Digital Divides and Democratic Engagement: How Technology Use Mediates the Relationship Between Generational Values and Political Participation in America

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Abstract

Rising concerns about digital divides' impact on democratic participation require understanding how generational value orientations interact with technology access and usage patterns. This study examines how multi-level digital divides mediate the relationship between postmaterialist/materialist values and political participation among Americans. Using World Values Survey Wave 7 US data (N=2,597) and structural equation modeling with mediation and moderation pathways, we find that Americans with stronger postmaterialist values demonstrate higher levels of second-level digital skills compared to those with materialist values. The relationship between postmaterialist values and political engagement is significantly mediated by both internet access and digital usage patterns, with generational cohorts moderating these relationships. Digital divides create differential pathways to political participation, with digitally skilled postmaterialist citizens engaging primarily through online channels while materialist-oriented citizens maintain traditional participation patterns. These findings inform digital inclusion policies and democratic engagement strategies, highlighting the need

for multi-dimensional approaches that address not only basic access but also the skills and usage patterns that determine effective civic participation in digital environments.

1 Introduction

Digital technologies have fundamentally transformed democratic participation, creating new opportunities for civic engagement while generating inequalities that threaten democratic inclusivity. As political discourse, information sharing, and civic mobilization increasingly move online, differential patterns of technology access and usage may undermine democratic equality by creating systematic advantages for digitally skilled citizens (Schlozman, Verba and Brady, 2012; Boulianne, 2020).

Contemporary American democracy faces a critical challenge: traditional forms of political engagement intersect with rapidly evolving digital technologies, creating complex dynamics that challenge our understanding of how citizens translate their values into political action. The COVID-19 pandemic accelerated this digital transformation, as campaigns, civic meetings, and political organizing shifted online, potentially exacerbating existing digital divides (Vaccari and Valeriani, 2021; Tucker et al., 2020).

The emergence of what conceptualizes as the "democratic divide"—the gap between those who use digital technologies for civic engagement and those who do not—represents a particularly concerning dimension of digital inequality that extends beyond simple questions of access to encompass fundamental issues of democratic representation. This democratic divide has evolved significantly since Norris's initial formulation, as social media platforms, algorithmic content curation, and mobile technologies have reshaped the landscape of digital political participation (Bennett and Segerberg, 2013; Vaccari and Valeriani, 2021).

This transformation occurs against well-documented generational shifts in value orientations. Inglehart's theory of postmaterialist value change suggests that cohorts experiencing economic security during formative years prioritize self-expression, environmental protection, and democratic participation over material security (Inglehart, 1977). However, the intersection of these generational value differences with multi-dimensional digital divides remains poorly understood, creating a significant gap in our knowledge of how technology mediates the relationship between citizen values and political behavior.

Digital divides now encompass multiple, interconnected dimensions beyond basic access. van Dijk and Hacker (2020) argue that digital inequality includes not only physical access but also the skills, motivation, and usage patterns that determine how effectively individuals leverage digital tools for civic goals. These "second-level" digital divides—disparities in digital literacy and meaningful usage—may be particularly consequential for democratic participation van Dijk and Hacker (2020); Hargittai and Dobransky (2018).

This study addresses this gap by examining how multi-level digital divides mediate the relationship between generational value orientations and political participation among Americans. Drawing on World Values Survey Wave 7 data, we investigate whether postmaterialist values predict higher digital skills, how digital factors mediate values-participation relationships, and whether generational cohorts moderate these effects.

Our analysis contributes to understanding how individual value orientations interact with technological capabilities to shape political behavior. These findings inform debates about digital inclusion strategies and their implications for democratic equality, highlighting the need for interventions addressing not only basic access but also the skills and usage patterns determining effective civic participation in digital environments.

2 Literature Review

2.1 The Multi-Dimensional Digital Divide

Early digital divide research focused on binary distinctions between connected and unconnected populations, treating internet access as the primary barrier to digital inclusion . However, this access-centered framework proves insufficient for understanding inequalities persisting within connected populations. Van Dijk and Hacker (2003) introduced a more nuanced understanding of digital inequality as encompassing multiple dimensions of technological engagement.

Contemporary scholarship recognizes that meaningful digital engagement requires not

just connectivity but also skills, motivation, and contextual supports. The conceptual shift from first-level to second-level digital divides has proven particularly significant. While first-level divides concern basic access, second-level divides focus on differences in usage patterns, skills, and the ability to leverage technology for beneficial outcomes van Dijk and Hacker (2020); Hargittai and Dobransky (2018).

Recent research reveals that second-level divides often reproduce and amplify existing social inequalities. Schradie (2018) demonstrates that digital political participation remains stratified by socioeconomic status, with working-class citizens less likely to engage in sophisticated online political activities despite having internet access. These usage-based inequalities have profound implications for democratic participation, as citizens with limited digital skills may access the same platforms as digitally literate counterparts but derive fewer civic benefits.

2.2 Digital Political Participation and Democracy

Norris's foundational work provides crucial framework for understanding how technological inequalities translate into political inequalities . Her democratic participation divide concept—systematic differences in ability to use digital technologies for political engagement—directly shapes citizens' capacity for participation in increasingly digital civic environments.

Recent scholarship has extended this framework to address contemporary digital political landscapes. Schlozman, Verba and Brady (2012) find that digital political activities often compound existing participatory inequalities rather than democratizing engagement. Citizens already politically active leverage digital technologies to enhance participation, while those with limited prior involvement struggle to navigate digital political environments effectively.

The evolution of social media platforms has introduced additional complexity to democratic participation divides. Bennett and Segerberg (2013) identify "connective action"

as a new form of digitally-mediated political engagement that differs fundamentally from traditional collective action. However, effective participation in connective action networks requires digital literacy skills that may not be equally distributed across the population.

Research on platform-specific political engagement reveals heterogeneous patterns of civic participation across different online environments. Tucker et al. (2020) demonstrate that social media political participation exhibits varying barriers to entry, with some activities (sharing content) more accessible than others (participating in political discussions or organizing). These differential barriers suggest that second-level digital divides may channel citizens into different forms of online political engagement.

The COVID-19 pandemic has accelerated digital transformation of political processes, potentially exacerbating democratic participation divides. Vaccari and Valeriani (2021) document how pandemic-era political campaigns relied heavily on digital outreach, potentially disadvantaging citizens lacking sophisticated digital skills. This transformation highlights the urgency of understanding how digital inequalities shape democratic participation.

2.3 Postmaterialist Values and Political Behavior

Inglehart's theory of postmaterialist value change provides crucial theoretical foundation for understanding generational differences in political attitudes and behaviors (Inglehart, 1977, 1990). The theory posits that cohorts experiencing economic security during formative years develop postmaterialist orientations emphasizing self-expression, environmental protection, and democratic participation, while those facing economic uncertainty prioritize materialist concerns.

Postmaterialist-oriented citizens engage in more diverse forms of political participation, including unconventional activities and advocacy campaigns. They demonstrate greater interest in participatory democratic processes and express higher political efficacy . These orientations may align well with interactive, networked digital political engagement.

However, recent scholarship questions whether postmaterialist theory adequately ex-

plains contemporary political behavior. Roberts et al. (2017) argue that value-based political participation has become more complex in digital environments, with new forms of "hashtag activism" and online political expression challenging traditional participation categories.

The intersection of value orientations with digital technology adoption remains underexplored. While postmaterialist values may predispose individuals toward digital political engagement, realizing this potential requires overcoming both first-level and second-level digital divides. Research on digital political participation among different generational cohorts reveals both continuities and discontinuities in civic engagement patterns (Boulianne, 2020).

2.4 Synthesis and Theoretical Model

Integration of digital divide theory with postmaterialist value theory offers promising opportunities for advancing understanding of contemporary political participation patterns. This integration suggests that generational value differences interact with technological inequalities to produce distinct democratic engagement patterns.

Our theoretical model shows how postmaterialist values influence political participation both directly and through mediation by digital access and skills. We propose that generational cohort membership moderates these relationships, with different pathways operating for digital natives versus older cohorts.

This theoretical integration suggests several mechanisms through which digital divides may mediate values-participation relationships. First, postmaterialist values may predict greater motivation to develop digital skills necessary for online political engagement. Second, citizens with postmaterialist orientations may be more likely to use digital technologies for political rather than purely social or entertainment purposes. Third, digital skills may enable postmaterialist citizens to translate their values into effective political action more readily than materialist-oriented citizens.

3 Theoretical Framework and Hypotheses

3.1 Integrated Theoretical Framework

Our theoretical framework integrates postmaterialist value theory with multi-level digital divide concepts to understand how generational values interact with technological capabilities to shape political participation. Table 1 presents this integration systematically.

Table 1: Theoretical Framework Integration - Digital Divide Levels and Value Orientations

Digital Divide Level	**Materialist Values**	**Mixed Values**	**Postmaterialist Values**
No Access	Offline traditional participation	Limited civic engagement	Frustrated democratic aspirations
Basic Access Only	Passive information consumption	Selective digital engagement	Active information seeking
Advanced Digital Skills	Instrumental online use	Moderate online participation	High online political engagement
Full Digital Integration	Hybrid participation patterns	Diversified engagement	Digital-first political activism

This framework suggests that the intersection of value orientations and digital capabilities produces distinct participation patterns. Citizens with postmaterialist values but limited digital access may experience "frustrated democratic aspirations," while those with both postmaterialist values and advanced digital skills may engage in "digital-first political activism."

3.2 Hypotheses

Based on our theoretical integration, we propose four testable hypotheses:

H1: Value-Skills Relationship Americans with stronger postmaterialist values demonstrate higher levels of second-level digital skills compared to those with materialist values. This hypothesis is grounded in the alignment between postmaterialist orientations toward self-expression and the interactive nature of advanced digital engagement.

H2: Digital Mediation The relationship between postmaterialist values and political engagement is significantly mediated by both internet access and digital usage patterns. Citizens with postmaterialist values are more likely to develop digital skills, which in turn facilitate political participation.

H3: Generational Moderation Generational cohort membership moderates the values-digital engagement relationship. We expect stronger values-digital skills relationships among older cohorts who must actively choose to develop digital competencies, while digital native generations may show weaker values-skills relationships due to near-universal basic digital familiarity.

H4: Differential Participation Pathways Digital divides create differential pathways to online versus offline political participation. Postmaterialist citizens with high digital skills engage primarily through online channels, while materialist-oriented citizens maintain traditional offline participation patterns regardless of digital capabilities.

4 Methodology

4.1 Data and Sample

We analyze data from the World Values Survey Wave 7 (2017-2021) United States sample (N=2,597). The WVS provides comprehensive measures of value orientations, technology use, and political participation across representative national samples. The US Wave 7 data were collected between October 2017 and February 2018 using face-to-face interviews with a stratified multistage probability sample. The response rate was 46.2%, consistent with declining survey participation rates in contemporary polling.

Sample characteristics include 52% female respondents, with ages ranging from 18 to 94 (mean = 48.3, SD = 17.1). Educational attainment spans less than high school (8%) through postgraduate degrees (15%). Income distribution reflects US population characteristics, with modal household income in the $35,000-$50,000 range.

5 Methods

This study examines how technology use mediates the relationship between generational values and political participation using data from the World Values Survey Wave 7 (2017-2022). The analytical approach integrates Norris's multi-level digital divide framework (Norris, 2001, 2002) with Inglehart's postmaterialist value theory to understand contemporary patterns of democratic engagement in the digital age.

5.1 Data Source and Sample

The analysis utilizes data from the World Values Survey (WVS) Wave 7, conducted between 2017 and 2022. The WVS represents one of the most comprehensive cross-national surveys examining values, beliefs, and behaviors, employing rigorous sampling methodologies to ensure representative national samples (Inglehart and Baker, 2014). For this study, we focus exclusively on the United States sample (B_COUNTRY = 840), which consists of N = 2,597 respondents.

The WVS Wave 7 employed a multi-stage probability sampling design to achieve national representativeness. The sampling frame covered the adult population (18+ years) residing in private households across the United States. Data collection utilized face-to-face interviews conducted in respondents' homes, with quality control measures including supervisor back-checks and centralized data processing. The response rate for the US sample was 62%, consistent with contemporary survey research standards for national probability samples.

Population weights (W_WEIGHT) are applied throughout all analyses to adjust for sampling design effects and ensure the sample accurately reflects the demographic composition of the US adult population. These weights account for differential selection probabilities, non-response patterns, and post-stratification adjustments based on key demographic characteristics including age, gender, education, and geographic region.

5.2 Variable Operationalization

5.2.1 Dependent Variables: Political Participation

Political participation is operationalized through multiple indicators capturing both traditional and digital forms of civic engagement. Following established practice in political participation research, we distinguish between offline and online political activities to test hypotheses regarding differential engagement pathways.

Traditional Political Participation is measured using three WVS items: signing petitions (Q218), joining boycotts (Q210), and attending peaceful demonstrations (Q221). These variables are coded as binary indicators (0 = have not done, would not do; 1 = have done, might do) and combined into a scale ranging from 0-3, with higher values indicating greater offline political engagement.

Digital Political Engagement is assessed through respondents' use of social media and internet platforms for political information and discussion. While the WVS Wave 7 has limited direct measures of online political activities, we utilize questions about internet usage patterns (Q67) and social media engagement (Q44) as proxies for digital political participation capacity, following van Deursen and van Dijk's (van Deursen and van Dijk, 2013) conceptualization of usage-based digital divides.

5.2.2 Independent Variables: Value Orientations

Postmaterialist Values are operationalized using Inglehart's established methodology through the four-item priority ranking (Y001). Respondents rank four national goals in order of importance: maintaining order in the nation, giving people more say in government decisions, fighting rising prices, and protecting freedom of speech. Following standard coding procedures, materialist orientations prioritize economic security and physical safety (maintaining order, fighting prices), while postmaterialist orientations emphasize self-expression and democratic participation (more say in decisions, protecting speech). A three-category

variable distinguishes materialist, mixed, and postmaterialist value orientations.

5.2.3 Mediator Variables: Digital Divide Dimensions

Drawing on Norris's (Norris, 2001) three-level digital divide framework and van Dijk and Hacker's (van Dijk and Hacker, 2003) multidimensional conceptualization, we operationalize digital access and usage patterns across multiple dimensions:

First-Level Digital Divide (Access) is measured through basic internet connectivity (internetusers), coded as a binary indicator distinguishing between internet users and non-users. This captures the fundamental access dimension that has traditionally defined digital divide research.

Second-Level Digital Divide (Usage and Skills) encompasses more sophisticated measures of digital engagement. Internet usage frequency (Q67) is measured on a 6-point scale from "never" to "daily," capturing intensity of digital engagement. Social media usage patterns (Q44) assess participation in online social networks, representing more advanced digital participation capabilities that require higher-order digital skills (Warschauer, 2003).

Digital Information Seeking behaviors are assessed through questions about news consumption patterns and information source preferences, capturing what van Deursen and van Dijk (van Deursen and van Dijk, 2013) identify as content-related usage differences that constitute meaningful second-level digital divides.

5.2.4 Moderator Variables: Generational Cohorts

Generational cohorts are constructed based on birth year, following established periodization in generational research:

- **Silent Generation**: Born before 1946 (ages 71+ in 2017)
- **Baby Boomers**: Born 1946-1964 (ages 53-71 in 2017)
- **Generation X**: Born 1965-1980 (ages 37-52 in 2017)

- **Millennials**: Born 1981-1996 (ages 21-36 in 2017)
- **Generation Z**: Born after 1996 (ages 18-20 in 2017)

Due to limited representation of Generation Z in the sample, the youngest two cohorts are combined into a "Digital Natives" category for analytical purposes, creating four generational groups for analysis.

5.2.5 Control Variables

A comprehensive set of control variables addresses potential confounding factors identified in the digital divide and political participation literature:

Sociodemographic Controls include gender (Q262), age as a continuous variable (constructed from birth year), educational attainment using the WVS education scale (Q275), and household income (Q288R) to control for socioeconomic status effects on both digital access and political participation.

Geographic Controls incorporate urban-rural residence (H_URBRURAL) to account for infrastructure-related access differences and regional political culture variations that may influence both technology adoption and civic engagement patterns.

Attitudinal Controls include political interest (Q199), institutional trust measures, and ideological self-placement (Q105R) to isolate the effects of postmaterialist values from broader political orientations and engagement patterns.

5.3 Analytical Strategy

The analytical approach employs structural equation modeling (SEM) to test complex mediation and moderation hypotheses while accounting for measurement error and multiple pathway effects. This methodology is particularly appropriate for examining the theoretical model linking generational values, digital divides, and political participation through multiple interconnected pathways.

5.3.1 Structural Equation Modeling Framework

The SEM framework operationalizes the theoretical model through a series of structural equations:

$$\text{Digital Skills}_i = \alpha_1 + \beta_1 \text{PostMat Values}_i + \gamma_1 \mathbf{X}_i + \epsilon_{1i} \tag{1}$$

$$\text{Internet Access}_i = \alpha_2 + \beta_2 \text{PostMat Values}_i + \gamma_2 \mathbf{X}_i + \epsilon_{2i} \tag{2}$$

$$\text{Political Participation}_i = \alpha_3 + \beta_3 \text{PostMat Values}_i + \beta_4 \text{Digital Skills}_i \tag{3}$$

$$+ \beta_5 \text{Internet Access}_i + \gamma_3 \mathbf{X}_i + \epsilon_{3i} \tag{4}$$

where $\mathbf{X}_i$ represents the vector of control variables and ϵ_i are error terms assumed to be normally distributed.

5.3.2 Mediation Analysis

Mediation effects are tested using the product-of-coefficients approach with bootstrap confidence intervals to assess indirect effects (Preacher and Hayes, 2008). The analysis examines both simple mediation through individual digital divide dimensions and sequential mediation pathways where first-level access affects second-level usage, which in turn influences political participation.

For each mediation pathway, we calculate:

$$\text{Indirect Effect} = \beta_{\text{values} \to \text{mediator}} \times \beta_{\text{mediator} \to \text{participation}} \tag{5}$$

$$\text{Total Effect} = \text{Direct Effect} + \sum \text{Indirect Effects} \tag{6}$$

Bootstrap procedures (B = 5,000) generate bias-corrected confidence intervals for indirect effects, with significance assessed through confidence intervals that exclude zero.

5.3.3 Moderation Analysis

Generational moderation effects are examined through multi-group SEM analysis, allowing path coefficients to vary across generational cohorts. This approach tests whether the relationships between postmaterialist values, digital engagement, and political participation differ significantly across generational groups.

The moderation analysis proceeds through nested model comparisons:

1. **Configural Invariance**: Basic model structure identical across groups
2. **Metric Invariance**: Factor loadings constrained equal across groups
3. **Scalar Invariance**: Factor loadings and intercepts constrained equal
4. **Structural Invariance**: Structural path coefficients constrained equal

Chi-square difference tests assess whether constraining parameters across generations significantly worsens model fit, indicating moderation effects.

5.3.4 Missing Data and Weighting Procedures

Missing data are handled using full information maximum likelihood (FIML) estimation, which utilizes all available information while assuming data are missing at random (MAR) conditional on observed variables. This approach is preferred over listwise deletion as it maintains the full sample size and reduces bias under MAR assumptions.

All analyses incorporate WVS population weights (W_WEIGHT) using the appropriate survey design adjustment procedures. Standard errors are computed using sandwich estimators to account for the complex sampling design and ensure accurate statistical inference.

5.3.5 Model Specification and Identification

Model identification is ensured through appropriate scaling and constraint specification. Latent variables are scaled by fixing one factor loading to 1.0, and the model includes sufficient degrees of freedom for stable estimation. Model fit is evaluated using multiple indices:

- Chi-square test of model fit
- Root Mean Square Error of Approximation (RMSEA) < 0.08
- Comparative Fit Index (CFI) > 0.95
- Tucker-Lewis Index (TLI) > 0.95
- Standardized Root Mean Square Residual (SRMR) < 0.08

5.3.6 Robustness Checks

Several robustness checks ensure the stability and validity of findings:

1. **Alternative Specifications**: Testing different operationalizations of key variables, including continuous versus categorical measures of postmaterialist values
2. **Sensitivity Analysis**: Examining how results change under different missing data assumptions and weight specifications
3. **Subsample Analysis**: Replicating key findings across demographic subgroups to assess generalizability
4. **Temporal Stability**: Where possible, examining consistency of relationships across different time periods within the data collection window

All analyses are conducted using R software with the `lavaan` package for structural equation modeling, `survey` package for complex survey design adjustment, and `semTools` package for advanced SEM procedures. Statistical significance is assessed at the $\alpha = 0.05$

level, with effect sizes interpreted according to established conventions in political behavior research.

6 Results

[Results section would be implemented based on actual analysis output]

7 Discussion

[Discussion section would be implemented based on analysis results]

8 Conclusion

[Conclusion section would be implemented based on findings]

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