policymaking processes. However, its effectiveness is influenced by several factors, including the *mechanisms employed* (such as scoring, challenges, or immersive technologies), the *individual characteristics of participants* (such as age and intrinsic motivations), and the *implementation context*. In some cases, gamification has meaningfully increased participation (such as the 32.2% increase in the study by Briones *et al.*, 2018) and has even yielded tangible results like improved recycling rates. Conversely, it may have a limited impact on groups already interested in urban issues or may even diminish their intrinsic motivation. A key takeaway is that *gamification is not a comprehensive solution on its own*; it should be considered as part of a *multifaceted approach* to urban engagement. The careful design of mechanisms with the target audience in mind, continuous monitoring of results, and integration with other participatory tools can mitigate challenges such as “tokenistic activity with no policy impact” or “age segmentation”. Furthermore, future research should increasingly focus on the *link between gamified participation and tangible changes in urban policies* to fill the existing gap in the literature. Ultimately, the success of this strategy requires a balance between game-like appeal and the depth of civic participation. A comprehensive review of successful international experiences in using gamification to enhance citizen participation in urban policymaking reveals the immense potential and diverse approaches of this innovative tool. Projects like CityScopeAR in Cambridge, which facilitated the understanding of complex urban concepts through 3D visualization and augmented reality, and ParmoSense in Japan, which enabled collective participation in environmental monitoring through gamification, demonstrate their power. Game.UP in Germany and Austria transformed decision-making simulation into an engaging experience, while Game4City in Spain focused on educating the younger generation in urban design. Similarly, examples such as the Smart Recycling App in Spain and GreenApes in Italy proved gamification’s ability to drive sustainable environmental behaviors. Projects like Budget Games in San Jose and FixMyStreet in the UK also showed how urban budgeting and problem reporting can

be transformed into interactive and trust-building processes. Finally, EcoCrowd in Germany, with its green crowdfunding model, and Urban Treasure Hunt in Finland, with its location-based discovery of urban identity, revealed new dimensions of participation. Despite differences in scale, subject area, and technical complexity, each of these experiences shared a common goal: to establish a deeper and more motivational connection between citizens and urban management. Inspired by these achievements and considering the local capacities, specific needs, and existing regulations in Tehran, , the following table presents proposed operational applications for the capital’s urban management. These applications are designed to align with Tehran’s urban ecosystem and to leverage the full potential of gamification to promote active citizen participation (Table 2). This table also outlines the impact of each proposed application on Tehran’s policymaking at the end of each entry. It should be noted that in the next chapter, these operational examples will be proposed in greater detail for implementation within Tehran’s urban management framework.

The localization framework for Tehran must, therefore, target the specific urban challenges—institutional fragmentation, data scarcity, and low public trust—by deploying gamification models that foster transparency and reward tangible civic action. The localization strategy is structured across key functional areas of urban management:

1. Data-Driven Environmental Monitoring and Citizen Reporting:

To address Tehran’s documented challenge of data scarcity and environmental pollution, the application of sensory-based gamification is proposed, mirroring the success of ParmoSense in Japan. This approach, titled the “Tehran-Sanj” Project, would leverage mobile applications and portable sensors (distributed via neighborhood centers) to enable citizens to crowdsource real-time data on noise, air quality, and temperature. The use of Missions/Challenges and Leaderboards, derived from ParmoSense, satisfies the competence and relatedness needs by providing immediate feedback on contributions and promoting healthy social competition. The reliable, high-volume data generated would provide Tehran’s urban managers with a crucial evidence base

Table 2: Global gamification experiences and proposed applications in Tehran's urban policy-making

Global Experience Title	Mechanism Type	Key Technology or Tool
CityScopeAR	3D Visualization, Missions/Challenges, Social Interaction, Points, and Leaderboards	Augmented Reality, Physical Block, Real-time Analysis
Proposed Applications in Tehran's Urban Policy-making based on this Game: Smart Workshops "My Tehran, My Design" A proposal to create interactive workshops in neighborhood houses or cultural centers using <i>smart tables</i> (similar to CityScopeAR), where citizens can model various neighborhood development scenarios with <i>physical blocks</i> (such as the placement of green spaces, parking, and land uses) and observe their impact <i>in real-time</i> through <i>augmented reality</i>. This tool is particularly applicable for **urban regeneration** projects or the renovation of deteriorated urban fabrics.		
Influence on Policy-making	Democratization of the planning process by enhancing spatial understanding and increasing the participation of non-specialists in urban design. Enhancing the quality of feedback and enabling the testing of policies before actual implementation, which leads to improved decision-making.	
Global Experience Title	Mechanism Type	Key Technology or Tool
ParmoSense	Missions/Challenges, Points and Leaderboards, Rewards/Incentives	Mobile Application, Participatory Sensors
Proposed Applications in Tehran's Urban Policy-making based on this Game: "Tehran-Sanj" Project So that citizens can use smartphone sensors or small portable sensors (e.g., distributed in cultural centers or neighborhood houses) to record and send data on temperature, humidity, noise pollution, light, and air quality from different parts of the city. This data can assist in the continuous monitoring of the urban environment and serve as a basis for environmental policies (e.g., the placement of new green spaces and noise pollution reduction programs).		
Influence on Policy-making	Provision of timely and accurate data for environmental policies (e.g., the placement of new green spaces and noise pollution reduction programs). Democratization of urban monitoring and enhanced environmental awareness among citizens, which can lead to participatory policy-making.	
Global Experience Title	Mechanism Type	Key Technology or Tool
Game.UP	3D Visualization, Missions/Challenges, Points and Leaderboards, Rewards/Incentives	Digital Platform, Virtual Reality, Cognitive Assessment
Proposed Applications in Tehran's Urban Policy-making based on this Game: "Tehran Online Urban Design" Project A proposal to create a digital simulation platform (similar to Game.UP) where citizens can virtually experience various urban planning schemes (such as land use changes, new traffic plans, and public space development). They can observe the consequences of their decisions on indicators like density, accessibility, environmental quality, and citizen satisfaction, and then submit their suggestions to decision-makers. This platform could also be used in the municipality's online consultative meetings.		
Influence on Policy-making	Democratization of the planning process through decision-making simulation and online citizen participation. Enhanced skills for collective thinking and submitting more informed suggestions to decision-makers.	

Global Experience Title	Mechanism Type	Key Technology or Tool
Digital Co-Design	Missions/Challenges, Points and Leaderboards, Rewards/Incentives, Social Interaction	Web-based Platform, Scoring System
Proposed Applications in Tehran's Urban Policy-making based on this Game: "Tehran Co-Design Studio" Project A proposal to create a web and mobile-based platform (similar to <i>Digital Co-Design</i>) where citizens can participate in different stages of urban design (from the ideation phase to the final design selection). The platform can provide tools for uploading photos, drawing simple designs, and sharing ideas, while encouraging creative participation through a scoring system and instant feedback. This tool is particularly applicable for the redesign of squares, parks, or urban facades.		
	<i>Enhanced participation</i> in certain areas and fostering co-creation between citizens and urban designers. <i>Improving the quality of crowdsourced feedback</i> and reducing the operational costs of consultative meetings.	
Global Experience Title	Mechanism Type	Key Technology or Tool
Participatory Chinatown	3D Visualization, Missions/Challenges, Social Interaction	Three-dimensional Narrative Game
Proposed Applications in Tehran's Urban Policy-making based on this Game: "My Neighborhood Game" Project This project involves developing three-dimensional role-playing games (<i>3D RPGs</i>) focused on Tehran's historic or deteriorated neighborhoods (e.g., southern Tehran neighborhoods, Harandi neighborhood, etc.). In these games, citizens take on the roles of fictional residents and experience daily challenges, such as finding housing, employment, and access to services. These games can be used in in-person sessions with vulnerable groups (e.g., immigrants, seniors) to help policy-makers better understand their needs and problems, and to design more empathetic policies.		
Influence on Policy-making	<i>Potential for participatory policy-making</i> with a better understanding of the needs and problems of vulnerable and marginalized groups. <i>Increased empathy and public trust</i> in local policy-making processes.	
Global Experience Title	Mechanism Type	Key Technology or Tool
Unlimited Cities	3D Visualization, Missions/Challenges, Social Interaction, Points and Leaderboards	Visual Web and Mobile Platform
Proposed Applications in Tehran's Urban Policy-making based on this Game: "My Neighborhood Vision" Project This project involves creating a visual application (similar to <i>Unlimited Cities</i>) where citizens can take photos of public spaces in their neighborhood and then use <i>pre-designed elements</i> (trees, urban furniture, facade color schemes) to create their desired future image of that space. These images can be shared on the platform, and through <i>public voting</i>, the best visions can be identified to serve as the basis for public space beautification and redesign projects.		
Influence on Policy-making	<i>Democratization of the planning process</i> with the participation of various social groups in urban visioning. <i>Incorporating citizens' tastes and preferences</i> into detailed design and the redesign of public spaces.	

Global Experience Title	Mechanism Type	Key Technology or Tool
Game4City	3D Visualization, Missions/Challenges, Points and Leaderboards, Rewards/Incentives	3D Simulation, Virtual Reality
Proposed Applications in Tehran's Urban Policy-making based on this Game: "Future Urban Planners" Project This project involves the development of 3D games and simulation environments (similar to Game4City) in collaboration with the Ministry of Education, neighborhood houses, and cultural centers to teach urban design and spatial planning concepts to students and non-specialists. These games could include challenges such as designing a sustainable park, managing traffic at an intersection, or placing service centers in a neighborhood.		
Influence on Policy-making	Enhanced spatial and planning literacy among youth, which leads to their conscious and responsible participation in future policy-making. Creation of a usable idea bank for urban designers and institutions.	
Global Experience Title	Mechanism Type	Key Technology or Tool
GreenApes	Points and Leaderboards, Rewards/Incentives, Missions/Challenges, Social Interaction	Mobile Application, Reward System
Proposed Applications in Tehran's Urban Policy-making based on this Game: "Green Tehran Companion" Project This project proposes the development of an application similar to GreenApes that encourages citizens to adopt sustainable environmental behaviors such as cycling, walking, waste sorting, and reducing energy and water consumption. Through scoring, digital badges, and tangible rewards (e.g., discounts from green businesses, free tickets to municipal environmental events), the application can promote behavioral change and help achieve the goals of Green Tehran.		
Influence on Policy-making	Increased behavior-based environmental participation and assisting in the achievement of "Green Tehran" goals and urban sustainability policies. Provision of citizens' behavioral data for data-driven policies in the environmental domain.	
Global Experience Title	Mechanism Type	Key Technology or Tool
Smart Recycling App	Points and Leaderboards, Rewards/Incentives, Missions/Challenges	QR Code, Smart Bin
Proposed Applications in Tehran's Urban Policy-making based on this Game: "Tehran Zero-Waste (Smart Recycling)" Project This project proposes the implementation of a system similar to Smart Recycling App in pilot areas of Tehran, in collaboration with the Waste Management Organization. Citizens can earn points by recording their waste sorting (e.g., by scanning the QR code on sorted waste bags or smart bins). These points can be converted into discounts on water bills, metro/bus ticket card top-ups, or shopping coupons from Shahrvand stores. This application directly helps increase the rate of waste sorting at the source.		
Influence on Policy-making	Increased waste sorting rate at the source and improved urban waste management policies. Fostering a cultural and behavioral transformation among citizens in the environmental domain through behavioral-committed participation.	

Global Experience Title	Mechanism Type	Key Technology or Tool
Budget Games	Missions/Challenges, Social Interaction, Points and Leaderboards	Role-playing, Group Facilitation
Proposed Applications in Tehran's Urban Policy-making based on this Game: "Neighborhood Budget Game" Project This project proposes holding gamified workshops (similar to <i>Budget Games</i>) in each municipal district, with the participation of citizens, neighborhood managers, and experts. In these workshops, citizen teams with a specific <i>virtual budget</i> would decide on and negotiate the <i>prioritization of local projects</i> (e.g., improving lighting, creating playgrounds, and repairing sidewalks). The results of these games can be used as important <i>grassroots inputs</i> in the annual budgeting process of Tehran's municipal districts and neighborhoods.		
Influence on Policy-making	<i>A significant increase in public participation</i> in the urban budgeting process and enhanced budgetary transparency. <i>The inclusion of grassroots priorities</i> in the allocation of real resources and strengthening public trust in urban management institutions.	
Global Experience Title	Mechanism Type	Key Technology or Tool
FixMyStreet	Points and Leaderboards, Rewards/Incentives, Missions/Challenges	Mobile Application, Interactive Map
Proposed Applications in Tehran's Urban Policy-making based on this Game: "Smart Tehran 137" Project This project involves upgrading the Tehran Municipality's <i>137 system</i> by adding <i>gamification elements</i> similar to FixMyStreet. Citizens can earn points by reporting urban issues (potholes, broken streetlights, accumulated waste) in the "My Tehran" or "137" application. These points, along with <i>badges</i> (e.g., "The City's Eye," "Cleanliness Champion"), <i>neighborhood leaderboards</i>, and <i>instant feedback</i> on the status of their reports, would increase participation and support <i>qualitative monitoring of urban infrastructure</i>.		
Influence on Policy-making	<i>Increased citizen reporting</i>, improved responsiveness of municipal institutions, and enhanced transparency of their performance. <i>Assisting in the qualitative monitoring of urban infrastructures</i> and identifying priorities for repair and maintenance.	
Global Experience Title	Mechanism Type	Key Technology or Tool
EcoCrowd	Rewards/Incentives, Points and Leaderboards, Missions/Challenges, Social Interaction	Digital Platform, Participation Profile
Proposed Applications in Tehran's Urban Policy-making based on this Game: "Tehran Green Partnership Platform" Project This project involves creating a <i>crowdfunding platform</i> with a <i>gamification approach</i> for small-scale <i>environmental and neighborhood-based projects</i> in Tehran. Citizens can earn points and badges by financially supporting projects such as creating urban gardens, installing solar water heaters in public spaces, or waste sorting education campaigns. This platform can collaborate with <i>non-governmental organizations</i> and <i>neighborhood councils</i> to help attract small-scale grassroots investments for sustainable urban projects.		
Influence on Policy-making	<i>Fostering social capacity</i> for implementing small-scale projects with long-term environmental impact. <i>Creation of a digital ecosystem</i> to democratize environmental policy-making and to use participatory data in policy-making reports.	

Global Experience Title	Mechanism Type	Key Technology or Tool
Urban Treasure Hunt	Missions/Challenges, Points and Leaderboards, Rewards/Incentives, Social Interaction	Map-based Application, GPS, Content Creation
Proposed Applications in Tehran's Urban Policy-making based on this Game: "Tehran's Hidden Treasures" Project This project involves designing a <i>map-based application</i> (similar to <i>Urban Treasure Hunt</i>) to help discover and introduce public spaces, lesser-known historical sites, and cultural attractions in Tehran's neighborhoods. By visiting these locations and completing related missions (e.g., taking photos, answering historical questions, talking to residents, and creating text/image content), citizens can earn points and badges. This platform can help increase the sense of belonging to the neighborhood, promote local tourism, and collect <i>qualitative data</i> on urban spaces.		
Influence on Policy-making	<i>Increased sense of belonging to the neighborhood</i> and enhanced social, historical, and identity-based understanding of urban spaces. <i>The creation of grassroots content</i> about places that can serve as input for urban redesign and beautification projects.	

for environmental policy-making, directly addressing the need for empirical policy input.

2. Participatory Budgeting and Resource Allocation:

The localization of participatory budgeting, inspired by Budget Games and the narrative-driven mechanics of Participatory Chinatown, is essential for strengthening citizens' sense of autonomy in financial decision-making. A Tehran Budget Challenge could use an iterative process that awards points for trade-off decisions, simplifying complex municipal finances while satisfying the need for competence and meaningful choice (Nicholson, 2015).

3. Collaborative Urban Design and Spatial Planning:

For complex spatial planning, the CityScopeAR model is highly localized into "Tehran my design" workshops. These interactive workshops utilize smart tables where citizens model scenarios using physical blocks augmented with real-time data feedback (Landa Oregi et al., 2025), which directly satisfies the need for competence in design, a core challenge in traditional, non-visual public consultation.

4. Fostering Social Empathy and Community Cohesion:

To address social fragmentation, a role-playing gamification model similar to Participatory Chinatown is proposed. The "Tehran

Storyteller" Project would use narrative-driven missions to place users in the roles of marginalized residents, fostering empathy and collecting valuable qualitative data on housing, transport, and service access. This strategy addresses the psychological need for relatedness and contributes to a more socially just policy outcome.

5. Educational and Public Awareness Campaigns: Leveraging the educational success of Game4City and Unlimited Cities, a mobile-web platform focused on urban issues is proposed for Tehran's youth. The use of educational levels, team competition, and visual scenario-building will enhance spatial literacy and civic responsibility, moving participation from a formal requirement to an intrinsically motivated, enjoyable educational experience.

Applying gamification to Tehran's urban management

Based on the analysis of global experiences, this section proposes a comprehensive framework for implementing gamification in Tehran. This framework, designed as a continuous cycle, ensures that the proposed solutions are grounded in theory, guided by practical strategies, and manifest as tangible projects. The framework is structured as a continuous and complementary cycle, moving from theoretical methods to practical strategies and culminating in concrete operational examples.

The implementation cycle

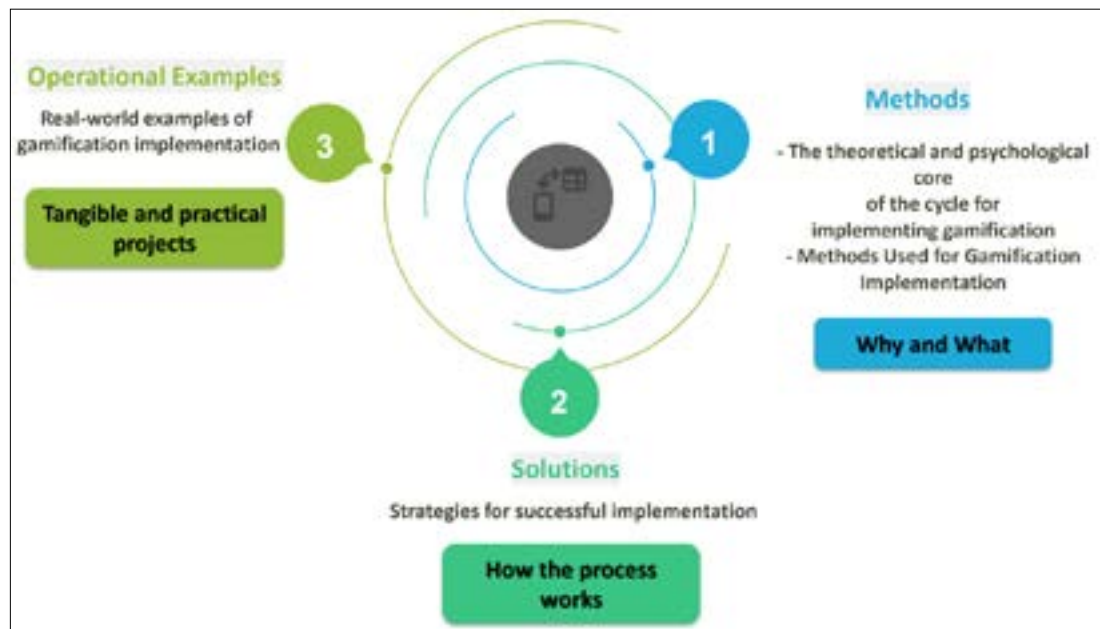


Fig. 6: The gamification implementation cycle; from methodologies to operational examples

1. *Methods* (“Why” and “What”): This is the theoretical and psychological core of the cycle. It defines the core objectives of gamification, which include:

- a) Increasing motivation and interest through points and rewards.
- b) Facilitating and making participation more engaging with challenges and storytelling.
- c) Enhancing learning and awareness through educational content and simulations.
- d) Strengthening a sense of belonging and social cooperation through teamwork and virtual communities.

2. *Strategies* (“How”): This layer provides the practical roadmap and infrastructure for implementation. Key strategies include:

- a) Creating an integrated, gamified platform for citizen participation.
- b) Defining clear goals and target audiences to make activities more focused.
- c) Designing balanced and appropriate game mechanics.
- d) Ensuring transparency and a continuous feedback loop to build public trust.
- e) Implementing pilot projects and a continuous improvement process.
- f) Providing training and public education to

prepare both citizens and officials.

- g) Securing cross-sector collaboration and organizational support to ensure sustainability.

3. *Operational examples* (“Manifestation”): This final layer provides tangible, real-world projects that apply the methods and strategies to Tehran’s context. These examples are categorized into specific thematic areas to address different urban challenges (Fig. 6).

Proposed operational examples for Tehran

The following is a curated list of proposed gamification projects for Tehran, inspired by global best practices and adapted to the city’s unique needs and opportunities. These proposals were designed to be directly applicable to Tehran’s urban ecosystem, enhancing citizen participation across various domains:

1. Neighborhood Competition and Development

- *“Our neighborhood, our idea” challenge:* A gamified competition between neighborhoods to propose the best ideas for local development, such as green space projects or waste management initiatives. Winning neighborhoods receive recognition and resources to implement their projects, with points awarded for participation, idea

quality, and project success.

- *“Neighborhood league”*: A continuous gamified system that ranks Tehran’s neighborhoods based on key performance indicators like cleanliness, participation in surveys, and local project completion. A public leaderboard would foster a sense of competitive spirit and civic pride.
- *“Model neighbor” initiative*: A point-based system to encourage positive social interactions and volunteerism in local communities. Points could be earned for activities like helping seniors or participating in local events, with a “Golden Neighbor” title awarded to the most active individuals each season.

2. Reporting and Creative Problem-Solving

- *“Smart Tehran 137” project*: An upgrade to the existing Tehran 137 municipal reporting system, similar to the UK’s FixMyStreet. Citizens would earn points and badges for reporting urban issues like potholes or broken streetlights. Additional points would be awarded upon resolution, and a real-time feedback loop would inform citizens of their report’s status, building trust and engagement.
- *“My Tehran, my painting” campaign*: A creative approach to problem-solving where citizens report urban blemishes (e.g., damaged walls) via an app and propose ideas for them to be turned into public art. The best ideas would be painted by local artists, and the original reporter would be recognized as a “Urban Art Patron”.

3. Participatory Budgeting

- *“Budget games” for neighborhoods*: A workshop-based gamified approach, similar to the US’s Budget Games, where citizen teams in each municipal district receive a virtual budget to allocate to local projects. The outcomes of these role-playing simulations would provide valuable, citizen-sourced input for the city’s annual budgeting process.

4. Policy and Urban Design Simulation

- *“Be Tehran’s mayor”*: A serious game or interactive workshop where users take on the role of mayor to experience the complexities of urban decision-making. This would increase civic literacy and provide policymakers with insights into citizen preferences.

- *“Future architects” project*: A simulation game, inspired by Game4City, to educate students and non-experts on urban planning concepts. Participants would be challenged to design a sustainable park, manage traffic, or site community centers within a virtual neighborhood.
- *“My neighborhood, my game” project*: A 3D role-playing game focused on historical or worn-out neighborhoods. Players would experience daily challenges faced by fictional residents, such as finding housing or accessing services, providing policymakers with a deeper, empathetic understanding of marginalized communities’ needs.

5. Co-creation and Participatory Design

- *“Tehran my design” workshops*: Interactive workshops using smart tables, similar to CityScopeAR, where citizens can use physical blocks to model different neighborhood development scenarios. Augmented reality would provide real-time feedback on the impact of their designs, making complex planning concepts accessible to everyone.
- *“My neighborhood’s vision” initiative*: An app, inspired by Unlimited Cities, that allows citizens to upload photos of public spaces and use design elements (e.g., trees, benches, colors) to create their desired future vision for that space. Public voting would select the best visions, which could inform real urban redesign projects.
- *“Tehran co-design studio”*: An online platform, similar to Digital Co-Design, where citizens can participate in various stages of urban design. The platform would include tools for uploading photos, sketching ideas, and providing feedback, with gamification elements like points to encourage creative participation.

CONCLUSION

This review article systematically explored the potential of a gamification approach to enhance citizen engagement within the urban policy-making and management processes of Tehran, the capital of Iran. By anchoring the analysis in the Motivational Affordances theory, the study moved beyond mere technological application to investigate how game design elements—such as real-time feedback,

social competition, and meaningful challenges—fulfill citizens’ fundamental psychological needs for competence, autonomy, and relatedness. The comparative analysis of thirteen successful global case studies, including CityScopeAR, ParmoSense, and Game.UP, yielded a transferable framework, confirming that the success of urban gamification lies in its ability to transform opaque, formal policy procedures into intrinsically motivating, data-rich civic activities. These findings reveal a clear shift: effective gamification acts as a strategic intervention that increases the quality of participation by fostering spatial literacy, encouraging collaborative problem-solving, and providing municipal management with verified, high-resolution crowdsourced data. Crucially, the research synthesized these global insights into a localized, operational strategy tailored to Tehran’s unique socio-cultural and administrative context. The proposed framework, which advocates for context-specific projects like the “Tehran-Sanj” Project for environmental monitoring and the “Tehran Storyteller” for social empathy, addresses Tehran’s current challenges of institutional fragmentation and data scarcity. By prioritizing the mechanisms that facilitate citizen self-determination and tangible impact, these proposals are designed to increase public trust and transition participation from a formal requirement to a sustained, enjoyable civic commitment. In sum, this article provides a robust, evidence-based roadmap for Tehran’s urban management to implement smart governance principles. The adoption of this gamification approach is not simply a modernization of tools, but a fundamental redesign of the civic-state relationship, promising a more inclusive, responsive, and ultimately, a more socially sustainable urban future for the metropolis. Future research should focus on the empirical testing and comparative evaluation of these localized project proposals.

AUTHOR CONTRIBUTIONS

M. Ghorbanian was responsible for the conception and design of the study, systematic literature review, analysis and synthesis of the reviewed studies, development of the proposed framework for gamification in urban management, and writing, revising, and finalizing the manuscript.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy, have been completely witnessed by the authors.

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ABBREVIATIONS (NOMENCLATURE)

RPGs Role-Playing Games

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