

A New Dimension of Acceptance? Introducing Perceived Public Value as Extension of UTAUT in the Smart City Context

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Abstract— Smart city technologies aim to address urban challenges by leveraging digital innovation to contribute to livability. However, their acceptance by citizens remains a critical challenge. Technology acceptance models such as the Unified Theory of Acceptance and Use of Technology (UTAUT) assess individual benefits, overlooking community-oriented motivations. This study proposes expanding UTAUT by introducing perceived public value (PPV) as a new dimension that reflects collective benefits that individuals perceive for their community. Drawing on public value theory, we synthesize a concept of public value and evaluate UTAUT's capability to reflect resulting public value dimensions. Our findings suggest that integrating PPV as additional dimension in UTAUT could enhance understanding of technology acceptance in the smart city context and lays the groundwork for empirical validation. This research contributes to both research and practice by advocating for the inclusion of public value considerations in smart city development, aiming for more sustainable urban development.

Index Terms—Smart city, technology acceptance, public value, UTAUT, sustainable development.

I. INTRODUCTION

THE increasing development of smart city solutions is crucial for addressing urban challenges such as overpopulation, space shortages, and pollution, with the goal to provide a livable environment for citizens [1], [2], [3]. By leveraging the advantages of information and communication technology (ICT), these solutions can offer advantages across various domains, including smart economy, smart environment, smart mobility, smart governance, smart living, and smart people [4].

However, smart city applications can only fulfill their purpose if they are widely accepted and adopted by citizens [5]. The most commonly used models to evaluate technology acceptance are the technology acceptance model (TAM) and the unified theory of acceptance and use of technology (UTAUT) [6], [7], [8], [9]. However, these models are primarily used in

the context of private organizations and focus on evaluating personal utility and use. In contrast, smart city applications serve a broader, more heterogeneous user base composed of diverse citizens. These applications aim to benefit the entire population and are even more dependent on citizen acceptance, as citizens are both key stakeholders and end-users [10]. Despite the growing relevance of smart city applications, their potential societal and sustainability benefits, and the need for broad acceptance, existing technology acceptance models and their adaptations have largely measured only individual advantages. To our knowledge, they have not yet assessed the societal value of such applications. In smart cities, technology is not merely a personal tool that provides individual value but a communal resource that can enhance collective well-being and support sustainable development goals (SDGs) [11], [12]. This shortcoming highlights the necessity for an integrated framework that considers both individual and community-oriented motivations in technology acceptance.

Although not originally focused on technology, the concept of public value provides a relevant framework for evaluating the societal contributions of public services [13]. Public value can help understand the societal contributions of organizations or activities which primarily result from government performance. Given that smart city initiatives are often driven and funded by government, public value could offer a valuable perspective for identifying additional acceptance dimensions centered on societal benefit. Similar to previous research on service acceptance models that included sustainability and quality of life as important factors, user acceptance of smart city applications may extend beyond individual utility [14].

Drawing on public value theory and research on technology acceptance, this article thus answers the following research questions:

RQ 1: How can public value be conceptualized in the context of smart city applications?

RQ 2: To what extent do UTAUT variables reflect public value dimensions?

RQ 3: How could UTAUT be adjusted to reflect public value dimensions?

Although this article does not provide empirical evidence yet, we bridge public value with technology acceptance and provide a first conceptualization that paves the way for further research. Our findings contribute to research on technology acceptance and public value for smart cities by introducing an extension of UTAUT that reflects public value. For practice, we highlight the importance of citizens as central stakeholders of smart city solutions that are essential for the acceptance of smart cities.

To answer our research questions, this article is structured as follows. First, we review relevant literature on technology acceptance and public value, followed by a detailed description of our research process. Next, we propose a condensed conceptualization of public value and examine the extent to which UTAUT variables reflect the related dimensions. We then present an extension of UTAUT tailored to smart city applications, introducing the variable *perceived public value* (PPV) as a new dimension designed to capture the collective value smart city applications. Finally, we discuss our findings and outline directions for future research. With this study, we aim to support the integration of public value considerations into the development of smart city solutions, ultimately contributing to more sustainable smart cities that service people, planet, and prosperity.

II. RELATED LITERATURE

A. Technology Acceptance in Sustainable Smart Cities

UTAUT and its predecessor TAM have been essential in predicting technology adoption behaviors [6], [8], [9]. While TAM focuses on perceived usefulness and ease of use as predictors of the attitude towards using a technology, UTAUT extends TAM by introducing constructs such as performance expectancy, effort expectancy, social influence, and facilitating conditions to forecast behavioral intentions and use [7], [8]. UTAUT has been extended to account for factors influencing use behavior for the consumer market by adding hedonic motivation, price value, and habit [15]. While these models have provided valuable insights into the factors influencing technology acceptance in private organizations, their use has been limited in the smart city context [16], [17], [18].

However, smart city applications differ from enterprise tools in both user base and purpose. Citizens represent a more heterogeneous user group compared to employees of one company, as they vary in terms of demographics (e.g., teenagers and seniors), socio-economic backgrounds (e.g., education levels, income, social status, and living conditions), cultural backgrounds (e.g., languages, values, and norms), as well as user capabilities and tech-savviness. Second, smart

city application use is typically voluntary rather than mandated. Smart city solutions aim to contribute to benefits for citizens and thus to livability in the city, making cities inclusive, safe, resilient, and sustainable [12]. Despite these distinctions, prior acceptance studies have focused primarily on individual performance benefits [19], [20]. While UTAUT incorporates social influence, it largely addresses personal acceptance drivers rather than broader expectations of technology serving the public good, benefits for the community, or societal gain. Studies examining additional variables such as trust and government support have produced mixed results and did not assess broader societal value [21], [22], [23]. Similar to previous research on service acceptance models that included sustainability and quality of life as important factors, user acceptance in UTAUT might reach beyond individual benefits [14]. In sum, to our knowledge, no study has yet examined whether perceived community or societal value also has an influence on citizen's intention to use smart city applications.

B. Public Value

The concept of public value emerged in the 1990s in government research and provides a framework for evaluating the contributions of organizations or activities to society and, as such, to common good [13]. Since then, it has evolved in several directions that conceptualize public value from strategic-managerial, psychological, and normative perspectives. Further research also detailed public values, including human dignity, citizen involvement, or integrity [24].

Moore states that “the core idea is a simple one: public managers should be focused on ‘creating public value’ from the assets entrusted to them by the public.” (Moore, 2021, p. 1). He conceptualizes public value from a managerial and strategic perspective as a strategic triangle encompassing legitimacy and support, operational capability, and public value [13]. Bozeman expands the idea from a normative perspective and defines public values as “those providing normative consensus about (a) the rights, benefits, and prerogatives to which citizens should (and should not) be entitled; (b) the obligations of citizens to society, the state, and one another; and (c) the principles on which governments and policies should be based” (Bozeman, 2007, p. 13). In this view, public values go beyond what the public wants, being collective and socially constructed and not reducible to individual preferences. The concept is further expanded with the introduction of the Public Value Scorecard, which draws on psychological needs theory to evaluate how individuals perceive public value across five organizational dimensions: task fulfillment, morality, quality of life, social cohesion, and profitability [27]. Faulkner and Kaufman describe public value as outcome-focused and group it in four dimensions, including outcome achievement, which assesses the social and economic impacts of an initiative; trust and legitimacy, which reflect the public's confidence in an organization and its fairness; service delivery quality, denoting client satisfaction and convenience; and efficiency, which considers whether the benefits of an activity outweigh its costs [28].

In sum, while definitions vary, public value aims to ensure that public organizations and managers deliver services and outcomes that are beneficial to the public, by considering efficiency, ethical factors, and social outcomes.

C. Research Gap

Considering the call for more sustainable smart city solutions that are accepted and used by the public, we see the potential of public value as a promising concept to explain technology acceptance beyond individual benefits since smart city applications can be a form of a public service. Despite its broad application in public organizations and first applications in e-Government [29], to our knowledge public value theory has not been incorporated in technology acceptance models yet.

Despite the advantages of TAM and UTAUT in assessing influencing factors of technology acceptance, we identified a gap in their ability to account for the collective notion of technology serving a greater good, or public value. These models, and their expansions, focus predominantly on individual acceptance factors and do not consider the broader societal influence that smart city technology should contribute to. To bridge these gaps, we suggest the incorporation of public value frameworks in existing technology acceptance theory in the context of smart cities. By incorporating public value per-

key contributions based on two criteria: 1) the number of citations, reflecting their relevance to the academic field, and 2) the requirement that they provide a clear conceptualization of public value. We selected the conceptualizations of public value by Moore [13], Bozeman [26], Faulkner and Kaufman [28], and Meynhardt [27]. We then conducted a comparative analysis of their conceptualizations of public value and identified five common dimensions among them, which we mapped in a synthesized public value concept. This synthesis aimed to answer how public value can be conceptualized in the context of smart city applications (RQ 1).

In the second phase, we synthesized the concepts of public value and technology acceptance. We selected UTAUT as technology acceptance model to evaluate public value, as it builds on TAM and captures additional dimensions beyond perceived usefulness and ease of use. We did not use UTAUT2 due to its tailoring to the consumer context, which includes dimensions such as price value and hedonic motivation. As smart city applications are typically offered free of charge and serve a public rather than a consumer-oriented purpose, these extended dimensions were deemed less relevant in our context. Next, we conducted a qualitative comparative analysis of the dimensions of the synthesized public value concept from phase 1 and the UTAUT dimensions. From this, we identified gaps in UTAUT that fail to reflect

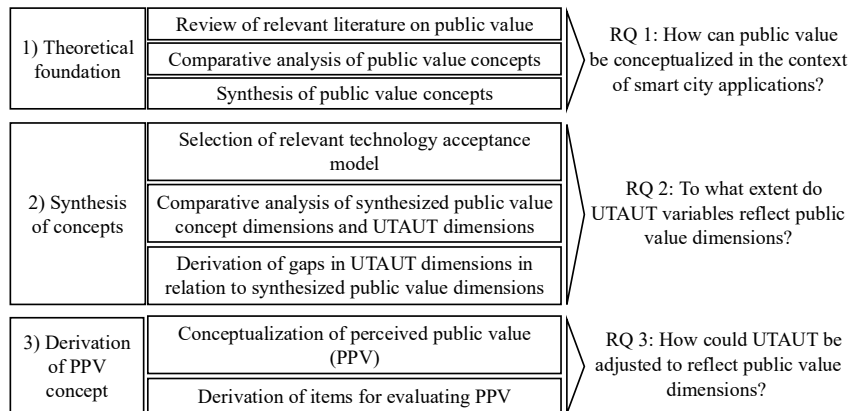


Fig 1. Research Process

spectives, we can better assess the potential of smart city technologies to meet the collective needs of citizens and align with broader goals such as sustainability and livability. Ultimately, balancing individual and collective value while ensuring sustainable and effective implementation may enhance public acceptance of smart city applications. Considering the concept of public value in relation to the call for “IS for the better” [30], the expansion of existing technology models could thus challenge the notion that acceptance is solely based on individual advantages and fill the proposed research gap.

III. RESEARCH PROCESS

To answer our three research questions, we structured our research process into three phases (Fig. 1). In the first phase, we ensured a theoretical foundation by identifying and analyzing relevant literature on public value. We selected four

public value dimensions. The resulted findings addressed the extent to which UTAUT variables reflect public value dimensions (RQ 2).

In the third phase, we derived a new concept of *perceived public value* that could be added to UTAUT as an additional dimension to assess the influence of public value on the intention to use smart city applications. Furthermore, we derived initial measurement items that could be used in future evaluations of PPV. This phase aimed to answer how UTAUT could be adjusted to reflect public value dimensions (RQ 3). We present the results of this process in the following.

IV. CONCEPTUALIZATION OF PERCEIVED PUBLIC VALUE

The result from phase 1 was a synthesized conceptualization of public value. Table I summarizes the results from the comparative analysis of the selected public value concepts.

We first compared how each author defines public value to provide context for their conceptualizations. In the rows, we present the identified similarities between the concepts in five conceptual dimensions of public value:

- Legitimacy and trust,
- operational capacity,
- outcome orientation, efficiency, and profitability,
- citizen engagement and participation,
- and ethical/moral foundation.

In the columns, we assigned the related sources. The resulting table shows how each concept addresses the five conceptual dimensions. Some definitions and concepts might relate to more than one conceptual dimension, depending on the focus. For example, trust and legitimacy as defined by Faulkner & Kaufman (2018) can relate to a distinct dimension with emphasis on the trust in an organization but can also contribute in part to the dimension of ethical and moral foundation when focusing on the fairness of processes.

As a result of phase 2, Table II illustrates the conceptual overlap between the four UTAUT dimensions performance expectancy, effort expectancy, social influence, and facilitating conditions. We conducted a qualitative review of the UTAUT items and public value dimensions to assess overlap and distinction. We did not consider moderating variables of UTAUT. We used a plus sign (+) when UTAUT sufficiently reflects a public value dimension, a minus sign (-) when no overlap was found, and a combination of both (+/-) for partial overlap.

For *legitimacy and trust*, we observed partial overlap with social influence, which captures social or organizational pressure to adopt a system. This may relate to perceived legitimacy but does not reflect trust in institutions or government

as a central theme. *Operational capacity* showed partial alignment with facilitating conditions, which refer to technical and organizational support for use. This partly reflects institutional readiness to deliver services. *Outcome orientation, efficiency, and profitability* aligned with performance expectancy, as both emphasize the belief that a system will improve performance. Effort expectancy also overlaps in terms of efficiency, assuming that ease of use contributes to effective service delivery. *Citizen engagement and participation* showed indirect overlap with social influence and effort expectancy. While UTAUT acknowledges social norms, it does not explicitly model participatory or co-creation processes. Effort expectancy also reflects ease of use which is somewhat reflected in service delivery quality as part of client satisfaction. Last, we did not find any overlapping dimension in UTAUT that reflects ethical or moral foundation, highlighting its value-neutral stance. Although several public value dimensions are only partially represented, the complete absence of a moral/ethical foundation stresses a significant conceptual gap between the two frameworks.

As results of phase 3, we developed a new dimension that could be added to UTAUT. While UTAUT captures drivers of individual technology acceptance, its constructs only partially address the broader dimensions of public value. This underscores the need for an expanded or integrated model when evaluating smart city application use. UTAUT assumes a rational individual actor motivated by personal benefit. However, in public administration, both managers and citizens may also be driven by collective, moral, and social values. The narrow individual focus of UTAUT thus overlooks the societal responsibilities and ethical expectations that may shape citizen attitudes towards smart city solutions.

TABLE I.
CONCEPTUALIZATION OF PUBLIC VALUE BASED ON [13], [26], [27], [28]

		Moore (1995)	Bozeman (2007)	Faulkner & Kaufman (2018)	Meynhardt (2019)
	Value definition	What the public values / benefits from	Rights, entitlements, and societal obligations	Achieving desirable outcomes (social, economic, etc.)	Subjective perception of value based on individual experience
Conceptual dimension	Legitimacy and trust	Legitimacy and support (political/legal)	Obligations of citizens to society, state, and one another; principles on which governments and policies should be based on	Trust and legitimacy (fair process, trust in organization)	Morality (is the organization decent) and social cohesion (is it acceptable)
	Operational capacity	Organizational ability to deliver	N/A	Efficiency	Implicit in task fulfillment
	Outcome orientation, efficiency, and profitability	Implicit in value creation	Implicit in value creation	Outcome achievement (strong emphasis on achieving social, economic, environmental and cultural outcomes)	Focus on individual (quality of life) and collective (morality, acceptance) well-being, but also on profitability
	Citizen engagement / participation	Implicit in focus on the mission of socially oriented public value	Obligations of citizens to society, the state, and one another	Service delivery quality (client satisfaction and suitable citizen engagement, accessibility, convenience)	Quality of life (positive experience) and social cohesion (satisfying needs for belonging)
	Ethical/moral foundation	Implicit in political and legal backing, benefits and useful outcomes for the public	Shared responsibility of citizens and government	Trust and legitimacy (transparent and fair process), service delivery quality (client satisfaction), Outcomes (social, economic, environmental, cultural)	Morality (satisfaction of moral-ethic needs)

We therefore propose a new dimension called *perceived public value* (PPV), defined as the extent to which an individual believes that a system will create value for the broader community. We chose PPV as a new term for two reasons. First, to distinguish it from prior definitions of public value. Second, to emphasize that public value may extend beyond the individual perspective, which cannot always be directly measured. While citizens likely value the personal benefits of smart city applications (performance expectancy), they may also be motivated by a sense of civic duty or community contributions. In such cases, adoption may stem as much from civic responsibility as from personal convenience.

To assess PPV, we developed six measurement items based on the public value dimensions that were not covered by UTUAT in phase 2 (Table III). We excluded the dimension *outcome orientation, efficiency, and profitability*, as it is sufficiently addressed by performance and effort expectancy. We developed the items based on the style of previous UTAUT questionnaires [6], [21], [23] and added the items according to the identified focus of each public value dimension. The proposed items are intentionally formulated broadly to allow adaptation to specific applications and use cases. We propose that incorporating PPV into UTAUT may improve understanding of citizen behavior in smart city contexts. Doing so acknowledges the civic motivations behind technology use, particularly in cases where collective adoption and use enhances overall system effectiveness.

TABLE II.
PUBLIC VALUE DIMENSIONS AND UTAUT MAPPING

Public Value Dimension (PPV)	UTAUT Dimensions	Conceptual Overlap
Legitimacy and Trust	Social Influence (some overlap)	+/-
Operational Capacity	Facilitating Conditions (some overlap)	+/-
Outcome Orientation, Efficiency, Profitability	Performance Expectancy, Effort Expectancy	+
Citizen Engagement and Participation	Social Influence (indirect), Effort Expectancy (indirect)	+/-
Ethical/Moral Foundation	Not Applicable	-

TABLE III.
MEASUREMENT ITEMS FOR PERCEIVED PUBLIC VALUE (PPV)

Measurement Item(s)	Public Value Dimension
PPV1: The application contributes to the city's objectives which are targeted with the application.	Legitimacy and Trust
PPV2: The application contributes to the main goal (for which it was developed).	Operational Capacity
PPV3: The application contributes to the feeling of community. PPV4: The application contributes to fulfilling citizen's needs beyond individual needs.	Citizen Engagement and Participation
PPV5: The application contributes to sustainability factors and the environment. PPV6: The application contributes to quality of life (in the city).	Ethical/Moral Foundation

V. DISCUSSION AND OUTLOOK

In this article, we introduced PPV as an additional dimension to be integrated into UTAUT to evaluate factors influencing citizens' intention to use smart city applications. Our research has both theoretical and practical implications. From a theoretical perspective, our study bridges a significant gap by proposing a novel way to account for community-centered benefits within technology acceptance models. Modifying UTAUT to incorporate public value may not only enhance its explanatory power in the context of smart cities but also align it more closely with broader sustainability goals. For practice, the inclusion of PPV emphasizes the importance of considering societal benefits in the design and evaluation of smart city applications. Our literature review demonstrated how public value represents a crucial foundation for smart city applications and how it may influence technology acceptance. We therefore encourage stakeholders to integrate assessments of public value early in the planning stages of smart cities to improve future acceptance of such solutions. This approach could promote the development of cities that are not only technologically advanced but also aligned with the SDGs.

Although we carefully conducted our research based on relevant literature and structured analyses, we acknowledge several limitations. First, our study is primarily conceptual and has not yet validated PPV as an extension of UTAUT. Future research should test this dimension and evaluate whether it improves the model's ability to explain citizens' intention to use smart city applications. This includes conceptualizing how PPV integrates into UTAUT and determining its appropriate placement within the model. In fact, we have already taken initial steps toward this goal and plan to report preliminary findings in the near future. Second, we based our comparative analysis in phase 2 on four conceptualizations of public value. While carefully selected, we recognize that our inclusion criteria may have excluded other relevant frameworks. A broader literature review may have yielded additional insights that could have extended the synthesized concept. Third, the perception of public value likely varies across demographic, cultural, and socio-economic contexts of the user base. Future research could explore how these contextual factors influence both the perception of public value and acceptance of smart city applications. Evaluating public value as a dimension of acceptance could help in developing smart city applications that include contributions to public value and thus correspond to citizens' needs, eventually improving future acceptance.

In conclusion, while empirical validation remains necessary, this research represents a foundational step in introducing public value into UTAUT. We contribute groundwork for future studies to empirically test the proposed dimension in real-world settings. We also emphasize the importance of recognizing the collective benefits of technology adoption, aligning with the broader objectives of sustainable development as key responsibility and goal of public organizations. Our work encourages further exploration of the intersection of public value and technology acceptance, urging researchers and

practitioners to consider the broader impacts of technology acceptance. The integration of public value considerations offers further opportunities for information systems research aimed at societal benefit. In this context, we expand upon our previous work on the relevance of citizen engagement for technology acceptance [31], [32].

We hope that our future empirical work on PPV will offer additional evidence for the importance of community-oriented perspectives. Through this lens, smart cities can evolve to become centers of technological advancement that while also serving citizen's needs and prioritizing sustainability, creating a more livable future for all.

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