

The Influence of Information Systems and Political Participation on Simultaneous Regional Head Election Effectiveness During the COVID-19 Pandemic

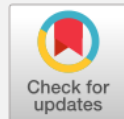
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ABSTRACT

The COVID-19 pandemic required new approaches to organizing regional elections, highlighting the use of information systems to reduce infection risk and improve election management effectiveness. This study examines the influence of information systems and political participation on the efficacy of simultaneous regional head elections during the pandemic. A quantitative design determined a sample of 402 respondents with the Slovin formula at a 95% confidence level. Data were collected through a Likert-scale questionnaire comprising 12 indicators of information systems, 21 of political participation, and 12 of electoral effectiveness, and analyzed using Structural Equation Modeling (SEM) with LISREL. The results show that information systems exerted a positive but statistically insignificant effect on electoral effectiveness (T -value = 0.79, below the 1.96 threshold). In contrast, political participation demonstrated a significant positive impact (T -value = 6.79), underscoring its decisive role in achieving effective election outcomes under pandemic conditions. These findings emphasize the importance of citizen engagement for sustaining democratic processes during public health crises and illustrate how digital technologies can support, but not replace, active political participation.

Keywords: COVID-19 Pandemic; Electoral Effectiveness; Indonesia; Information Systems; Political Participation; Simultaneous Regional Head Elections

1. Introduction

Regional elections are crucial in developing democracy in Indonesia, encompassing political institutions and processes and producing tangible impacts on public welfare and social equality. Democracy is not merely about electing leaders; it also requires the active and informed participation of citizens in political decision-making, with the level of involvement serving as a key indicator of democratic quality (Diamond, 2015). Regional elections, therefore, play a strategic role in creating governments that are responsive, accountable, and representative of diverse societal interests. In addition, an ideal democracy should be capable of generating policies that are both inclusive and equitable, thereby contributing directly to improvements in community well-being and social justice (Sinaga, 2013). Within this framework, elections function not only as a mechanism for selecting leaders but also as a platform for citizens to evaluate, reward, or sanction political actors, reflecting the extent to which democratic principles are applied in practice (Perludem, 2011).

The COVID-19 pandemic (2019-nCoV) has caused significant loss of life and disrupted the planned timeline for Indonesia's simultaneous regional head elections, which were initially scheduled for 23 September 2020 but postponed to 9 December 2020. In response, the General Election Commission (Komisi Pemilihan Umum or KPU) issued Regulation 13 of 2020 mandating strict health protocols throughout the electoral process. Campaign activities and information dissemination were recommended to be conducted primarily online to minimize physical gatherings and reduce the risk of virus transmission. This adjustment was intended to maintain the smooth conduct of democratic elections while safeguarding public health. The regulation highlights the importance of leveraging internet-based media platforms, such as electronic mass media, social media, and other online channels, for campaign communication (Article 57) and public debates (Article 59). Such measures are consistent with global experiences of "pandemic elections," where digital technologies were crucial in protecting electoral integrity while addressing public-health constraints (Landman & Splendore, 2020).

The application of information systems in regional head elections during the COVID-19 pandemic was crucial for enhancing public safety by minimizing direct contact and avoiding large gatherings, thereby reducing the risk of virus transmission among voters and election officials. This strategy aligns with the Minister of Home Affairs' recommendation to utilize social media for the 2020 general election campaign (Aritonang, 2020). By employing these systems, election organizers could improve transparency and efficiency, provide essential voter education, and facilitate broader participation without compromising public health. This approach became particularly vital when traditional campaigning methods were restricted, allowing for effective communication about candidates and voting procedures through online platforms. Furthermore, adopting these technologies encouraged innovative campaign strategies, enabling candidates to connect with constituents creatively and interactively. Comparable patterns have been observed globally, where digital tools and online outreach emerged as key mechanisms to sustain electoral participation during pandemic conditions (Landman & Splendore, 2020). Ultimately, leveraging information systems prioritized health and safety during the pandemic and strengthened the democratic process by making it more accessible and responsive to voters' needs.

South Tangerang City was one of 270 regions that conducted simultaneous regional head elections on 9 December 2020. This case merits close examination because the election was held during a severe public-health crisis, which had already resulted in widespread illness and fatalities. According to official data from Covid19.go.id, by 27 December 2020, South Tangerang had recorded 17,488 confirmed positive cases and 396 deaths (Ministry of Health, 2021). Such

circumstances illustrate the global dilemma of protecting public health while safeguarding democratic processes during emergencies (James & Alihodzic, 2020).

According to the announcement of the General Election Commission of South Tangerang City (Number 83/PL.02.1-Pu/01/3674/KPU-Kot/XI/2020) concerning the Permanent Voters List for the 2020 mayoral election, a total of 976,019 voters were registered. However, political participation fell short of the established target: the Commission aimed for a 77 percent turnout, yet only 60.28 percent of registered voters cast their ballots. This substantial gap between the projected and actual turnout underscores the limited effectiveness of the election's implementation during COVID-19, suggesting that health-related restrictions and public anxiety may have discouraged voter engagement despite regulatory efforts to ensure safety.

Previous studies provide relevant insights yet differ in scope and emphasis from the present research. For example, research has examined the political participation of the indigenous people of Kampung Naga in the Tasikmalaya Regency regional head election, revealing that community participation was predominantly conventional and largely autonomous, occurring without external mobilization (Irawan & Adham, 2020). Other work has explored the political participation of novice voters in the 2017 Bombana Regency election, identifying various forms of engagement, such as voting, discussing politics, participating in campaigns, and joining interest groups, while also noting inhibiting factors, including daily busyness, a sense of political inefficacy, and family restrictions related to travel distance (Sari et al., 2020). Further studies have investigated the penetration of information technology in the 2018 simultaneous regional head elections, evaluating electoral technology through three levels, tools, enablers, and transformers, and finding that while the SITUNG application functioned primarily as a tool and SIDALIH reached the enabler stage by improving voter data verification, technology had yet to achieve the transformer level capable of fundamentally reshaping elections to become more inclusive, transparent, and participatory (Cahyaningsih et al., 2019). These Indonesian cases resonate with broader global findings that digital innovations can enhance electoral integrity and citizen engagement, but require supportive institutional capacity to translate technological adoption into meaningful democratic outcomes (Norris, 2014).

The primary distinction of the present study lies in its analytical focus. Whereas earlier research mainly described forms of political participation or assessed specific technologies, few studies have systematically examined how political participation and information systems jointly influence the effectiveness of regional head elections, particularly under the extraordinary constraints of a global health crisis. This study addresses that gap by analyzing the structural relationships between these factors and electoral effectiveness during the COVID-19 pandemic. It further highlights how political participation and information systems may interact as mutually reinforcing drivers of election success, rather than functioning in isolation.

The study also departs from prior work on electoral technology. Earlier investigations often focused narrowly on individual innovations such as SMS gateways for oversight or incremental improvements in voter data management. In contrast, this research adopts a broader perspective to evaluate the overall influence of information systems on electoral effectiveness, encompassing human resources, technological infrastructure, and network relationships. Additional novelty arises from its empirical setting: the research was conducted in South Tangerang City, a location previously unexamined in this context, and during an unprecedented public-health emergency. Methodologically, the study employs a quantitative approach using a causal relationship model to test two key hypotheses: first, that information systems exert a measurable influence on the effectiveness of simultaneous regional head

elections during the COVID-19 pandemic; and second, that political participation similarly shapes electoral effectiveness, influenced by factors such as socio-economic status, political socialization, organizational experience, political awareness, trust in government, and participation simulations.

2. Literature Review

2.1. Information Systems and Digital Transformation in Electoral Processes

Adopting digital technologies in electoral management can be understood through established technology-adoption theories. The Technology Acceptance Model (TAM) posits that user acceptance of a new system is primarily driven by perceived usefulness and ease of use, which shape behavioral intention to adopt the technology (Davis, 1989). Similarly, Rogers' Diffusion of Innovation (DOI) theory explains how innovations spread through a social system over time, highlighting key factors such as relative advantage, compatibility, complexity, trialability, and observability as predictors of adoption (Rogers, 2003). These frameworks are highly relevant to elections, where both voters and election administrators must perceive digital platforms as applicable, secure, and manageable before integrating them into the electoral process.

Simultaneous regional head elections are a cornerstone of democratic governance because they ensure public representation and reinforce the legitimacy of policymaking. The effectiveness of these elections depends on multiple factors, notably the quality of information systems and the level of political participation among citizens. During the COVID-19 pandemic, these factors became even more critical due to public-health risks, restrictions on movement, and the urgent need for digital transformation in electoral administration.

Information systems are pivotal in contemporary electoral processes by enhancing transparency, accessibility, and efficiency. Global evidence shows that the adoption of e-voting, biometric verification, and digital voter registration can strengthen electoral integrity and reduce opportunities for fraud (Aidynov et al., 2024; Hajian Berenjestanaki et al., 2023; Norris, 2014). Innovations such as blockchain technology and cryptographic protocols further reinforce the security and verifiability of election results. Digital platforms and mobile applications have also become essential tools for voter education and information dissemination, enabling citizens to make better-informed decisions and maintain engagement even when in-person campaigning is restricted.

To conceptualize the operational dynamics of electoral information systems, three interrelated dimensions have been proposed: human resources, which involve the competence, performance, collaboration, and responsibility of election officials and voters, where technical competence and digital literacy directly influence system adoption and effectiveness (Indrajit, 2004; Mao et al., 2023); technology, which encompasses the infrastructure, software applications, and hardware components that support electoral processes, including voter registration systems, ballot counting mechanisms, and result-transmission networks (Duenas-Cid et al., 2024; Indrajit, 2004); and relationships, which address the functional connections among election management bodies, political parties, candidates, and voters, increasingly mediated by digital platforms and communication systems (Al Amosh, 2024; Indrajit, 2004). Recent international studies further confirm that successful digital elections require a balanced integration of institutional capacity, technological reliability, and stakeholder engagement to maintain transparency and integrity (Asimakopoulos, Antonopoulou, Giotopoulos, et al., 2025).

Despite these advances, cybersecurity threats and unequal digital literacy remain persistent challenges. The development of secure, fair, and anonymous e-voting systems became even

more urgent during the COVID-19 pandemic, when traditional paper-based voting posed significant health risks (AboSamra et al., 2017; Pawlak & Poniszewska-Marańda, 2021; Springall et al., 2014). These concerns underscore the necessity of continuous technological innovation, rigorous security protocols, and public education to ensure that digital transformation strengthens rather than undermines democratic processes.

2.2. Political Participation

Political participation is a fundamental element of democratic elections, encompassing conventional forms such as voting and campaign involvement as well as non-conventional expressions, including protests, digital activism, and other civic actions (Congge et al., 2023). Participation is not limited to the formal act of casting a ballot but also involves continuous public oversight of elected officials to ensure that political decisions remain aligned with the public interest. In a digital democracy, such engagement requires a strong foundation of civic knowledge and the ability to navigate online spaces where political discourse increasingly unfolds (Congge et al., 2023).

Several theoretical perspectives can illuminate the adoption and intensity of political engagement. The Civic Voluntarism Model argues that individuals participate in politics when they possess the necessary resources, such as time, money, and civic skills, along with psychological engagement and mobilizing networks that lower the cost of participation (Eliasoph et al., 1996). In the digital era, the mobilization thesis suggests that online platforms reduce participation barriers and broaden opportunities for engagement, while the reinforcement thesis contends that digital tools primarily strengthen the involvement of citizens who are already politically active (Boulianne, 2020). These frameworks are highly relevant to Indonesia's simultaneous regional head elections during the COVID-19 pandemic, when social media and online debates became primary venues for political interaction.

Empirical studies provide further insight into the multifaceted nature of political participation. Participation has been conceptualized as shaped by a combination of social and economic status, situational contexts, parental political affiliation, organizational experience, political awareness, trust in government, and external stimulation through socialization and media outreach (Hendrik, 2010). Higher socioeconomic status, for example, often correlates with greater political involvement because individuals with more resources have the time and capacity to engage (Pratiwi et al., 2023). Contextual conditions, such as the political climate and campaign intensity, can either encourage or discourage participation (VanHeuvelen et al., 2024), while family political orientations and intergenerational socialization exert a lasting influence on individual political behavior (Mayer et al., 2024; Saud et al., 2023; Woodard IV & Schmitt, 2002). Organizational experiences in civic groups or unions help develop political skills and networks that sustain engagement (Oxendine et al., 2007), and political awareness, knowledge of candidates, issues, and procedures, strongly predict meaningful participation (Lai & Beh, 2025; Shin et al., 2024; Zetra et al., 2022). Trust in government affects citizens' willingness to engage with political institutions (Nath & Verma, 2025), while mobilization by parties, candidates, or civil society through social media and informal discussions can stimulate otherwise passive citizens to participate (Huang et al., 2016; Schiffbeck & Basaraba, 2025).

During the COVID-19 pandemic, digital forms of participation such as social media engagement, online debates, and virtual campaign events largely replaced traditional face-to-face campaign activities, allowing voter interaction to continue despite restrictions on physical gatherings (Lorenz-Spreen et al., 2022). Although these digital opportunities lowered participation costs and facilitated wider information access, structural inequalities in internet

availability and persistent political apathy limited their reach, creating disparities in turnout and engagement across different regions and social groups.

Guided by the Civic Voluntarism and mobilization–reinforcement frameworks, this study treats political participation as a key explanatory factor that interacts with electoral information systems to influence the effectiveness of Indonesia’s simultaneous regional head elections. By integrating Hendrik’s multidimensional indicators with contemporary theories of digital engagement, the analysis captures how socioeconomic resources, political awareness, institutional trust, and online mobilization collectively shape electoral outcomes in the unique context of a pandemic-era election.

2.3. Electoral Effectiveness During the COVID-19 Pandemic

The COVID-19 pandemic introduced unprecedented challenges to electoral management worldwide. Many democracies were forced to postpone elections, while others adapted by implementing strict health protocols, expanding mail-in ballots, and experimenting with online voting systems to safeguard both public health and democratic continuity (Sorsa & Kivikoski, 2023). Although these adjustments were often temporary, they raised concerns about the resilience of democratic institutions and the potential narrowing of democratic practices during public-health emergencies.

The concept of electoral effectiveness can be anchored in broader theories of democratic quality, with four fundamental dimensions, breadth, equality, protection, and mutually binding consultation, identified as key indicators of effective democratic processes (Tilly, 2007). Breadth refers to the proportion of the population that can meaningfully participate in electoral processes, a dimension constrained during the pandemic by mobility restrictions and the persistent digital divide that limited voter access to online information and services (Lee, 2025). Equality highlights that all citizens should have equal opportunities to participate, a principle challenged by disparities in internet infrastructure and technological literacy (Asimakopoulos, Antonopoulou, Giannoukou, et al., 2025; Hofstra et al., 2023; Morris & Morris, 2013). Protection concerns safeguarding citizens’ rights to participate freely without coercion or intimidation, a task complicated by disrupting traditional monitoring mechanisms and the need for new security protocols (James & Garnett, 2025). Mutually binding consultation represents the degree to which electoral outcomes genuinely reflect citizen preferences and create enforceable commitments between governors and governed, a dimension tested when emergency measures altered standard democratic procedures and campaign dynamics (Grogan, 2022).

Beyond Tilly’s framework, theories of electoral integrity emphasize the role of technological infrastructure and citizen trust in sustaining democratic legitimacy. The Electoral Integrity Framework suggests that electoral effectiveness depends on the interaction of procedural quality, institutional capacity, and public confidence (Norris, 2014). During the pandemic, these elements became intertwined with adopting digital technologies, requiring election management bodies to balance health protocols with transparency and reliability.

Empirical evidence from Indonesia and other emerging democracies shows that well-designed digital interventions, such as blended campaign strategies, contactless voting procedures, and real-time result reporting, can prevent elections from becoming vectors of disease transmission while preserving democratic participation (Landman & Splendore, 2020). Nevertheless, the success of these measures has varied, with some regions facing delays, misinformation, and logistical challenges.

For the present study, electoral effectiveness is the combined outcome of information systems and political participation in sustaining inclusive, secure, and legitimate elections

during crises (Hendrik, 2010; Indrajit, 2004; Tilly, 2007). These conceptual lenses provide a comprehensive framework for analyzing how technological capacity and citizen engagement jointly shape election outcomes, allowing the research to test how the quality of digital infrastructure and the level of public participation influence key indicators of electoral effectiveness, such as turnout, transparency, and public trust, in Indonesia’s simultaneous regional head elections during the COVID-19 pandemic.

3. Research Methodology

This study adopts a quantitative research design to analyze the relationships among information systems, political participation, and electoral effectiveness during the COVID-19 pandemic. The target population comprises human resources involved in organizing simultaneous regional head elections. The required sample size was first estimated using the Slovin formula with a 95% confidence level to determine the minimum number of respondents (Sevilla et al., 1992, for general Slovin application). A more precise calculation was then performed using the Cochran formula, resulting in a final sample of 402 respondents drawn from a total population of 231,433 individuals (Cochran, 1977).

The study operationalizes three main variables: information systems, political participation, and electoral effectiveness.

- The information system variable is measured through three dimensions, human resources, technology, and relationships, which capture competence, technological reliability, and stakeholder connectivity (Indrajit, 2004).
- The political participation variable comprises seven dimensions: social and economic status, situational context, parental political affiliation, organizational experience, political awareness, trust in government, and stimulation of participation (Hendrik, 2010).
- The electoral effectiveness variable reflects four democratic quality dimensions: breadth, equality, protection, and mutually binding consultation (Tilly, 2007).

Table 1 presents the variables, dimensions, and indicators used in the analysis. Data were collected using a structured questionnaire consisting of 45 indicators, 12 indicators for the information system variable, 21 for political participation, and 12 for electoral effectiveness. The collected data were analyzed using Structural Equation Modeling (SEM) with the LISREL software to test the hypothesized relationships among variables.

Table 1. Recapitulation of Variables, Dimensions, and Indicators

Variable	Dimension	Indicator
Information System	Human resources	1) Competence of information system management staff
		2) Performance of information system management staff
		3) Collaboration of information system management staff
		4) Responsibility of information system management staff
	Technology	1) Reliability of information system hardware
		2) Reliability of information system software
		3) Integration of hardware and software

Variable	Dimension	Indicator
		information systems 4) Effectiveness of information technology implementation
	Relationships	1) Information system functional relationships 2) Information systems function in decision-making 3) Information systems function in policy implementation 4) Information system functions in establishing relationships with external parties
Political Participation	Social & economic status	1) Lineage 2) Education 3) Occupation 4) Wealth
	Situation	1) Family 2) Community 3) Stakeholders
	Parental political affiliation	1) Political party 2) Decision maker 3) Decision implementation
	Organizational experience	1) Achievement of organizational goals 2) Shared responsibility attitude 3) Political support attitude
	Political awareness	1) Rights 2) Obligations
	Trust in government	1) Policy formulation 2) Policy implementation 3) Policy evaluation
	Stimulation of participation	1) Socialization 2) Social media 3) Informal discussion
Electoral Effectiveness	Breadth	1) Extensive rights 2) Political inclusion 3) State jurisdiction
	Equality	1) Ethnic categories 2) Rights and obligations 3) Citizenship
	Protection	1) Exercise of power 2) Legal action 3) Recognition measures
	Mutually binding consultation	1) Resource distribution 2) Activity distribution 3) Interpersonal relationship distribution

Source: Compiled by the researcher

4. Results

4.1. Respondent Profile

The demographic characteristics of the respondents provide essential context for interpreting the study’s findings. Age distribution shows that younger individuals dominate the sample: respondents under 30 years make up 31%, followed by those aged 30–40 years (29%), over 50 years (22%), and 41–50 years (18%). Gender composition reveals a higher proportion of men (64%) compared to women (36%), indicating a gender gap in participation.

Regarding educational background, most respondents have a middle-to-higher level of education. High school graduates represent 46% of the sample, closely followed by bachelor’s degree holders (45%). Smaller groups hold a diploma/baccalaureate degree (6%), junior high school education (2%), or a master’s degree (1%).

Regarding institutional affiliation, the majority (83%) are not connected to any election-related organization. At the same time, the remainder includes members of the Voting Committee (PPS, 11%), the Regional Election Supervisory Agency (Bawaslu, 3%), the Regional Election Commission (KPU, 2%), and the District Election Committee (PPK, 1%). For position or function, nearly all respondents (99%) identify primarily as voters, with only a small minority serving in supervisory or administrative election roles.

The income distribution indicates that most respondents fall within the lower- to middle-income brackets. The largest group earns between IDR 2,500,000 and IDR 5,000,000 (42%), followed by those earning less than IDR 2,500,000 (41%). Smaller proportions report monthly incomes of IDR 5,000,000–7,500,000 (6%), IDR 7,500,000–10,000,000 (3%), and IDR 10,000,000–12,500,000 (2%).

These characteristics highlight a sample dominated by young, moderately educated, and middle-income voters, providing a relevant basis for examining how information systems and political participation affect electoral effectiveness during the COVID-19 pandemic.

Table 2. Demographic Characteristics of Respondents (N = 402)

Characteristic	Category	Frequency (%)
Age	< 30 years	31
	30–40 years	29
	41–50 years	18
	> 50 years	22
Gender	Male	64
	Female	36
Education	Junior high school	2
	High school	46
	Baccalaureate/Diploma (D1–D3)	6
	Bachelor’s degree (S1)	45
	Master’s degree (S2)	1
Institutional Affiliation	No organizational affiliation	83
	Voting Committee (PPS)	11
	Regional Election Supervisory Agency (Bawaslu)	3
	Regional Election Commission (KPU)	2
	District Election Committee (PPK)	1
Position / Function	Voter	99

Characteristic	Category	Frequency (%)
	Bawaslu staff	1
	KPU staff	<1
Monthly Income	< IDR 2,500,000	41
	IDR 2,500,000 – 5,000,000	42
	IDR 5,000,000 – 7,500,000	6
	IDR 7,500,000 – 10,000,000	3
	IDR 10,000,000 – 12,500,000	2
	IDR 12,500,000 – 15,000,000	6

4.2. Recapitulation of Overall Model Fit Test Results

Based on data processed using SEM LISREL, the analysis of the overall model, examining the impact of information systems and political participation on the effectiveness of simultaneous regional head elections during the COVID-19 pandemic, indicates that the model demonstrates a good overall fit. Evaluation was performed using 17 Goodness-of-Fit (GoF) indices across the absolute, incremental, and parsimonious categories. The results show that 10 indices meet the criteria for good fit and seven meet the marginal fit requirements. Because the number of good-fit indices exceeds the marginal ones, the overall model can be classified as having a Good Fit (Hair et al., 2019).

Validity testing confirms that all indicators for the information systems, political participation, and electoral effectiveness variables are valid, as indicated by t-values exceeding the critical threshold of 1.96. In total, 13 indicators from the exogenous latent variables (information systems and political participation) and the endogenous latent variable (electoral effectiveness) satisfy the validity criteria, demonstrating that the questionnaire items reliably measure the intended constructs.

Reliability testing also produced satisfactory results. Both the exogenous and endogenous latent variables achieved Construct Reliability (CR) values ≥ 0.70 and Variance Extracted (VE) values ≥ 0.40 , confirming strong internal consistency and acceptable measurement reliability.

Table 3. Reliability Test Summary of Latent Variables

Variable	Construct Reliability (CR) ≥ 0.70	Variance Extracted (VE) ≥ 0.40	Result
Information Systems	0.70	0.45	Good
Political Participation	0.94	0.64	Good
Electoral Effectiveness	0.71	0.41	Good

Source: LISREL output processed by the researcher

The structural model measurement results demonstrate that information systems and political participation simultaneously influence the effectiveness of simultaneous regional head elections during the COVID-19 pandemic, as shown in the standardized solution below:

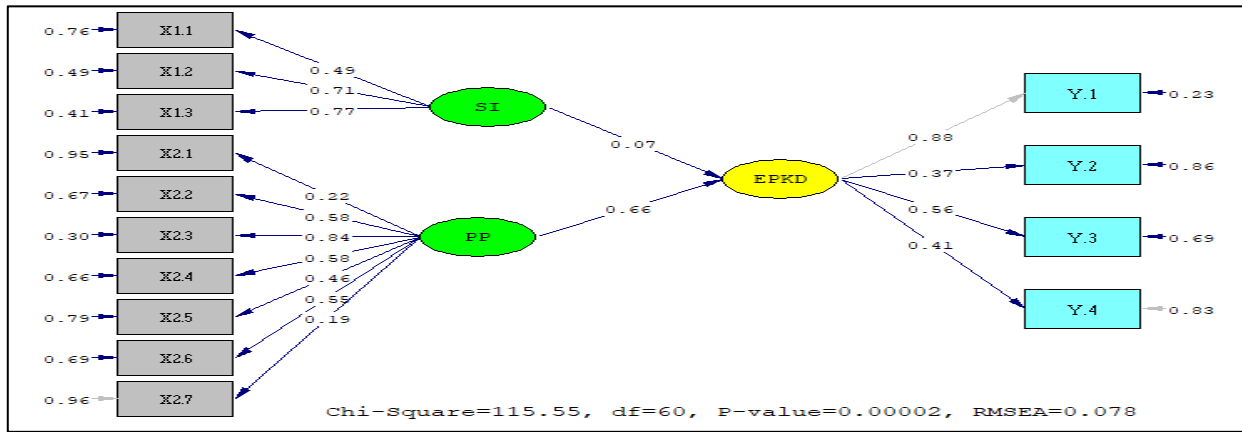


Figure 1. Structural Model (Standardized Solution)

Source: LISREL output processed by the researcher

Figure 1 shows that the three dimensions of Information Systems (IS), human resources (X1.1), technology (X1.2), and relationships (X1.3), contribute to the magnitude of influence on the effectiveness of simultaneous regional head elections during the pandemic. Likewise, the seven dimensions of Political Participation (PP), social and economic status (X2.1), situational factors (X2.2), parental political affiliation (X2.3), organizational experience (X2.4), political awareness (X2.5), trust in government (X2.6), and stimulation of participation (X2.7), also shape their combined impact on Electoral Effectiveness (EPKD), which is represented by four dimensions: breadth (Y1), equality (Y2), protection (Y3), and mutually binding consultation (Y4).

Hypothesis testing was performed to examine the influence of information systems and political participation on electoral effectiveness using t-values, with the results summarized as follows:

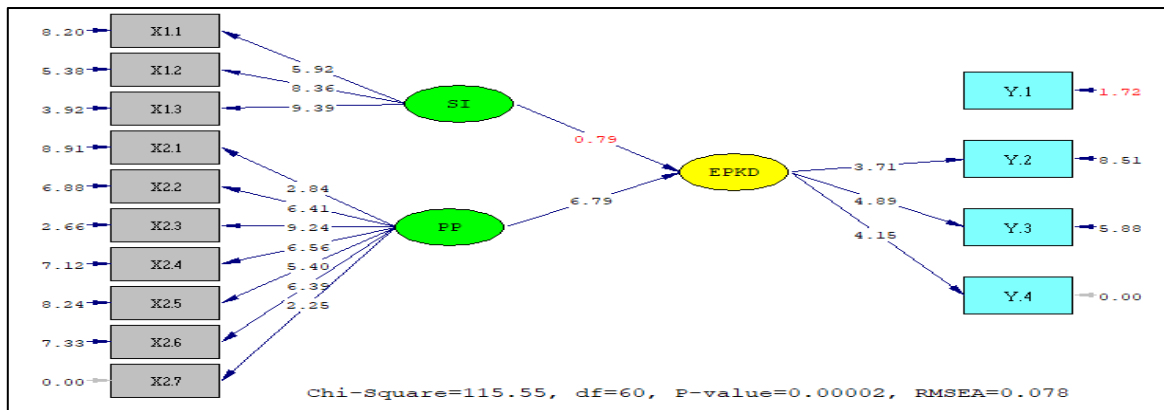


Figure 2. Structural Model (t-Values)

Source: LISREL output processed by the researcher

Based on Figure 1 and Figure 2, the numerical outputs of the structural models were incorporated into the path coefficient estimation table to obtain the structural equation measurement results. Analysis of the structural model indicates that information systems and political participation combined affect the effectiveness of regional head elections during the COVID-19 pandemic. The specific coefficients and significance levels are presented in the following table.

Table 4. Estimated Path Coefficients and Significance of the Effects of Information Systems and Political Participation on the Effectiveness of Simultaneous Regional Head Elections during the COVID-19 Pandemic

Structural Path	Path Coefficient	t-Value	Cut-off Value	Decision	R ²
Information Systems (X1) → Electoral Effectiveness (Y)	0.07	0.79	1.96	Not Significant	0.47
Political Participation (X2) → Electoral Effectiveness (Y)	0.66	6.79	1.96	Significant	0.47

Source: LISREL output processed by the researcher

The simultaneous testing of the structural equation model shows that information systems and political participation explain 47% of the variance in the effectiveness of simultaneous regional head elections ($R^2 = 0.47$). This indicates that improvements in these two variables account for nearly half of the observed variation in electoral effectiveness, while the remaining 53% is attributable to other unexamined factors.

Hypothesis testing reveals that the information systems variable exerts a positive but statistically insignificant effect on electoral effectiveness (path coefficient = 0.07; t-value = 0.79 < 1.96). Accordingly, the hypothesis proposing a significant influence of information systems is not supported. In contrast, political participation demonstrates a positive and significant effect (path coefficient = 0.66; t-value = 6.79 > 1.96), confirming that greater public engagement significantly enhances the effectiveness of regional head elections during the COVID-19 pandemic.

These findings highlight that, while technological infrastructure is essential, citizen political participation plays a more decisive role in ensuring effective electoral outcomes under crisis conditions. Future research should examine additional factors, such as institutional trust, media influence, and regional governance capacity, to provide a more comprehensive understanding of election effectiveness in pandemic or other emergency contexts.

This influence is further demonstrated by the path coefficient measurements, where the information systems variable shows a coefficient of 0.07, while political participation records a coefficient of 0.66. Together, these two path coefficients contribute to the coefficient of determination (R^2) of 0.47, indicating that 47% of the variance in the effectiveness of simultaneous regional head elections during the COVID-19 pandemic can be explained by these two variables. Although both variables are related to electoral effectiveness, the contribution of information systems is noticeably weaker than that of political participation. Enhancing both factors simultaneously is expected to improve the effectiveness of regional head elections during a pandemic, but political involvement clearly exerts the more decisive influence.

To identify the most dominant dimensions within each construct, simultaneous measurements of the exogenous and endogenous latent variables were analyzed, as presented below.

Table 5. Contribution of Dimensions to the Influence of Exogenous Latent Variables on Endogenous Latent Variables

Dimension/Factor	Loading	t-Value	Cut-off Value	Rank
Information Systems				
Human Resources (X1.1)	0.49	5.92	1.96	III

Dimension/Factor	Loading	t-Value	Cut-off Value	Rank
Technology (X1.2)	0.71	8.36	1.96	II
Relationships (X1.3)	0.77	9.39	1.96	I
Political Participation				
Social & Economic Status (X2.1)	0.22	2.84	1.96	V
Situation (X2.2)	0.58	6.41	1.96	II
Parents' Political Affiliation (X2.3)	0.84	9.24	1.96	I
Organizational Experience (X2.4)	0.58	6.56	1.96	II
Political Awareness (X2.5)	0.46	5.40	1.96	IV
Trust in Government (X2.6)	0.55	6.39	1.96	III
Stimulation of Participation (X2.7)	0.19	2.25	1.96	VI
Electoral Effectiveness				
Breadth (Y1)	0.88	,	1.96	I
Equality (Y2)	0.37	3.71	1.96	IV
Protection (Y3)	0.66	4.89	1.96	II
Mutually Binding Consultation (Y4)	0.41	4.15	1.96	III

Source: LISREL output processed by the researcher

The ranking of dominant dimensions is summarized in the following table.

Table 6. Most Dominant Dimensions Across Variables

No.	Variable	Dimension	Loading Factor
1	Information Systems	Relationships (X1.3)	0.77
2	Political Participation	Parents' Political Affiliation (X2.3)	0.84
3	Electoral Effectiveness	Breadth (Y1)	0.88

Source: LISREL output processed by the researcher

As shown in **Table 6**, the Breadth dimension of electoral effectiveness exhibits the highest loading factor (0.88), indicating it is the most influential indicator in explaining election effectiveness during the pandemic. This is followed by Parents' Political Affiliation within political participation (0.84) and Relationships within information systems (0.77), highlighting the critical role of inclusive participation, family political socialization, and strong inter-organizational connections in achieving effective elections under crisis conditions.

4.3. Information Systems and Political Participation in Pandemic-Era Regional Elections

The structural equation model reveals that information systems and political participation jointly explain 47 percent of the variance in the effectiveness of simultaneous regional head elections during the COVID-19 pandemic ($R^2 = 0.47$). However, their individual contributions differ sharply. Information systems show a positive but statistically insignificant effect (path coefficient = 0.07; $t = 0.79 < 1.96$), whereas political participation exerts a strong and significant influence (path coefficient = 0.66; $t = 6.79 > 1.96$). These findings confirm that while digital platforms were indispensable for minimizing infection risk, technological adoption alone could not guarantee effective elections, a pattern consistent with global evidence that technology can support but not substitute citizen engagement (Landman & Splendore, 2020; Norris, 2014).

During the 2020 elections, Indonesia's General Election Commission encouraged online campaigning and voter information dissemination to reduce physical gatherings (Aritonang, 2020). Technology-adoption theories such as the Technology Acceptance Model (Davis, 1989)

and Diffusion of Innovation (Rogers, 2003) predict that perceived usefulness, ease of use, and compatibility drive adoption. However, the weak path coefficient suggests that voters and administrators did not perceive sufficient relative advantage or system reliability to translate these platforms into measurable effectiveness. Similar limitations were noted in earlier Indonesian elections, where applications like SITUNG and SIDALIH improved data verification but fell short of transforming electoral practices (Cahyaningsih et al., 2019). Structural barriers, including inadequate infrastructure, incomplete candidate data, weak legal underpinnings, and uneven digital literacy, further undermined transparency and accountability (Duenas-Cid et al., 2024; Indrajit, 2004).

Political participation, by contrast, emerged as the decisive driver of electoral effectiveness, aligning with democratic theory that treats participation as a core indicator of democratic quality (Diamond, 2015; Tilly, 2007). Guided by the Civic Voluntarism Model (Eliasoph et al., 1996) and the mobilization–reinforcement debate (Boulianne, 2020), citizens engaged through both conventional voting and digital activism, even as pandemic restrictions forced campaigns into online spaces (Lorenz-Spreen et al., 2022). Yet turnout in South Tangerang reached only 60.28 percent, below the 77 percent target, reflecting lingering health concerns and digital divides (Ministry of Health, 2021). Dimension analysis highlights the enduring role of family political socialization. Parents' Political Affiliation recorded the highest loading (0.84), and situational factors such as community networks and trust in government (Hendrik, 2010; Mayer et al., 2024).

Overall, the evidence demonstrates that secure and reliable information systems are necessary to safeguard elections during crises, but they must be accompanied by strategies that strengthen participation. Enhancing the relationships dimension of information systems (loading = 0.77), through voter education, inter-agency coordination, and sustained trust-building, can help convert technological infrastructure into genuine democratic gains. Ultimately, inclusive citizen engagement remains the most potent determinant of electoral effectiveness when democracy operates under the constraints of a public-health emergency.

4.4. Political Participation and Electoral Effectiveness during the COVID-19 Pandemic

The structural equation model confirms that political participation exerts a strong and statistically significant influence on the effectiveness of simultaneous regional head elections during the COVID-19 pandemic (path coefficient = 0.66; $t = 6.79 > 1.96$). This finding underscores the theoretical claim that citizen engagement is a central indicator of democratic quality (Diamond, 2015; Tilly, 2007) and resonates with the Civic Voluntarism Model, which links participation to individual resources, psychological engagement, and mobilizing networks (Eliasoph et al., 1996). Under pandemic conditions, when face-to-face campaigns were curtailed, political participation became even more critical for sustaining electoral legitimacy despite health restrictions (Landman & Splendore, 2020).

Field evidence from Indonesian regional elections illustrates the complexity of participation dynamics. Social and economic status often constrains lower-income groups, limiting their ability to access information and voting facilities (Hendrik, 2010; Pratiwi et al., 2023). Conversely, parental political affiliation and organizational experience can strengthen mobilization, as family networks and civic group ties provide political socialization and resources that encourage voting. Studies of previous simultaneous elections also show that inadequate political awareness and weak institutional trust remain significant barriers to turnout, while targeted socialization through mass media and community networks can gradually raise participation levels (Lorenz-Spreen et al., 2022; Nath & Verma, 2025).

Empirical patterns during the 2020 regional elections further highlight these dynamics. South Tangerang, for example, recorded only 60.28 percent voter turnout, far below the 77 percent target, despite regulations promoting online campaigns to reduce physical gatherings (Aritonang, 2020; Ministry of Health, 2021). Although digital platforms lowered some participation costs, they did not fully compensate for structural inequalities in internet access or for lingering public anxiety about infection risks (Boulianne, 2020). Therefore, the strong effect of political participation in the model reflects the decisive role of social resources and trust networks in overcoming health-related constraints and longstanding socio-economic barriers to democratic engagement.

The empirical analysis further highlights the mediating role of political trust in shaping participation during pandemic elections. Trust in government has long been recognized as a key predictor of citizen engagement because it lowers the perceived risks and costs (Nath & Verma, 2025). In line with this perspective, the present findings show that satisfaction with democracy only indirectly enhances political engagement, with political trust as the critical bridge between democratic evaluations and participatory behavior. When citizens are confident in electoral integrity and governmental responsiveness, they are more willing to invest time and resources in voting and other political activities, an observation consistent with the Electoral Integrity Framework, which links procedural quality and public confidence to democratic legitimacy (Norris, 2014).

At the same time, the persistence of corrupt practices and clientelistic politics threatens this virtuous cycle of trust and participation. Democratic theory warns that the emergence of leaders who exploit public office for personal gain can erode civic norms and discourage participation (Diamond, 2015). Indonesian experiences during regional elections illustrate how money politics, weak oversight, and health-protocol violations undermine electoral integrity, reinforcing citizen cynicism and lowering turnout. Strengthening political accountability, understood as the capacity of society to demand transparency and sanction abuse, is therefore essential for sustaining participation. Earlier studies emphasize that public oversight through forums, consultations, and feedback mechanisms can improve the quality of government decisions and align policies with citizens' interests (Hendrik, 2010; Indrajit, 2004).

High levels of participation remain the clearest expression of popular sovereignty, signaling that citizens not only value their voting rights but also possess the political awareness necessary to evaluate and influence government performance (Tilly, 2007). Conversely, persistent abstention or the growth of "white group" non-voters weakens the representativeness of electoral outcomes and undermines democratic consolidation (Lorenz-Spreen et al., 2022). Increasing turnout in simultaneous regional head elections requires collaborative efforts by election organizers, political parties, and civil society to expand political education, provide clear information, and build trust in the electoral process. Such initiatives reinforce the breadth dimension of electoral effectiveness, ensuring extensive rights and inclusive participation, which the structural model identifies as the most decisive indicator of democratic quality during the COVID-19 pandemic.

The final analysis integrates broader democratic theory with the specific structural results of this study. As democratic governance depends on scientific rationality and public deliberation, tensions often arise between theoretical ideals and practical realities. Democratic systems require evidence-based policymaking, yet populist pressures, economic inequalities, and exclusivity of expertise can distort knowledge translation into policy (Norris, 2014; Tilly, 2007). These dynamics, also noted in global discussions of pandemic governance, highlight the need

for participatory interventions to maintain accountability and inclusiveness during crises (Landman & Splendore, 2020).

Within the structural model, the Relationship dimension of the information systems variable (loading = 0.77) and the Parents' Political Affiliation dimension of political participation (loading = 0.84) emerge as the most influential factors shaping electoral effectiveness, particularly within the Breadth dimension of democratic quality (loading = 0.88). The relationship dimension captures how digital election systems support communication, data-driven decision making, policy implementation, and transparent interaction between government and citizens (Duenas-Cid et al., 2024; Indrajit, 2004). The parental political affiliation dimension reflects the intergenerational socialization of political values and the mobilization of family networks, consistent with earlier evidence that family political orientation strongly predicts participation (Hendrik, 2010; Mayer et al., 2024). These findings confirm that effective pandemic elections require reliable technological infrastructure and deep social embeddedness to sustain inclusion and legitimacy.

Perceptions of democracy further shape how citizens evaluate government performance and build political trust. Social and economic policy improvements can strengthen trust among citizens who view elections as a core democratic practice, while political rights protection or economic security failures can erode confidence and reduce participation (Nath & Verma, 2025). Because trust is both a normative requirement and a functional necessity for democratic stability, strategies to enhance transparency, public consultation, and institutional responsiveness are vital. By reinforcing the breadth of participation and the quality of information flows, these measures can help preserve democratic resilience in future public-health or political crises.

5. Conclusion

This study shows that the effectiveness of Indonesia's simultaneous regional head elections during the COVID-19 pandemic is determined primarily by the strength of political participation. At the same time, adopting information systems only plays a supporting role. Political participation proved to substantially affect electoral effectiveness, whereas information systems, although positively related, did not reach statistical significance.

Among the underlying dimensions, parental political affiliation within political participation and the relationship dimension within information systems emerged as the most dominant factors, reinforcing the breadth of electoral effectiveness. These results highlight the decisive role of intergenerational political socialization, inclusive voter engagement, and strong inter-organizational connections in ensuring that elections remain legitimate and representative under crisis conditions.

The findings emphasize that technological innovation alone cannot secure the quality of democracy. Strengthening voter education, building political trust, and enhancing participatory oversight are crucial to developing secure and user-friendly election information systems. Policymakers and election organizers are encouraged to integrate technological improvements with sustained strategies for mobilizing citizens, fostering transparency, and safeguarding electoral integrity.

Future research can explore additional variables such as digital literacy gaps, regional governance capacity, and media influence to capture factors beyond political participation and information systems that may further shape electoral effectiveness in public health emergencies.

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7. Declaration of Conflicting Interests

The authors declare no potential conflicts of interest concerning this article's research, authorship, or publication.

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