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Unveiling Key Drivers of Citizens' Acceptance of E-Voting: A Quantitative Analysis

Valmira Osmanaj ^{1*}, Syed Faizan Hussain Zaidi ¹, Atik Kulakli ¹, Miranda Harizaj ²

¹ College of Business Administration, American University of the Middle East, Egaila 54200, Kuwait.

² Faculty of Electrical Engineering, Polytechnic University of Tirana, Tirana, 1000, Albania.

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Abstract

The current study examines the broader factors influencing citizens' trust and adoption of electronic voting (e-voting) systems, extending beyond the conventional focus on trust in government and technology. A conceptual framework was developed by incorporating elements from the TAM, IDT, and trust theory. Data was collected through surveys and investigated using SEM to evaluate the relationships amongst crucial variables. The findings reveal that trust in e-voting is significantly shaped by citizens' trust in governing bodies, the transparency and reliability of the voting process, trust in the technology, and perceived ease of use. In contrast, perceived public value was not found to significantly impact trust. These results highlight the multifaceted nature of trust in digital governance and underscore the importance of considering both procedural and technological factors in system design. The novelty of this study lies in its broader perspective on trust, emphasizing the role of implementation and process transparency in influencing public perception. The proposed model offers practical insights for policymakers and system developers seeking to improve public confidence and foster wider adoption of e-voting technologies.

Keywords: E-Voting; Developing Country; Conceptual Model; Citizens' Trust; Citizen-Centric Approach.

1. Introduction

Voting a fundamental pillar of democratic governance, empowering individuals to influence public decisions and elect representatives at various institutional levels [1]. The growing incorporation of information and communication technologies (ICT) into governance has driven many nations to implement e-voting systems to enhance accessibility, reduce electoral costs, improve efficiency, and promote transparency [2, 3]. The COVID-19 pandemic further underscored the necessity of remote voting alternatives, solidifying e-voting's role as a sustainable democratic tool during crises [1, 4].

Despite these advantages, global experiences with e-voting are mixed. While countries such as India, Jordan, and the Philippines have adopted it, others like UK, Netherlands, and Norway have reversed their implementation due to persistent public distrust, lack of transparency, and technical vulnerabilities [4]. A large body of research has explored e-voting adoption through the lens of trust, primarily focusing on trust in technology [5-7] and trust in government institutions [7-9]. However, limited scholarly attention is paid to how the process of planning and implementing e-voting systems itself shapes citizen trust.

* Corresponding author: valmira.osmanaj@aum.edu.kw

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Building on this gap, the current study adopts a broader perspective by integrating findings from the Technology Acceptance Model (TAM), Innovation Diffusion Theory (IDT), and trust theory to propose a comprehensive conceptual framework for e-voting adoption. Existing literature identifies several critical constructs for evaluating e-voting systems: perceived ease of use, which reflects the system's usability [10]; perceived public value, which captures the social benefits citizens associate with e-government services [11]; and trust in the e-voting process, which relates to transparency, security, and system management [12, 13]. These factors, in turn, influence citizens' attitudes toward usage and their intention to adopt technologies employed in e-voting [14-16].

In the Albanian context, the introduction of e-voting followed constitutional amendments and political agreements in 2020, with pilot implementations during the 2021 and 2023 elections [17-19]. Although these pilots were a step forward, limited public engagement, delayed system certifications, and a lack of transparency raised concerns regarding trust and legitimacy.

Thus, the current study aims to explore the factors influencing citizens' trust and adoption of e-voting in Albania, guided by the research questions presented here:

- *RQ1: How is citizens' trust in e-voting affected by the implementation process managed by electoral institutions in Albania?*
- *RQ2: Do citizens perceive public value in using e-voting technologies?*
- *RQ3: What factors contribute to the adoption of advanced voting technologies?*

We develop and empirically test a novel e-voting adoption framework to address these questions. This framework combines TAM, IDT, and trust constructs to examine the interplay between institutional, technological, and perceptual factors using survey-based data and Structural Equation Modelling (SEM).

2. Literature Review

2.1. Voting Definition

There are several definitions of e-voting and internet voting (i-voting), each emphasizing different aspects of the technology employed during the voting process. E-voting is commonly described as the use of software and hardware to enable citizens vote via a computer-based information system [5, 6, 20]. In contrast, i-voting refers to a voting method that employs encryption to ensure secure and confidential voting over the Internet [21]. In another study, Kumar and Walia [22] characterized e-voting as an online platform that establishes and offers voting procedures to citizens through web-based applications. E-voting represents a technological advancement that supports governments in enhancing the democratic process by boosting voter participation in the selection of leaders and representatives [23]. Similarly, Decman & Kozel [24] define i-voting as an e-government service where user-centric design plays a central role. E-voting utilizes ICTs to streamline the processes of casting, counting, and reporting votes. Transactions such as e-voting utterly depend on a complex and interconnected network of digital technologies [25]. It allows citizens to elect officials at various levels, including national, provincial, and local governments [26].

2.2. Forms of E-Voting

As electronic services and the use of digital platforms have become more prevalent in various service sectors, issues related to adoption and acceptance have inevitably emerged. Different stakeholders tend to accept e-voting based on their understanding of technology and how it can be applied. Those who are accustomed to using ICT or other smart devices in their daily routines are more likely to implement e-voting in a similar manner [27]. E-voting system depends on numerous computers, commonly known as electronic voting machines, along with supporting equipment, specialized software, a robust network infrastructure, and sufficient internet bandwidth to cast votes. It also requires a well-established system for ICT-enabled voter registration, high-level cybersecurity, transparent tracking mechanisms, and substantial storage capacity for the Electronic Voters Database [9, 27-29]. Technology in e-voting can be divided into different phases of the electoral process, ranging from the registration of the voters to casting the vote, verification, and final counting of votes [30, 31].

E-voting is not merely a process automation, but it simplifies the entire electoral process. Additionally, it streamlines elections, increases voter participation, reduces errors in vote counting, and accelerates the announcement of results [9]. Several e-voting technologies have been projected and implemented to facilitate voting, including methods such as digital tallying, direct recording electronic machines to cast the vote, kiosk e-voting, online voting, remote e-voting, poll-site voting [9, 30, 32]. It is crucial to include thorough evaluation tools to assess both human-centric and digital capabilities [25]. E-voting systems must fulfil several criteria to be considered effective means of voting and be widely accepted by citizens, including being accurate, verifiable, flexible, reliable and convenient [33].

2.3. E-Voting Adoption Success Factors

The success factors for e-voting adoption depend on several elements, comprising ‘trust in technology’, ‘trust in the government’, ‘perceived public value’, and ‘perceived ease of use’, all of which play a crucial role in adopting technology. Moreover, the impact of these factors on citizens' trust, usage attitudes, and e-voting adoption intentions has been explored in various studies in literature.

"Trust in technology" and "Trust in the government" both play critical roles in the e-services offered by governments [24]. In a latest study conducted by Abdala et al. [7], the authors argue that the trust of the citizens in government is more likely to lead to a rise in overall electoral participation than their trust in the i-voting technology. Trust in technology encompasses the range of technologies that facilitate e-services usage and is vital when ICT is employed to uphold democracy. Therefore, trust is crucial for successfully using technology to enable e-participation, particularly in i-voting [14, 34]. In addition, digital skills are key requirements for the effective acceptance of e-government services by users [35]. Furthermore, integrating voting within a widely recognized digital services ecosystem for citizens is a reliable way to ensure the success of the voting process [23, 36].

Trust in government pertains to the “public’s view of the government’s competence and honesty” in delivering services [37]. The government plays a focal role in creating a transparent and trustworthy voting environment and in administering elections to ensure fairness [38]. Rahul & Gill [39] claimed that the immutableness and decentralization of blockchain make it a viable alternative for e-voting.

When evaluating the adoption rate of e-government services and people's willingness to use them, it is appropriate to utilize the TAM, which is well-recognized for assessing the acceptance of new technologies [40]. Their study focused on public inclinations and opinions regarding e-government services. Trust, safety, and protection are essential for technology adoption, specifically for e-government services [41].

Regarding perceived public values, various stakeholders, such as individuals, corporations, government agencies, and bureaucrats, participate in e-government. Karunia et al. [42] found that transparency influences the enhancement of accountability and responsibility within governmental agencies. According to Bailey et al. [43], people are inclined to use e-government services if they perceive them as means to minimize both the financial and time-related burdens. Therefore, governments must provide new electronic services to improve public governance, transparency, and accountability [44].

In addition, Decman & Kozel [24] identified three main advantages of i-voting in their study. First, it provides “convenience and accessibility” for people with physical disabilities, along with error-free voting and accurate results for greater efficiency. Second, social influence affects the participation of other i-voters [45]. Third, it offers cost-effectiveness compared to other voting systems [46].

A particular consideration is citizens' perception of the ease of use of technology, particularly in terms of whether it is time-consuming, easy to learn, and adaptable. People feel comfortable navigating platforms quickly [10]. The two main attributes are effort and performance expectancy, which ensure that e-voting services, or any similar e-government services, are promoted and widely used by the public. If the e-government portals provides reliable information and professional services, individuals are more likely to utilize e-government services [47]. Furthermore, it has been discovered that the desire to use and recommend e-government services is positively predicted by both the perceived value of the service and trust in the government [48].

The increasing interest in electronic voting systems demands robust security and integration, which are essential components of the voting process. According to Samayamanthula and Kodati [49], a decentralized e-voting approach enhances security by breaking the data into multiple layers and using cryptography to merge these fragmented pieces into a unified view, including biometric data through encryption and decryption. This method reduces risks and operational failures, offering a more secure and reliable voting platform. Rexha et al. [50] proposed that integrating blockchain technology into e-voting systems offers a more secure, precise, and transparent framework, as well as a more cost-effective alternative by reducing election expenses. In their study, Sindermann et al. [51] analysed the correlation between personality features and i-voting from a psychological perspective.

2.4. Models of E-Voting Systems

Researchers have extensively exploited the TAM to envisage and explicate the adoption of information technologies [15, 52]. TAM is regarded as the most commonly used model for recognizing the acceptance and usage of novel technologies [53]. According to TAM, there is a connection between a user's belief in a technology's usefulness, their attitude toward its usage, and their intention to use it. Similarly, both the attitude and intention to use the technology are induced by the user's perception of its ease of use. As a result, the user's “attitude and intention to adopt new technologies are shaped by two constructs: Perceived Usefulness (PU) and Perceived Ease of Use (PEoU)”. PU is defined as “the extent to which a user believes that using a specific system would improve job performance,” while PEoU is “the extent

to which a user believes that using a particular system would be effortless” [52]. In a study by Aljarrah et al. [54], the authors applied the TAM model to assess the acceptance of an e-voting system in Jordan from the voters' perspective and its readiness for use. In another study, the TAM model was employed to examine the impact of trust and security on Taiwan's e-voting system [55].

Another widely recognized theory for technology adoption is the IDT, introduced by Rogers [16]. Rogers defines an innovation as “an idea, practice, or object that is perceived as new by an individual or another unit of adoption,” and diffusion as “the process by which an innovation is communicated through certain channels over time among the members of a social system” [15]. Moreover, Agarwal [56] suggests that “potential users make decisions to adopt or reject an innovation based on beliefs they form about it.” IDT identifies five main attributes of innovation: “relative advantage, compatibility, complexity, trialability, and observability”. In their research, Lippert & Ojumu [6] applied Rogers' classification of adopters, “innovators, early adopters, early majority, late majority, and laggards”, to categorize individuals according to their likelihood to engage in e-voting. They concluded that “innovators and early adopters are more likely to trust technology and express an intention to use e-voting” systems. In another study by Assibong & Oshanisi [57], the authors utilized the IDT to conclude that the use of ICT has “reinforced the legitimacy of Nigerians in the democratic process”.

Other studies aiming to identify the main elements affecting citizens' intention to adopt e-voting have developed and validated hybrid models by combining multiple existing theories [23, 53, 58, 59]. For instance, Alomari [23] undertook a study to explore the vital factors affecting Jordanian citizens' intentions to adopt e-voting, utilizing e-government adoption model along with a framework founded on DOI theory and the TAM model. Similarly, Sensuse and Pratama [53] examined the preparedness for e-voting deployment in Indonesia, incorporating both public opinion and expert advice to propose an innovative e-voting architecture. The authors used both TAM and IDT to develop the measurement model for e-voting readiness [53].

Trust is a fundamental concept in social science [60], and it has been studied across various fields, often associated with the broader concept of social capital [61]. Despite extensive research on trust, Bauer & Freitag [60] argue that the study of trust remains contentious due to the wide range of definitions and limited measurement tools.

In current research on e-voting adoption and citizens' intention to use the system, most studies focus on two main components: trust in government [9, 23, 53], and trust in technology [5, 62, 63]. Building on Bauer & Freitag [60] perspective, we argue that trust should be evaluated in the context of additional factors, including ease of use, perceived public value, and trust in the e-voting adoption process.

3. Theoretical Framework and Hypothesis

Several theoretical models have been developed to elucidate and evaluate the adoption of technology, particularly in the domains of e-government and e-voting. Among the most frequently applied are the TAM [15] and the Unified Theory of Acceptance and Use of Technology (UTAUT) have been extensively utilized to assess technology usage across diverse settings. TAM, initially proposed by Davis [15], emphasizes the role of PU and PEoU in shaping users' behavioural intentions to adopt a given system. Conversely, UTAUT, established by Venkatesh et al. [64], builds upon this foundation by incorporating additional constructs, such as “social influence, performance expectancy, effort expectancy, and facilitating conditions”. In addition to these models, several other theoretical frameworks, such as the Technology Readiness Index, Diffusion of Innovation (DOI), Innovation Resistance Theory, Expectancy-Value Theory, and Mental Accounting Theory, offer complementary insights into individual readiness, resistance to technology, and cognitive processes involved in technology adoption. These models are frequently employed in conjunction with TAM and UTAUT to deepen the conception of user acceptance, particularly concerning the public sector digital services [65-67].

Despite their widespread application, these models are not without their limitations. TAM has been criticized for its reductive approach, as it provides broad insights into user attitudes but often fails to account for more contextual and psychological nuances, such as the roles of trust or resistance to change [65]. In a similar vein, while UTAUT offers a more comprehensive framework, it has been criticized for overlooking individual differences, such as digital literacy or prior technological experience, which could significantly influence technology adoption [65-67]. Furthermore, both models have been criticized for neglecting the attitude construct, which has proven essential in the early stages of technology adoption, where users' perceptions and intentions are still developing. For instance, earlier models like Theory of Reasoned Action (TRA) [68] and Theory of Planned Behaviour excluded attitude as a mediating variable, a gap that TAM later addressed, enhancing its predictive validity [69]. Additionally, adopting e-government services, such as e-voting, necessitates a positive perception of usefulness and ease of use, a high degree of trust, technological competence, and an understanding of the broader civic processes. As such, relying solely on TAM or UTAUT may fail to offer a comprehensive view of the factors influencing adoption, underscoring the need for an integrated framework that considers behavioural, contextual, and trust-related dimensions specific to public sector technology adoption [65, 67].

Building upon the critical evaluation of extant technology adoption models, this study proposes a comprehensive framework designed to capture the multifaceted factors shaping citizens' adoption of e-voting systems. The framework synthesizes constructs drawn from various established theories and empirical studies, aiming to address the gaps identified in TAM and UTAUT, particularly their inability to fully account for trust, user-specific characteristics, and contextual attitudes within the e-government domain. The proposed framework consists of eight key constructs, categorized into three principal dimensions: Trust Factors, Technology Acceptance Constructs, and Process Evaluation. Each of these dimensions is grounded in theoretical perspectives to ensure empirical relevance and contextual applicability.

• Trust Factors

Trust is an essential determinant in the e-government technologies adoption, particularly in sensitive contexts such as e-voting. Drawing from contemporary literature, the framework includes three distinct constructs related to trust:

- Trust in Government: Depicts the confidence of the citizens in governmental institutions to manage and oversee fair and secure electoral processes.
- Trust in Technology: Captures citizens' perceptions of the reliability, security, and technical competence of the e-voting system.
- Citizens' Trust in E-Voting: A composite belief that reflects the overall trust in the e-voting platform, shaped by both institutional and technological trust.

• Technology Acceptance Constructs

This dimension adapts the core elements of TAM to the e-voting context, focusing on the following constructs:

- Perceived Public Value: An alternative to the perceived usefulness construct, used to measure citizens' beliefs regarding the degree to which e-voting contributes to public benefit, transparency, and governance efficiency.
- Perceived Ease of Use: Evaluates the user-friendliness and operability of the e-voting system.
- Usage Attitude: Reflects users' general positive or negative disposition regarding the use of the e-voting system.
- E-Voting Usage Intention: Represents the likelihood that citizens will utilize the e-voting system in future elections, as influenced by the factors mentioned above.

• Process Evaluation

The final dimension integrates insights from the DOI theory, specifically focusing on the procedural aspects of adopting technological innovations:

- Trust in the Process: Depicts the confidence of the citizens in the fairness, transparency, and integrity of the e-voting process itself, independent from the technology or institutional factors.

By synthesizing elements of TAM, DOI, and trust-based models, this integrated framework aspires to offer a more nuanced comprehension of the behavioural, cognitive, and contextual factors that either facilitate or hinder citizens' willingness to adopt e-voting technologies. Figure 1 portrays the proposed e-voting adoption theoretical framework, including the interrelated constructs and their hypothesized relationships.

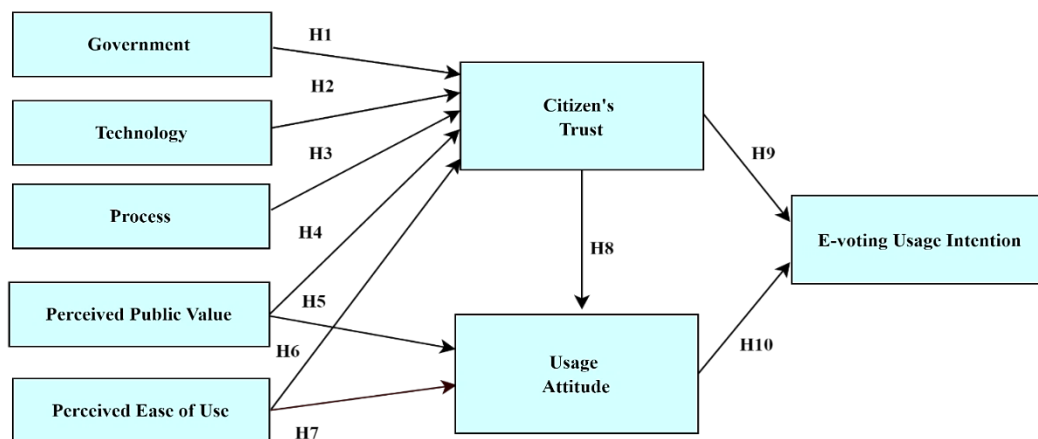


Figure 1. E-voting adoption theoretical framework

The relationships among the model's constructs are explored in the following paragraphs, and the hypotheses are outlined.

3.1. Trust in Government and Citizens' Trust in E-voting

Trust of the citizens in the government resembles the “evaluations of whether or not political authorities and institutions are performing according to the normative expectations held by the public.” [70]. Moreover, trust in e-voting services is based on citizens' “confidence in the goodwill, integrity, and competence of the various stakeholders” involved in delivering these services, such as “government officials, politicians, legislators, and system developers” responsible for its deployment and management [70]. In an opinion poll conducted by UNDP [71], on trust in governance, majority of the respondents have considered the protection of personal data a key aspect on the use of electronic services. Nevertheless, merely 35% of the respondents trust that public actors are capable to manage personal electronic data [71].

This study specifically examines trust in the government, with a focus on trust in the Central Election Commission (CEC), which is “the highest permanent state body responsible for administering elections, ensuring the protection and adherence to constitutional and legal principles, rights, and guarantees during elections.” [72]. Earlier research has emphasized trust in government as a crucial predictor of the successful initiatives of e-voting in several developing countries, including Indonesia [53], Jordan [23], and Nigeria [9]. Hence, we suggest the consequent hypothesis:

H1: ‘Trust in government’ is positively correlated to citizens’ ‘trust in e-voting’.

3.2. Trust in Technology and Citizens' Trust in E-Voting

Trust in technology is another crucial factor influencing the implementation and use of e-voting systems. Lippert [62] asserts that trust in technology “refers to an individual’s willingness to rely on a technology, based on their expectations that it will be predictable, reliable, and useful”. To provide a more in-depth understanding of trust in e-voting, Zhu et al. [5] identified essential measurements of trust in the technology, including “security, usability, privacy, and validity”. In the context of e-voting, they suggested that higher trust in the technology could reduce perceived risks and lead to stronger intentions to use e-voting. To validate these trust dimensions and examine the relationship between trust and the intention to use e-voting, the authors gathered data from 426 Indonesian voters. They confirmed the validity of these dimensions, finding that trust in technology directly influences the intention to adopt e-voting and indirectly impacts it through perceived risk [5]. Likewise, Hoffman et al. [13] identified three key technical dimensions of e-voting, including privacy, usability, and security, which are essential for fostering trust in critical e-voting processes such as voter registration, vote casting, and vote counting. In another study by Powell et al. [63], the authors explored the link between trust in the internet and the intention to use online voting among young adults and seniors. Their findings revealed that for young adults, trust on the internet was correlated with the intention to vote, but this was not the case for senior voters. Given that young adults make up the majority of voters in Albania [73], we hypothesize that trust in technology positively influences citizens’ trust in e-voting, leading to the following hypothesis in our research.

H2: ‘Trust in technology’ is positively related to citizens’ ‘trust in e-voting’.

3.3. Trust in Process and Citizens' Trust in E-Voting

The voting process faces several challenges that threaten its integrity, including ensuring voter privacy, gaining users' trust in the system, and guaranteeing that voting takes place with complete freedom, without limitations or efforts to influence it [74]. For citizens to trust the e-voting system, they must have confidence in all three stages of the voting process: voter registration, vote casting, and vote counting [13].

In line with the guidelines for implementing the provisions of Recommendation CM/Rec(2017)5 on e-voting standards [75], it is essential to ensure “public access to the components of the e-voting system and related information, especially documentation, source code, and non-disclosure agreements, should be disclosed to the stakeholders and the public at large, well in advance of the election period”. Additional guidelines on e-voting implementations are addressed in the handbook related to the new voting technologies [12]. Concerning the handbook, OSCE recommends that the technology must guarantee the “honest counting of votes and reporting of results” [12], “Equal suffrage to adult citizens” [12], and “Verify that elections take place by the law and with democratic principles” [12].

Such legal provisions and guidelines aim to enhance transparency and increase public confidence in e-voting. Secrecy of the vote is one of the main principles that is related to the right to vote and can challenge public reassurance in the e-voting process. Secrecy of the vote refers to not being “possible to associate a vote with a specific voter” [12].

Election observation plays a crucial role in ensuring the transparency of e-voting, as highlighted in paragraph 8 of the 1990 CSCE/OSCE Copenhagen Document. Political representatives, candidates, and observers must be able to oversee the activities of election authorities at every level, particularly during the voting, counting, and tabulation stages. Transparency also involves the responsibility to ensure that all election participants, including voters, are given adequate resources to understand how the new voting technology works [12].

We firmly believe that trust in the e-voting process, which encompasses the adoption and integration of e-voting technology, the execution of the election, the counting of votes, and ensuring transparency for all stakeholders, offers a more thorough understanding of trust in e-voting. As a result, the following hypothesis is proposed:

H3: Trust in the e-voting process is positively related to citizens’ ‘trust in e-voting’.

3.4. Perceived Public Value, Citizens' Trust, and Usage Attitude

The perceived public value (PPV) “refers to the extent to which a person believes that using a specific system will allow citizens to voice their opinions, resulting in improved public governance, convenience, accountability, and transparency” [11, 76]. In their study, Al-Hujran et al. [11] substituted the PU element of the TAM model with the PPV construct, arguing that “PPV is a more comprehensive factor in non-organizational contexts where the use of technology is voluntary” [11].

The implementation of e-voting is regarded as a governmental effort to improve the democratic process and encourage greater citizen involvement in elections [23, 77]. Nonetheless, the integrity of the election process remains a critical determinant of public trust and support for digital voting systems, which are often viewed as less reliable than traditional in-person methods [78]. The current study suggests that when the e-voting process is perceived as offering greater convenience, accountability, and transparency, it enhances the PPV of the system. Consequently, this increased value is expected to foster greater trust among citizens in the e-voting platform. Based on this reasoning, the following hypothesis is suggested:

H4: *‘Perceived public value’ positively relates to citizens’ ‘trust in e-voting’.*

Several scholars argue that the accomplishment of any e-government initiative is greatly dependent on how citizens perceive its value [79, 80]. Being an e-government initiative, e-voting is believed to deliver public value by allowing citizens to “voice their opinions and engage in the decision-making process” [81]. Additionally, governments adopt electronic systems to improve the quality of the information and provided services, promote better governance, and ensure greater transparency and accountability [44]. This study evaluates the perceived value of e-voting in empowering citizens to express their views, which in turn is expected to foster improved public governance and a more favourable attitude toward the use of e-voting systems. Based on this premise, the subsequent hypothesis is propositioned:

H5: *‘Perceived public value’ positively relates to citizens’ attitudes of using the ‘e-voting system’.*

3.5. Perceived Ease of Use, Citizens' Trust, and Usage Attitude

This study adopts the definition of PEoU by Davis [15], which refers to “the degree to which a person believes that using a particular system would be free of effort.” From the perspective of voters, this relates to the “effort expectation,” or how simple it is to learn and operate a new technology. As noted by Ali et al. [82], individuals are more inclined to engage with government portals that used and navigated easily. In line with the TAM, a key factor for the success of any new initiative is understanding users’ expectations regarding the time and effort required to adopt the technology [83]. Furthermore, Gronier et al. [10] assert that user trust increases when websites are user-friendly. By the same logic, we propose that a user-friendly e-voting platform will boost citizens’ trust in the system, leading to the following hypothesis:

H6: *‘Perceived ease of use’ positively relates to citizens’ ‘trust in e-voting’.*

In their study, Xin et al. [40] emphasize that e-government services must be clear and easy to use in order to be accessible to individuals with limited internet skills. They contend that effort expectancy positively influences citizens’ attitudes regarding the usage e-government services Xin et al. [40].

H7: *‘Perceived ease’ of use is positively related to citizens’ attitudes of using the ‘e-voting system’.*

3.6. Citizens' Trust, Usage Attitude and E-Voting Usage Intention

In his study, Avgerou [84] examined citizens’ trust in e-voting as a multifaceted concept involving both the institutions responsible for overseeing elections and the technologies used for voter registration, vote casting, result aggregation, and dissemination. Warkentin et al. [85] highlight the critical role of government bodies in ensuring electoral integrity and fostering trust in e-services. Similarly, Baudier et al. [1] identify trust in the voting system as the most influential factor in the electoral process.

In a study conducted by Decman & Kozel [24], the explored the factors affecting Slovenian citizens’ willingness to adopt i-voting through the COVID-19 pandemic. Their findings confirmed that trust in the voting system positively influences voter attitudes, with a specific focus on trust in the Electoral Commission, the authority tasked with maintaining electoral integrity [14, 24, 48]. Based on these insights, this study posits a positive relationship among citizens’ trust and their attitude aimed at using e-voting system, leading to the following hypothesis:

H8: *Citizens’ trust in e-voting is positively related to citizens’ attitudes towards usage.*

Research indicates that public confidence in the voting process and the underlying technology significantly influences their intention to adopt i-voting [26, 51]. Furthermore, research by Ali & Al Mubarak [86] and Mensah [14] demonstrates that trust in electoral management institutions is a key determinant of citizens’ willingness to engage in electronic voting. Similarly, this study posits that trust in e-voting has a positive effect on Albanian citizens’ intention to use the system. Based on this reasoning, the subsequent hypothesis is proposed:

H9: *Citizens’ ‘trust in e-voting’ is positively related to ‘e-voting usage intention’.*

The TRA [68] and TAM [15] both highlight the significant role that individual attitudes play in embracing novel technologies. In the realm of e-government, it is suggested that citizens with a favourable attitude toward such services are more inclined to plan on using them [87]. Numerous studies have established a positive and direct relationship between citizens' attitudes and their intention to engage with e-government and e-voting systems [14, 26, 48, 87, 88]. Aligned with this view, the present study argues that citizens' attitudes significantly contribute to their willingness to adopt e-voting.

H10: *Citizens' usage attitude is positively related to e-voting usage intention.*

4. Research Methodology

Research methodology is the methodical and theoretical foundations of the research approach employed in the field of the proposed research study [89]. Research is the organized practice of gathering and examining data to reveal new knowledge. It is also feasible to carry out additional research and theory expansion for currently extended theories [90]. The present study, "Factors influencing Albanian Citizens' Adoption of e-voting", which is "positivist" in nature, presumed that a quantitative research design is suitable in this context [91]. Theoretical models and hypotheses are frequently examined using quantitative approaches; therefore, a survey-centred, quantifiable, analytic method was employed in this study. Further, a thorough analysis of literature is the principal part of quantitative research to formulate or develop hypotheses. The philosophical and hypothetical underpinning of contemporary research entails theory testing and theory construction [92]. For each construct, the measurement items were specifically chosen from the literature, theoretical claims, variables, and factors were carefully selected, and their implications were examined [93] the review of the literature and were thought to capture every facet of the construct domain. As a result, the previous section confines a comprehensive review of the existing literature on e-voting system adoption.

The three steps processes planned below are used for examining the proposed hypotheses and validating the suggested framework including associated instrumental items [93].

4.1. Survey

Examining and analysing the proposed theoretical e-voting adoption framework was the main purpose of the current research study. This research utilized survey practice to assess the various constructs influencing the adoption of e-voting in Albania. The survey is a conventional research technique to approach the participants to gather their appropriate experience concerned with the usage of technology for performing the task. Through the survey, the respondent's perception, and behaviour concerning technological usage, technological usage experience, trait, and expertise might be captured [94, 95]. When latent constructs or factors in a conceptualized framework are to be measured then survey approaches in quantitative research should be considered [96]. A survey questionnaire was designed and developed based on ongoing research on digitally transformed e-voting adoption to make sure that the survey was relevant and suitable for the proposed ongoing study. A five-point Likert scale, with responses ranging from 'strongly disagree' (1) to 'strongly agree' (5), was employed to indirectly assess the latent constructs [97]. It was important to execute a pilot analysis with a minor set of data to assess the relevance, reliability, and validity of data and also to create the measuring scale, a pilot analysis was conducted using SPSS [98]. Appendix 1 comprises the measuring items' scale.

4.2. Sample Population and Pilot Study

Given that most Albanian citizens have already been using e-government services across various contexts, a random sampling approach was adopted, ensuring that majority of respondents were well-qualified to provide accurate results. In this study, simple random sampling, a type of non-probability sampling, was employed. Respondents received the surveys online. However, in certain cases, further measures were used to persuade respondents to set aside time to complete the questionnaires. Simple random sampling involves selecting sample members at random from the population, paying no heed to the population's existing stratification. It is vital to consider the existing sampling methods' methodological advantages and disadvantages. Convenience sampling makes it easier for participants to participate, but it may introduce biases. Random sample, on the other hand, offers higher validity and reliability. Researchers should think about using more reliable sampling methods and increasing the size of their samples to improve the generalizability of their findings in order to progress the discipline [99]. The possibility of including participants with varying social-demographic profiles in the sample was taken into consideration when constructing the questionnaire. However, Albania is a relatively small country in southern Europe with doesn't have wide variability in the country's demographics.

To gather information about the citizens' adoption of e-voting in Albania, 308 Albanian citizens were asked to fill out surveys. A Google form containing the survey questions and the participant's consent statement was produced, and

the link to the form was distributed to the Albanian participants. The Google Forms link was distributed using WhatsApp, and other social media platforms were used for disseminating the Google Forms link, which helped us to inform the people promptly and didn't cause any technical issues for survey respondents to submit their answers [95]. Female survey participants with 66.23% were more than the male participants with 33.76%. Master's degree participants were higher with 199 out of 308, whereas the remaining were 35 – PhD, 50 with bachelor's degrees, and 23 with high school diplomas. Participants with various age groups were (88 – above 45 years age; 54 – above 40 years age; 56 – above 35 years age; 36 – above 30 years age; 29 – above 25 years age; and 45 – years age 18 and above). The preceding distribution of gathered data clearly explains the great diversity of participating citizens in the data collection process, which was carefully followed. Gunzler et al. [100], in their study stated that sample sizes of 200 may be regarded as substantial and acceptable for most research model validations. Additionally, for a quantitative analysis to be deemed adequate, the sample size for SEM must equal or exceed 200 participants. There were 308 acceptable responses received from the survey participants. Table 1 shows the pilot study's outcomes achieved through evaluating Cronbach's alpha: α_c of the proposed scale's constructs. The Cronbach's alpha values for each of the factors were greater than or equal to the threshold limit of 0.7 [101].

Table 1. Pilot study results with sample size 30

Factors / Constructs	Terms	α_c
Government	Gov	0.948
Technology	Tech	0.803
Process	Pro	0.847
Perceived Public Value	PPV	0.913
Perceived Ease of Use	PEOU	0.912
Trust	TST	0.926
Usage Attitude	UA	0.932
E-voting Usage Intention	EUI	0.875

4.3. Structural Equation Modelling

The volume of theoretical analyses and studies now employs the widely recognized SEM technique, particularly in the field of adopting emerging information technologies. The survey data were evaluated using SEM statistical analysis, which is thought of as a “second-generation procedure” in today's research surveys [96]. SEM provides statistical findings for overall model fit and allows estimation of all potential correlations between observable and latent variables simultaneously by combining multiple regression and component analysis [102]. It was determined to use SEM as an advanced inferential analysis approach for this research because it aims to evaluate a proposed framework with multiple dependent variables and support hypotheses, ensuring robustness in the outcomes. Confirmatory Factor Analysis (CFA) was used to evaluate the “measurement model” which is the first step of the SEM process and path analysis was used to evaluate the structural model which is the second step of the SEM process [93, 103]. Further, the “validity and reliability” of the scale and constructs were determined by Measurement Model Fit (MMF), as demonstrated by Cronbach's (α), convergent validity, and discriminant validity assessments [93].

5. Data Analysis and Research Results

Various statistical techniques were employed by researchers to formulate and validate the research outcomes. In the first generation, factor analysis and regression analysis were widely employed and prevalent. Since the 1990s, there has been a drastic shift toward more complex multivariate techniques like SEM, which has dominated the field of study in the second generation of research [104]. MMF indices and structural model fit indices are the two main components that are followed to analyse the model as part of SEM.

Before conducting the formal SEM analysis, specifically the MMF and Structural Model Fit (SMF) assessments, we first analysed voter attitudes toward e-voting and its associated constructs. Figure 2 displays a stacked bar graph illustrating voter perceptions across eight key constructs: Government, Technology, Process, Perceived Public Value, Ease of Use, Trust, Usage Attitude, and e-Voting Usage Intention. Each construct is broken down into five response categories: Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree.

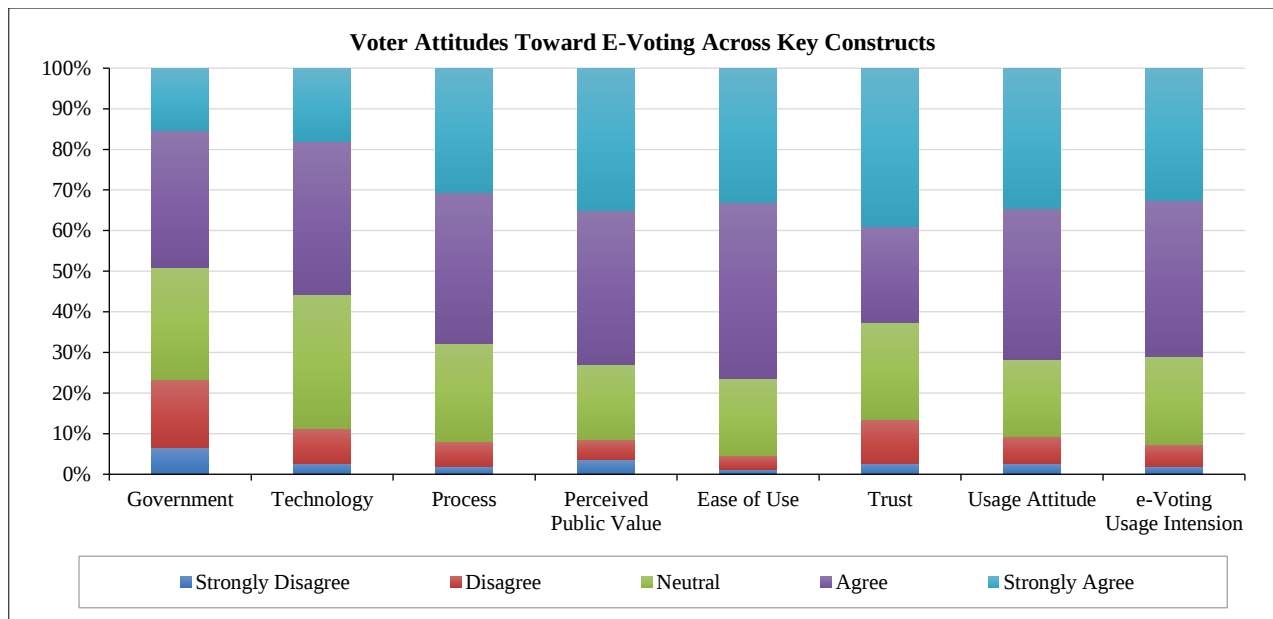


Figure 2. A stacked bar graph illustrating voter perceptions across e-voting constructs

Overall, voters exhibit a generally positive attitude toward e-voting, particularly regarding Ease of Use, Usage Attitude, and Usage Intension. However, a moderate proportion of neutral responses suggests there is room to strengthen voter confidence through targeted education and communication initiatives. Notably, slightly higher levels of disagreement are observed in the Government and Technology categories, indicating persistent concerns around security and transparency. Addressing these issues will be critical to building trust and enhancing the perceived public value of e-voting systems, both essential for driving broader adoption. While voter sentiment toward e-voting is largely favourable, especially usability, perceived value, and intent to use, specific concerns over governmental involvement and technological robustness remain. These findings highlight the importance of ongoing trust-building efforts.

5.1. MMF Analysis

The MMF evaluation in this research was executed using AMOS Graphics V.24. The preliminary research was conducted by employing CFA and the scale's "validity and reliability estimation" which are part of the SEM statistical approach for confirming the proposed MMF in this study [93]. CFA was employed to evaluate the measurement model, aiming to verify whether the constructs exhibited adequate validity and consistent reliability within the proposed scale. The primary objective of CFA is to identify the factor structure, helping researchers determine how effectively the observed variables represent their underlying factors [103]. This was done before considering the implied theoretical framework and making conjectures about the relationships between the included constructs and their embraced items. Two metrics were considered in order to obtain the measurement model's fit: goodness-of-fit (GOF) and the measurement model's validity and reliability [93]. "Chi-square (χ^2), goodness of fit index (GFI), adjusted goodness of fit index (AGFI), root mean square of error approximation (RMSEA), comparative fit index (CFI), incremental fit index (IFI), root mean square residual (RMR), normalized fit index (NFI), and Tucker–Lewis Index (TLI)" were among the MMF indices proposed by Hooper et al. [105] that were taken into consideration. Table 2 shows the CFA results pertaining to MMF.

Table 2. CFA test results

CFA Results		Scale Values	References
Chi-square	1.749	<3	[103, 105-108]
GFI	0.937	>0.9	
AGFI	0.905	≥ 0.85	
CFI	0.948	≥ 0.85	
RMR	0.041	<0.05	
NFI	0.950	≥ 0.85	
RFI	0.932	≥ 0.85	
IFI	0.948	≥ 0.85	
TLI	0.942	≥ 0.85	
RMSEA	0.038	<0.08	

MMF's second step involves measuring the suggested scale's "validity and reliability". By utilizing a variety of established analysis practices, we assessed the "validity and reliability" of the involved constructs included in the suggested framework. The internal consistency of the 40 proposed items for the scale is confirmed through the application of Cronbach's (α) test. Cronbach's (α) was used to assess the proposed scale's reliability and values within the range of 0.78 to 0.85 were found to satisfy the Cronbach's ($\alpha \geq 0.7$) criterion set by Hair et al. [93]. The following step was to determine the construct's validity. Construct's validity is determined by calculating the "discriminant and convergent validity" of the proposed constructs [109, 110]. According to Bagozzi & Yi [108] and Hair et al. [93] "convergent validity was assessed using the following criteria: (i) factor loading or standardized regression weights >0.50 ; (ii) average variance extracted (AVE) >0.50 of each construct; and (iii) composite reliability (CR) >0.70 " as also mentioned in Zaidi et al. [111] study. Table 3 illustrates that the results collected exceeded the requirements for convergent validity.

Table 3. Reliability and validity tests results

Constructs /Factors	Scale's Items	Factor Loadings	S.M.C. (R2)	Cronbach (α c)	C.R.	A.V.E.
Government (Gov)	Gov1	0.661	0.623	0.933	0.859	0.550
	Gov2	0.810	0.436			
	Gov3	0.738	0.656			
	Gov4	0.701	0.544			
	Gov5	0.699	0.490			
	Gov6	0.661	0.623			
Technology (Tech)	Tech1	0.772	0.596	0.877	0.851	0.535
	Tech2	0.691	0.478			
	Tech4	0.827	0.683			
	Tech5	0.683	0.467			
	Tech6	0.671	0.450			
Process (Pro)	Pro1	0.748	0.559	0.882	0.880	0.586
	Pro3	0.811	0.658			
	Pro4	0.769	0.592			
	Pro5	0.796	0.633			
	Pro6	0.699	0.488			
Perceived Public Value (PPV)	PPV1	0.720	0.518	0.902	0.839	0.505
	PPV2	0.770	0.593			
	PPV3	0.743	0.553			
	PPV4	0.666	0.444			
	PPV5	0.647	0.419			
Perceived Ease of Use (PEOS)	PEOS1	0.699	0.489	0.904	0.813	0.511
	PEOS2	0.718	0.516			
	PEOS3	0.768	0.590			
	POES4	0.640	0.410			
Citizen's Trust (CT)	CT1	0.763	0.583	0.868	0.828	0.547
	CT2	0.786	0.617			
	CT3	0.697	0.486			
	CT4	0.709	0.503			
Usage Attitude (UA)	UA1	0.832	0.693	0.899	0.826	0.545
	UA2	0.812	0.659			
	UA3	0.764	0.584			
	UA4	0.737	0.543			
E-voting Usage Intention (EUI)	EUI1	0.664	0.441	0.832	0.857	0.579
	EUI2	0.788	0.621			
	EUI3	0.842	0.709			
	EUI4	0.739	0.546			

After performing various rounds of AMOS MMFs, items (Tech3., Pro2, and EU15) were dropped from the proposed framework. Additionally, the MMF was verified using the discriminant validity test [93]. For confirming the discriminant validity, obtained values as outcomes in the diagonal are evidently higher than values in the other columns, as shown clearly in Table 4. Each individual construct's "discriminant validity" points toward how appropriately it can be revealed that it determines various constructs or factors. By interpreting test findings, we can verify that every test that came before it showed that the MMF was found to be suitable for examining the structural model fit in a later stage.

Table 4. Discriminant validity test results

	Tech	PEOS	PPV	CT	EUI	Pro	Gov	UA
Tech	0.789							
PEOS	0.102	0.708						
PPV	0.091	0.142	0.735					
CT	0.047	0.049	0.015	0.739				
EUI	0.079	0.022	0.007	0.152	0.740			
Pro	0.086	0.125	0.082	0.040	0.024	0.743		
Gov	0.131	0.122	0.057	0.027	0.067	0.046	0.741	
UA	0.047	0.037	0.044	0.058	0.101	0.139	0.289	0.747

The next step explains the hypothesis testing using structural model fit.

5.2. Structural Model Fit Analysis

After assessing the MMF's validity and reliability for the suggested scale, the next stage involved utilizing structural model fit indices to assess the proposed components' hypothesized associations. We carried out a structural model fit estimation to evaluate the predictability of the model and the significance of the constructs' relationships [93]. SEM has developed a technique for determining the correlation between latent variables, and the hypothesized relationships were confirmed by path analysis through AMOS graphics. Table 5 exhibits the structural model's fit evaluation results. In this structural model fit evaluation, the critical-ratio or t-value (benchmark ≥ 1.96), path coefficient value (β), and p-values at (≤ 0.001 ***; ≤ 0.01 **; < 0.05 *) were computed as indicated by Hair et al. [93].

Table 5. Hypothesis test results

Hypothesis	Path	S.E.	Path Coefficient (β)	C.R. (t-value)	P-level	Hypothesis Accept/Reject
H1	Gov $\rightarrow$ CT	0.040	0.17	2.589	0.010	Accept
H2	Tech $\rightarrow$ CT	0.075	0.25	3.585	***	Accept
H3	Pro $\rightarrow$ CT	0.057	0.50	5.860	***	Accept
H4	PPV $\rightarrow$ CT	0.045	-0.07	-1.115	0.265	Reject
H5	PPV $\rightarrow$ UA	0.057	0.21	3.207	0.001	Accept
H6	PEOS $\rightarrow$ CT	0.073	0.81	7.408	***	Accept
H7	PEOS $\rightarrow$ UA	0.093	0.39	3.386	***	Accept
H8	CT $\rightarrow$ UA	0.136	0.38	3.391	***	Accept
H9	CT $\rightarrow$ EUI	0.104	0.36	3.690	***	Accept
H10	UA $\rightarrow$ EUI	0.101	0.52	4.583	***	Accept

We provided the verified version of the theoretical framework we had proposed for assessing consumers' e-voting adoption after the structural and measurement models were successfully implemented. Figure 3 indicates the intended proven e-voting adoption framework, which models all accepted and rejected hypothesized relationships.

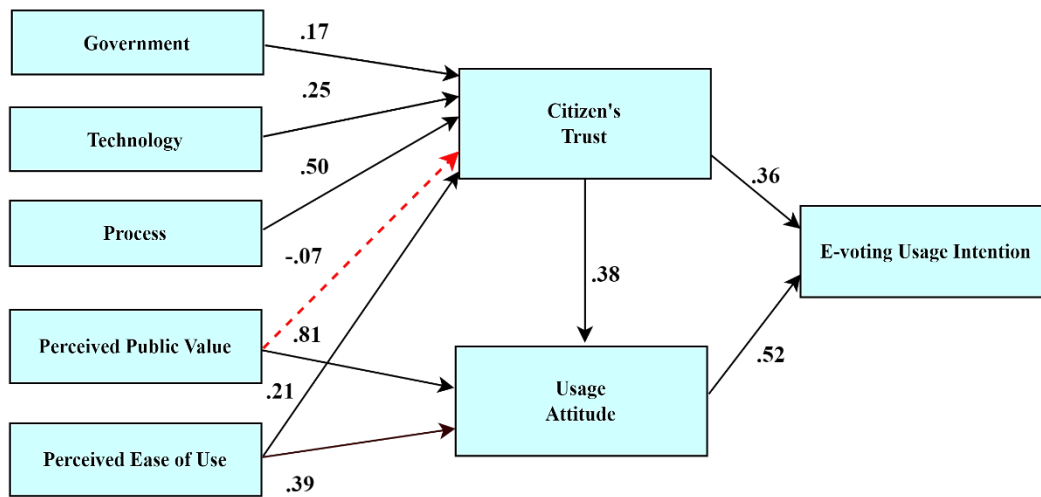


Figure 3. E-voting adoption framework

6. Findings and Discussion

The aim of this recent empirical study was to investigate the factors that affect the adoption of e-voting and Albanian citizens intentions to continue using e-voting systems. This study was piloted to identify and evaluate the novel factors influencing citizens' acceptance of electronic voting (e-voting) in Albania through a quantitative analysis. Data were collected via a structured questionnaire distributed to a representative sample of Albanian citizens, and the responses were analysed using SEM to validate the hypothesized relationships between proposed constructs and e-voting acceptance. As mentioned in the framework development section, the TAM model [15] was considered as the base model in this study. Further, TAM theory has been blended and used in other distinct aspects to define certain contexts in diverse research settings. Thus, the current study found several decisive factors to ascertain the citizens' e-voting adoption and intention to continue the usage of e-voting. Following a careful examination of the literature and the impact of intended adoption on the use of e-voting systems in Albania, eight factors/constructs were found significant. The impact of each of these eight factors was measured using AMOS software, and path coefficients (β) were determined to confirm the constructs' relationship as illustrated in Figure 2. Results indicate that eight of the ten hypotheses were validated and confirmed the hypothesized relationships among proposed factors. Figure 2 shows positive hypothesized relationships of hypotheses from H1 to H10, excluding H4, which couldn't meet the criteria. The endogenous factors in the newly presented integrated framework are CT, UA, and EUI, while the exogenous factors are Gov, Tech, Pro, PPV, and PEOS.

Hypothesis H4 with relationship (PPV $\rightarrow$ CT) was not proven due to insignificant threshold criteria including negative critical ratio ($-1.115 < 1.96$), p-value .265, and β (-.07). This result endorsed that within the context of Albanian e-voting systems, citizen's perceived public value as a factor didn't influence citizen's trust while utilizing e-voting. According to Constable et al. [112]. Public value can be expressed as "a systematic approach towards thinking with regard to public management and constant enhancements in public or citizens' services", also promoting a strong sense of core accountability while offering public services to the citizens [113]. For academics, assessing public value is crucial to verifying theories regarding the potential origins and effects of public value. It is sometimes challenging to quantitatively evaluate theories about how to maximize public value or the influence public value has on citizens' lives without a valid and reliable way to quantify an organization's public value [114]. In the contemporary e-governmental environment, which is surrounded by both the digital age and the traditional information asymmetry between the government and citizens, e-government is not limited in its integrity as a public value but rather as a fundamental condition for governance. Reducing corruption in a nation requires efforts in many facets of society. As with the correlation between political stability, as it relates to politics, and factors such as corruption, transparency, openness, and accessibility in public administration, is strongly linked to corruption [115]. As a result, e-government is highlighted as a cutting-edge tool and a successful promotion strategy. This preceding discussion establishes the connection between public honesty, government trust, and the development of e-government. The fundamental assumption related to public value is that a nation with a high degree of integrity would also have a high level of trust in its government. The discussion also emphasizes the importance of the relationship between the perceived value of public interest in e-government and, therefore, building public trust in the e-government system.

The path analysis of the hypothesized association H1 between (Gov $\rightarrow$ CT) indicates a positive relationship between citizens' trust in the government e-voting system with accepted values ($\beta = 0.17$, $t = 2.589$, $**p$ -value), and this finding is in line with. The study of Sindermann et al. [51] entitled "Internet voting: the role of personality traits and trust across three parliamentary elections in Estonia" confirmed the relationship amongst e-government voting openness with citizens' trust and explained how the role of government in the e-voting system enhances the citizens' trust. Further,

within the context of e-government service acceptance, similar positive relationships have been observed between e-government and citizens' trust in other studies [116, 117]. The government (Gov) in the present study considers various items in the proposed scale embraced "free and fair election through e-voting, integrity, competence, safe electronic service, and effective e-voting" to the citizens. These scale items for measuring government efforts play an important role in building citizens' trust toward the adoption of e-voting. The preceding arguments brought us to the inference that perceptions of the government agency's honesty and capacity to deliver e-services are referred to as trust in the government agency because this confidence reflects the perception of dependability and integrity; thus, citizens must have faith in their government agency and its e-services. Voters will evaluate how their personal information will be utilized because e-voting entails the exchange of personal information between the voter and the voting organization. Additionally, voters must have faith that the organization running the e-voting, whether it be the government or a third party, has the resources and intelligence needed to set up and safeguard the voting system. This assurance and conviction will foster trust, which has a significant influence on the adoption of technology in our study of e-voting. Prior research has demonstrated a relationship between trust and the perceived value of online services comparable to the relationship of e-voting with e-government [118]. Furthermore, it has been suggested that e-voting online may depend on one's level of trust in a government agency. Some governments frequently enlist the help of a third party to oversee the technology behind the services they offer (for instance, perhaps outsourcing the entire system and procedure to a private vendor) [85]. Although previous research looks at citizens' trust in government organizations when it comes to online voting, it is unclear if citizens will trust a private third party and how their intention to vote online will be impacted by that trust. For this reason, previous studies recommended incorporating a third party into the online voting trust process.

Hypothesized relationship H2 confirmed the path and positive association between (Tech $\rightarrow$ CT) with values ($\beta = 0.25$, $t = 3.585$, ***p value), which means that the technological aspect of e-voting affects the citizens' trust while citizens perform e-voting. The perception of technology construct (Tech) in this study incorporates various items on a proposed scale, including secured e-voting for elections, uninterrupted technology while citizens cast their votes, an error-free robust software system, and a user-friendly interface. A recent study by Zhu et al. [5] examines "the multi-dimensional trust of technology in citizens' adoption of e-voting in developing countries" and studies the effect of security and privacy of citizens in building technological trust. The finding of the present study not only emphasizes security and privacy issues in e-voting but also covers other software and hardware-related technological aspects, as mentioned earlier in the explanation of the hypothesized relationship. The development of citizens' trust in e-voting is intimately associated with trust in the government electoral agencies as well as the technology that is in place for offering e-voting systems to the citizens [5, 84, 119]. In the context of an organization, trust is the readiness to put one's faith in someone else. The adoption of internet-based technologies, such as websites, cloud services, mobile services, and security apps, is significantly influenced by trust. It also established how important trust is in systems related to e-government and e-commerce. Various academic studies have previously looked at the variables influencing the adoption of online voting. Trust has been identified as one of the primary determinants of adoption and acceptance among these characteristics. Carter & Belanger discovered that American individuals' intentions to use online voting are highly influenced by their perceptions of compatibility, simplicity of use, and faith in the government and the Internet. Technological, institutional, and social variables all have an impact on e-voting trust. To achieve this, scholars have investigated and tackled technology-related issues pertaining to trust, including data secrecy, message integrity, and authentication. The role of trust in technology and in an organization that oversees the voting process (usually a government agency) has been studied by others [85, 118].

Analysed results related to hypothesis H3 confirmed a positive relationship among (Pro $\rightarrow$ CT) and showed the effect of the e-voting process on building citizens' trust. This relationship was observed as positive with the accepted benchmark path analysis values ($\beta = 0.50$, $t = 5.860$, ***p value). Governments have been forced to act and use internet-based solutions to help their population because of the worldwide push for digitization. Internet voting is one such approach that has drawn increasing attention. IT-based voting, also known as e-voting, has been used to describe a variety of techniques, including electronic voting machines, punch cards, optical scans, private computer networks, internet-based applications, or specialized voting kiosks. In addition to voter restraint and the possibility of electoral fraud, traditional voting systems, which use a paper-based procedure, are frequently regarded as ineffective and fraught with security problems [118]. Therefore, the role of government agencies' e-voting process selection becomes pivotal in executing the e-voting system in their respective countries. This means government electoral agencies should adhere to a robust e-voting process to gain the utmost citizens' attention so that citizens get inclined to maximize their participation in the e-voting process. Citizen identification, explanation of the clear e-voting process, transparency in e-voting, and the process to limit casting an e-vote once were considered as relevant scale items to measure process factors in the present study. Alomari [23] in his study mentioned that "the primary indicators of public trust in the Jordanian government are its capacity to conduct various e-voting procedures, process and handle various forms, and give residents up-to-date election-related information". Our results are comparable to some former studies [14, 120] associated with e-government service adoptions with respect to different countries, where performance expectations "a decisive factor" considered as in the e-government process, and its effect on citizens' trust was found to be positive. According to Zaidi et al. [119], trust in e-government refers to people's belief that they are shielded from fraud, uncertainty, and harm when utilizing e-government services. One technological solution offered by government organizations is trust in e-government, and citizens who expect government employees to be trustworthy have a reciprocal relationship between government entities that provide public services and the private sector.

People's faith in e-government is demonstrated in their interactions with the government, where they believe it will behave justly and fairly [121]. The availability of information that enables external stakeholders to keep an eye on an organization's internal operations is known as transparency; more precisely, it is contemplated as the process transparency. Many citizens believe that increasing government openness is one way to enhance governance. Governments can prevent problems like corruption, improve their effectiveness and credibility, and encourage good governance with the aid of openness. Transparency, or the right to know, was considered a fundamental human right. The growth and spread of the online environment in the modern period appear to have made it easier for governments to make additional information available to the public for the benefit of citizens. Process transparency is currently seen as the solution to one of the most subtle problems facing governance: citizens' growing mistrust of the government [48].

Hypothesized relationship H4 was negative and rejected as discussed earlier; however, hypothesized relationship H5 among (PPV $\rightarrow$ UA) proves the positive confirmed hypothesized relationship via accepted benchmark values ($\beta = 0.21$, $t = 3.207$, .001-p value). This finding is similar to the study of Xin et al. [40] which confirmed the relationship among public values and citizen's attitudes. Within the context of government public value, to reclaim the citizens' confidence, governments should employ modern electronic government systems to improve public governance, openness, government information and services, and accountability [44]. H5 hypothesized relationship amongst PPV and UA identified as positive where PPV factor considers essential factor items involving convince, openness, accountability, and smooth accessibility as scale items regarding the government e-voting system in Albania. According to Bannister & Connolly [122], the "*Public value of E-government is known that technology is not value-free; rather, its implementation is driven by perceived values*". Knowledge of public sector management is necessary to comprehend e-government and the benefits it is meant to provide. Public and private organizations have different concerns, even though they both exist to benefit people. While government organizations serve individuals as constituents, private organizations serve people as consumers and strive to maximize profit. Because of this, government agencies are more concerned with accounting for "public value" in addition to seeking financial revenue to maintain their operations [123]. The concept of public value, according to Cordella & Bonina [124], is a more effective way to handle the intricate sociopolitical effects of ICT adoption in the public sector. Public sector changes, according to the public value framework, are composite results of widely held expectations of justice, legitimacy, and trust; their impact would vary depending on the social and political environment. The preceding discussion emphasizes on various factors where citizens' attitudes are formed due to public value.

Hypothesis H6 and hypothesis H7 were found positive and have shown significant positive relationships among (PEOS $\rightarrow$ CT) and (POES $\rightarrow$ UA) with accepted path values ($\beta = 0.81$, $t = 7.408$, ***p value) and ($\beta = 0.39$, $t = 3.386$, ***p value). These two findings explain that when citizens perform e-voting to cast their vote, then "perceived ease of use (PEOS)" is an essential factor that affects the citizens' trust and fosters citizens' attitudes toward utilizing the government e-voting system. Similarly, the study of Alomari [23] presented the relationship between perceived ease of use and adoption attitude towards the e-voting system. However, within the context of e-government adoption, few studies [14, 120] examined the relationship between effort expectancy and citizens' attitudes concerning e-government adoption. PEOS factor in the authors' present study comprises the items "e-voting process clarity, understandability, flexibility, quickness, skilfulness, and tracking voting results" in the proposed scale. In a variety of application domains, such as online voting and e-government, perceived ease of use is positively correlated with usage attitude and trust. Yang et al. [41] highlight that a usable system illustrates the efforts made by a service provider to make the online system less complicated and easier to use, lowering the effort needed from the target consumers. As a result, service providers gain credibility. If an online voting system is user-friendly, citizens will view it as an attempt by the organization to establish a reliable environment. Users will be more inclined to believe the organization using e-voting in this responsible setting. Perceived usefulness illustrates a person's conviction that utilizing a system will enhance performance. According to Davis [15], a technology's perceived utility and usability play a major role in its acceptability. Since then, one of the most important indicators of technology acceptance is usability embraced in various research settings. Our other important assumption is that people view e-voting as more beneficial when they have confidence in the government, but this is not the case when a third party oversees the process. These results suggest that citizens must first feel a certain degree of inclination towards e-voting services before they can develop a positive opinion and attitude toward them. Having said that, e-government services such as e-voting must be advantageous to users and make it easier for them to perform [125].

Hypothesized association H8 between (CT $\rightarrow$ UA) along CT shows a positive relationship with citizen's UA through anticipated benchmark values ($\beta = 0.38$, $t = 3.391$, ***p value) in this present e-voting adoption study. Likewise, studies of [23, 24, 120, 126] also confirmed the relationships among e-government service, citizens' trust, and citizens' adoption attitude. Factors CT and UA in the proposed framework embraced scale items "corruption-free voting, confidentiality, transparency" and "improve efficiency, increase voter turnout, increase voter's motivation", which were found very much relevant to the chosen factors. Our study is in line with the study of Decman & Kozel [24] entitled "Examining the Impacts of Technology and Trust on I-Voting Acceptance in the COVID-19 Aftermath," which studied the impact of technology on trust in institutions and technology. According to Decman & Kozel [24], trust in the internet voting system and electoral administration has an optimistic influence on voters' voting attitudes. The term "trust in technology" refers to the collection of technologies that make it possible to use an e-service, and it is somewhat broad. Since trust

has been demonstrated to positively affect citizen participation in the operation of government and society, it is essential when ICT is used to support democratic processes (e-democracy) [127]. Building trust in e-services is mostly dependent on government organizations tasked with maintaining the integrity of the election process. The conviction that the government is a reliable source that can hold free and fair elections in a digital setting is known as faith in the online voting system. One of the most notable contributions of this study was the inclusion of citizens' trust as a novel construct, separated into trust in technology and trust in government institutions. Both were statistically significant, with trust in institutions having a stronger impact. This emphasizes the importance of institutional transparency and accountability in shaping public readiness for digital transformation in governance.

Finally, hypothesis H9 and hypothesis H10 were proven as positive and have flashed significant positive relationships between (CT $\rightarrow$ EU) and (UA $\rightarrow$ EU) with admitted path values ($\beta=0.36$, $t=3.690$, ***p value) and ($\beta=0.52$, $t=4.583$, ***p value). Hypothesis H9 confirmed the relationship between citizens' trust with e-voting usage adoption intention, and hypothesis H10 confirmed the relationship between citizens' usage attitude and e-voting usage adoption intention. These two relationships are in line with previous studies [24, 120, 126, 128]. Predominantly, the findings related to hypotheses H8 and H9 may give preliminary credence to the idea that there are positive relationships between citizen's trust in e-voting and citizens' attitude and citizens' adoption intention, at the same time Sindermann et al. (2023) [51] suggest that citizens' trust may act as a mediator in the relationship between agreeableness and e-voting. Voter turnout has been demonstrated to be a habit-forming phenomenon. In other words, there is a good chance that someone who participates in elections once and has a positive attitude toward them will do so again. When the prospect of a new voting system presents itself, the question is whether the voter will still hold these views. We presume that sentiments on voting in elections through conventional means are mirrored in online voting, as proposed by Melenchuk & Khutkyy [129]. In light of the preceding studies, it is concluded that one important factor influencing the adoption of technology in its widest meaning is trust in it. Most of the research on online voting acceptance focuses on the portion of technological trust that pertains to the online exclusively. Potential internet voters in more developed nations are obviously accustomed to using the Internet through e-commerce services, but other aspects of Internet voting systems are less known and, as a result, are not as trusted. When employing Internet voting, we assume that voters view the Internet and associated services as a reliable platform.

Therefore, governments who wish to implement e-voting in their respective countries should consider such factors to guarantee public confidence in terms of citizens' trust in it. Consequently, these will lead the citizens to adopt e-voting and continue their intentions to use it in the future, too. The current study adds to the body of knowledge on this subject by examining the relationships between citizens' behaviour toward the adoption of e-voting. Since technology is becoming more useful in the way governments provide services to the public, the adoption of e-voting systems has become increasingly important in recent years. Studying e-government usage from a variety of angles is crucial to provide important stakeholders with the space they need to make the most of it. When citizens use e-government platforms, systems, or technologies to receive government services, they frequently consider some important factors such as participation, transparency, and citizens' confidence. Through literature and empirical research, this study offers a comprehensive description of these dimensions and their relationship to the TAM variables. As the TAM model is the base model adopted in this study so through modifications and extensions to the TAM's fundamental principles, the newly proposed model for e-voting adoption reasonably evolved by appending several new factors and assessed in the context of e-voting adoption in Albania.

7. Implications of the study

7.1. Theoretical Implications

In many ways, this study contributes to the body of knowledge and adequately responds to former calls for further quantitative studies on e-voting [130]. Within the perspective of e-voting, further quantitative investigations are highly sought and identification of the novel factors for evaluating the e-voting adoption is essentially required [33]. To the best of the associated authors' knowledge, within the perspective of e-voting adoption, there is a great dearth of any dedicated framework. Several studies have used TAM to assess e-government services, but limited studies have been carried out to evaluate e-voting adoption. Those studies that used TAM show the genuine nonexistence of relevant factors in their extended TAM-based research, which didn't cover the exclusive factors from governmental, technical, administrative, and human behaviour perspectives. Thus, to understand the e-voting adoption phenomenon, the inclusion of such exclusive factors to TAM was performed with careful consideration. TAM theory was extended to contemporary technology adoption theory in this study so that the implications of this extended theory could be evolved in the e-voting adoption domain. Considering the aforementioned arguments, we state that our study contributes significantly to the field of e-voting adoption evaluation from the citizens' perspective. Our study formulated a unique framework by comprising novel factors such as Government, Technology, Process, Perceived Public Value, Perceived Ease of Use, Citizens' Trust, Usage Attitude, and E-voting Usage Intention to study the adoption of e-voting in Albania. These incorporated new factors/constructs to the TAM were found to affect citizens' intentions to utilize e-voting systems. The study provides fresh perspectives on the intricate interplay among the factors affecting the uptake of new technologies in e-voting.

Considering the theoretical aspect, this study involved new factors/constructs of the TAM that were found to affect citizens' intentions to utilize e-voting systems. Additionally, this study contributes significantly to closing the gap between the implementation of an e-voting system in an Albanian society and its theoretical design. The study demonstrates that this e-voting adoption framework may be applied to determine the factors associated with the adoption of e-voting in particular south European countries too. We believe that this work advances the idea of e-voting and to an extent innovates the way to evaluate the adoption of e-government too.

7.2. Practical Implications

In addition to theoretical research implications, there are various implications to put into practice. Future potential for Internet applications in the political progression is continuously emerging, and the integration of e-services into the political process is expanding over time [128]. Citizens are concerned about using the Internet not just to gain information about voting but also willing to vote online instead of utilizing ballot paper, which is now termed as e-voting. It is recommended that government organizations leverage technological advancements to continuously enhance the simplicity and expediency of e-voting. According to Decman & Kozel [24] as mentioned in their study related to the impact of technology and trust in internet voting in Slovenia, the primary challenge is developing a transparent and safe voting technology system. Election administrations or agencies should be transparent to the public so that they are informed about these institutions' reliability, their ability to hold free and fair elections, and their proficiency with the technology that enables a smooth e-voting process.

Considering the preceding arguments, the findings from this study could offer some practical implications. Involving eight novel factors in TAM, the extended TAM covers the administrative and technological aspects, and findings from this framework could direct government agencies on how to set up an organizational and technical framework to improve the likelihood of the e-voting process in their region or respective country. Since these contributions are exclusive to our research, the literature on e-government adoption has been enriched, especially regarding e-voting framework validation. Further, the findings of this study will provide valuable insights into the challenges associated with e-voting and how to persuade citizens to embrace it, particularly for the Central Election Commission, which oversees the implementation of e-voting initiatives in Albania.

8. Conclusion

The objective of the current study was to examine the factors that influence a citizen's intention to adopt e-voting using the TAM and Web Trust theories of technology adoption. This study examines Albanian citizens' adoption intention to vote electronically by empirical data approach. 308 responders made up the sample size for this study. SPSS and AMOS software were utilized to perform SEM for analysing the data. The results showed a high degree of validity for the proposed constructions. When compared to previous studies on the acceptance of e-voting, our findings offer a more comprehensive empirical analysis of e-voting. To the best of our knowledge, this study is among the first to address and evaluate Albania's e-voting adoption intention of the introduced Albanian e-voting system. Thus, the present research contributes to the expanding corpus of literature on electronic voting. This study on the citizens' adoption intention to vote electronically has increased our understanding of the TAM, which describes citizens' acceptance and uptake of new technologies within the context of e-government. This study combines potential constructs of e-voting adoption among Albanian citizens to increase understanding of technology adoption models. The study provides fresh perspectives on the intricate interplay among the variables affecting the uptake of new technologies in e-democracies. Further, this concluded study has covered the primary factors that could affect citizens' adoption of e-voting. This study establishes a foundation for forthcoming research and investigations into other e-government services in Albania and to further validate the proposed framework.

Election procedures could be revolutionized by the contemporary online voting system, which we call e-voting. E-voting can increase voter turnout, particularly among older people and people living in distant places, by making voting easier and more accessible for residents using computers or mobile devices. Technology, institutions, and society all have an impact on e-voting. To achieve this, researchers have investigated and tackled technology-related issues pertaining to trust, including data secrecy, message integrity, and authentication. The role of trust in technology acceptance and the e-voting process has been studied by others, but not to such a depth as our model presents. In a broader sense, our results provide more evidence in favour of the generalizability of earlier research carried out in different settings, thus bolstering and expanding existing findings further. Even if people from different states have distinct, unique traits, it is helpful to confirm that perceived usefulness, perceived ease of use, trust, and usage attitude, other than government, technology, and process, appear to play a universal role in influencing the desire to vote online. We revealed evidence of a strong link between the intention to vote online and the two primary TAM components, perceived usefulness and perceived ease of use in line with results from earlier research, including [85, 118] which showed that the propensity to vote online is increased by perceived usefulness. Verifying earlier discoveries in a different setting enhances their applicability in this new setting and provides more proof of their generalizability. The findings

demonstrate that when voting agencies share values, people are more likely to trust them, whether they are governmental or commercial third parties. A common identity and the simplicity of online voting affect public trust in the agency. Additionally, the intention to vote online is increased by both TAM elements. By aiming to increase citizen voters' trust, usability, and convenience of use, we propose that the design of the e-voting artifacts, including user interface design components, should take our findings into consideration. Since technology is becoming more useful in the way governments provide services to the public, the adoption of e-government systems has become increasingly important in recent years. Studying e-government usage from a variety of angles is crucial to provide important stakeholders with the space they need to make the most of it. This study sheds light on Albanian citizens' adoption of e-government e-voting technology. The findings of this study serve as a foundation for transforming laws and policies, as well as a forum for academics and researchers studying technology adoption.

Given that the study's focus was on the e-voting service provided to citizens, future research may replicate this study in various contexts and community types, such as other Balkan nations, to standardize its use. To gauge how citizens use online and digital technology to cast their vote in online environment, it is advised that future research might include cross-national studies. Results from future research using different combinations of these variables may differ.

8.1. Limitations and Future Work

Our understanding of government e-voting, its advantages over ballot paper-based voting systems, and the variables affecting e-voting adoption in Albania has improved as a result of this study. There are, nevertheless, certain limitations to this study and have room for further investigation. This study is constrained by its scant discussion of the advantages of employing e-voting systems as well as the prerequisites and potential issues that may arise. Furthermore, the study only examined prevalent factors influencing voters' intentions to use e-voting, whereas how the technological e-voting process could be advanced and make the e-voting process fit for various electoral instances in the respective country is not emphasized. Security and risks as independent factors are also not substantially covered in the proposed framework; however, these are partially included in the trust factor as scale items. Sample collection was largely performed from the capital city of Tirana, Albania where citizens are aware of the technological aspects of the e-voting system. Since majority of survey participants had comparable ages and educational backgrounds, more research will be needed to address concerns pertaining to the digital divide. We further need to revalidate the proposed framework by considering the rural population of Albania and assess the rural citizens' intention towards e-voting adoption. If the proposed framework is validated in other Balkan countries, then additionally, we will be able to evaluate the integrated factors' functionality.

9. Declarations

9.1. Author Contributions

Conceptualization, V.O. and S.Z.; methodology, S.Z.; software, V.O.; validation, V.O., S.Z., A.K., and M.H.; formal analysis, S.Z.; investigation, V.O.; resources, A.K.; data curation, V.O.; writing—original draft preparation, V.O., S.Z., A.K., and M.H.; writing—review and editing, V.O., S.Z., A.K., and M.H.; visualization, V.O. and M.H.; supervision, V.O.; project administration, V.O. and S.Z. All authors have read and agreed to the published version of the manuscript.

9.2. Data Availability Statement

The data presented in this study are available on request from the corresponding author

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9.4. Institutional Review Board Statement

Not applicable.

9.5. Informed Consent Statement

Informed consent was obtained from all subjects involved in the study. A consent statement for the participants was included in the survey administered.

9.6. Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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