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EXPLORING CULTURAL VALUES AND SUSTAINABILITY PREFERENCES IN HOUSING DEVELOPMENT: A STRUCTURAL EQUATION MODELING APPROACH

Key words: indigenous housing, cultural values, sustainable development, sustainability preferences, Tiv housing

Introduction

Sustainability may be seen as behaviors and procedures directed toward meeting our present needs without jeopardizing the requirements of subsequent generations (United Nations SDGs, 2015). Environment, as one of the primary pillars of sustainability, covers the provision of suitable housing and the creation of human settlements that are inclusive, safe, resilient, and long-lasting (Car-Pušić, Tijanić, Marović & Mladen, 2020). This inclusiveness means that essential services should be provided through changes, improvements, and slum upgrading for the growth of both countries, communities, and regions. According to Neef et al. (2018), this embraces giving communities value-based developments to retain their identities, adapt to climate change, and keep their cultures alive.

Furthermore, to ensure inclusiveness, end-users as beneficiaries should be involved in the planning, designing, and developing implementation schemes in their areas (Wang, Zhao, Wu & Tang, 2017; Ostańska, 2019). The integration of participatory strategy is vital in ensuring the value-based development proponent and preservation of people's cultural identities in accordance with the UN Sustainable Development Goals

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(SDGs) (Ezennia & Hoskara, 2021; Aule, Majid, Jusan & Ayoosu, 2022). The position of the SDGs is that stakeholders must ensure that local communities have a say in the planning and management of infrastructures in their areas (UN General Assembly, 2016; Aule, Jusan & Ayoosu, 2019). This call for participation further justifies the need for appropriate articulation of cultural values and sustainable development in the built environment.

Nigerian stakeholders, like other developing economies, are building value-based housing and urban development identity from the country's more than 250 ethnic groups (Isah & Khan, 2016; Umar, Yusuf, Ahmed & Usman, 2019). A study by Maina (2013) revealed that previous mass housing arrangements that failed to take people's values into account during planning and designing resulted in "uncomfortable prototypes" where inhabitants made unprotected changes in order to merge their mainstream cultural beliefs. One may ask, what is the relationship between the cultural values of the different Nigerian ethnic groups and their preferences for sustainable housing improvements in their indigenous built environments?

Therefore, this study assumes that there is a significant relationship between values and preferences for sustainable housing development. With the significant relationship, it is becoming increasingly important to examine the inherent values that motivate the indigenous housing of the numerous cultural groups in Nigeria so that all-encompassing vernacular architecture suitable to most groups may be articulated and implemented. Besides, the primitive native values will serve as reliable data for justified value-based scheduling, creating, and developing projects with distinctive identities consistent with present-day advancements.

The hypothesized significant association between cultural values and the people's preferences for sustainable housing improvements will be tested in this study using the structural equation modelling (SEM) approach. The ordinal-scale survey for this study was carried out between February and March 2022 to systematically validate the values in indigenous built surroundings of the Tiv society of Benue State, central Nigeria, and relate them to the people's preferences for lasting transformational improvements. The research surveyed and tested the link between people's values and their choices for sustainable development by utilizing factors previously discovered through some qualitative inquiries. The result is intended to give helpful information for value-based strategies, designs, and implementation among the Tiv society in central Nigeria. Furthermore, the findings will be articulated with the values of other ethnic groups to establish an acceptable and comprehensive vernacular architecture and urban identity acceptable to most Nigerians.

Material and methods

Content design of the survey

This part of the study was a cross-sectional ordinal-scale survey conducted between February and March 2022 using online Google form instruments. The study collected quantitative data to statistically establish the mainstream values and test their relationship with the transformative preferences of the Tiv people of central Nigeria. The survey variables for the inquiry were obtained from themes elicited in previous interviews, as summarized in Figure 1.

FIGURE 1. Elicited attributes, consequences, and values in Tiv indigenous housing. Adapted as published by the authors (Aule et al., 2022)

The elicited variables earlier coded into attributes, consequences, and values using the QSR® NVivo® software version 12 were also ranked based on the frequency of mentions by interview participants, as presented in Table 1. The elicited and ranked variables provided the basis for the subsequent ordinal scale survey, which is the primary methodology for this study. The variables tested to be significant and valid with 20% frequency in the previous study were further investigated employing a five-point Likert scale, with 1 representing "highly disagree" to 5 for "highly agree". The survey questions were categorized into attributes, consequences, values, and preferences for transformative improvements.

Questions were based on the shapes, material, and settings of the peoples' indigenous houses, as earlier elicited and ranked. All questions were formatted multi--choice with a paragraph space provided at the end of the survey for necessary feedback from respondents. The "required" restriction was also activated in the Google form to check cases of missing data. Finally, a survey link was generated and shared with some social media groups and indigent

TABLE 1. Variables elicited from interviews provided the basis for the ordinal scale survey. Adapted as published by the authors (Aule et al., 2022)

Interview attributes				
S/No	Concrete attributes		Abstract attributes	
i	round or circular shape	23	cultural meaning	17
ii	separate houses	22	material availability	15
iii	earth-mud	19	history, heritage	13
iv	bamboo framed roof	18	natural of earth	11
v	disperse setting	18	strengths of material	07
vi	thatched roof	17	drainage of roof	06
vii	reeds, canes	05	infinite earth	05
viii	rectangle shape	04		
Interview consequence				
S/No	Functional consequence		Psycho-social consequence	
i	free movements	15	feeling natural	17
ii	climatic control	12	feeling relaxed	09
iii	farming space	09	feeling modest	07
iv	ventilating space	09	feeling strong	07
v	protective purpose	07	feeling cool	05
Interview values				
S/No	Instrumental values		Terminal values	
i	determination & ambition	16	independent living	17
ii	simple living	14	basic comfort	11
iii	cleanliness	11	safety & security	07
iv	creative craft	11	cultural identity	06
v	nature conservation	09		

individuals in Benue state, the study area. Since the survey is concerned with one state in Nigeria, Benue state was taken as an area cluster where the sample was taken. As an area with limited internet and other electronic amenities, the convenient sampling approach was used where units in the Benue cluster volunteered to engage in the survey. The results were first scrutinized using the IBM® Statistical Package for Social Science (SPSS®) software version 22. Main tests were conducted using the IBM® SPSS® Analysis of Moment Structures (Amos™) software version 24 for the first-order confirmatory factor analysis (CFA) and the subsequent second-order SEM.

An overview of structural equation modeling

While it could be more accessible to measure tangible elements such as the number of people, weight, height, cars, and temperature, among others, with some physical devices; it is often difficult to measure intangible perceptions, values, achievement, esteem, preferences, satisfaction, among others, using instruments (Pahlevan Sharif & Sharif Nia, 2018). The Likert scale is one of the practical ordinal survey tools to measure non-concrete perceptions of people (Kline, 2016). Therefore, the CFA and SEM are instruments to analyze and test correlations in ordinal scale data, especially in social science studies.

The SEM estimates a sequence of dependent connections among a collection of ideas or constructs represented by several measurable variables, incorporating the results into an integrated model (Malhotra, 2020). Though referred to by other family names such as covariance structure analysis, covariance structure modeling, or covariance structure analysis (Kline, 2016), it is usually carried out in two parts called orders. The two parts are the first-order CFA and the second-order SEM. Typically, CFA involves drawing path diagrams and covariances and loading the observed or measured variables called factors. The loaded CFA model is then run and assessed, eliminating insignificant factors with less than 0.5 standardized regression weights (Pahlevan Sharif & Sharif Nia, 2018). The model is then fitted based on recommended standards, with reliability and validity also assessed. The first-order CFA is completed once the model goodness-of-fit is attained and conditions for reliability and validity are met.

The second-other SEM involved reorganizing the model into independent and dependent constructs, fitting it before establishing the strength of their relationships.

Since this study is modeled on constructs of attributes, consequences, and values, the SEM model will be used to test the three hypotheses:

- H_1: There is a significant correlation between housing attributes and transformative preferences.
- H_2: There is a significant correlation between utility consequences and transformative preferences.
- H_3: There is a significant correlation between people's values and transformative preferences.

Demography of survey respondents

This section contains the demography of survey respondents. Regarding age, about 82% of respondents were adults above 30 years with the requisite knowledge

and experience to elicit meaning and values in their indigenous built environments. Concerning the state of origin, close to 98% of respondents were indigenous to Benue state, the study area; however, the remaining 2% of outsiders were retained for negative case analysis and generalizations. In the sphere of home ownership, more than 80% of respondents either live in their houses or rented apartments, while the remaining were drawn from local builders and female leaders. Interestingly, all the respondents reported having completed their secondary education, with about 81% graduates.

The demography of the survey respondents looks good as most seem mature and responsible enough to provide needed responses. Even the 18% of female respondents seem reasonable to identify gender-based values in the African context, where participation of the female gender in many spheres is still gathering momentum.

Preliminary data checks and screening

Two supervisory experts, among other experienced research-group members, validated the survey contents. Their valuable feedback and inputs were utilized to refine and finalize the inquiry. Furthermore, preliminary results for the first week were utilized as a pilot study where inconsistencies were checked and minor errors were corrected. While the sample size for CFA varies based on complexities and area of study, many scholars agreed to a minimum of 200 valid responses (Kline, 2016; Sharif, Mostafiz & Guptan, 2018; Malhotra, 2020; Achoba, Majid & Obiefuna, 2021).

Though 255 completed responses were received, 12 were initially excluded as redundant and outliers. With the "required" restriction in the online survey, there was no incidence of missing values from the data collected. A general reliability test was conducted where data exhibited high consistency with a Cronbach's alpha of 0.934. A principal component analysis (PCA) test was also conducted, with most variables having communalities greater than 0.5 weights. Furthermore, the Kaiser–Meyer–Olkin (KMO) and Bartlett's test of sphericity were generated to check the correlation matrix and data's suitability for a productive confirmatory factor analysis (CFA). As shown in Table 2, the PCA results produced a 0.000 significance level and 0.872 KMO, confirming the relevance of the data set for CFA.

TABLE 2. Kaiser–Meyer–Olkin (KMO) and Bartlett's test of sphericity (own studies)

Test		Value
Kaiser–Meyer–Olkin measure of sampling adequacy		0.872
Bartlett's test of sphericity	chi-square approximation	6 438.240
	degrees of freedom	1 225
	significance	0.000

Following recommendations by scholars (Sharif et al., 2018), an exploratory factor analysis (EFA) was also conducted on the data to check variables with high cross-loadings, where two were finally removed, bringing the absolute sample to 241 valid respondents. With suggestions from the resulted eigenvalues, the constructs were grouped into the four parent clusters of attributes, consequences, values, and preferences.

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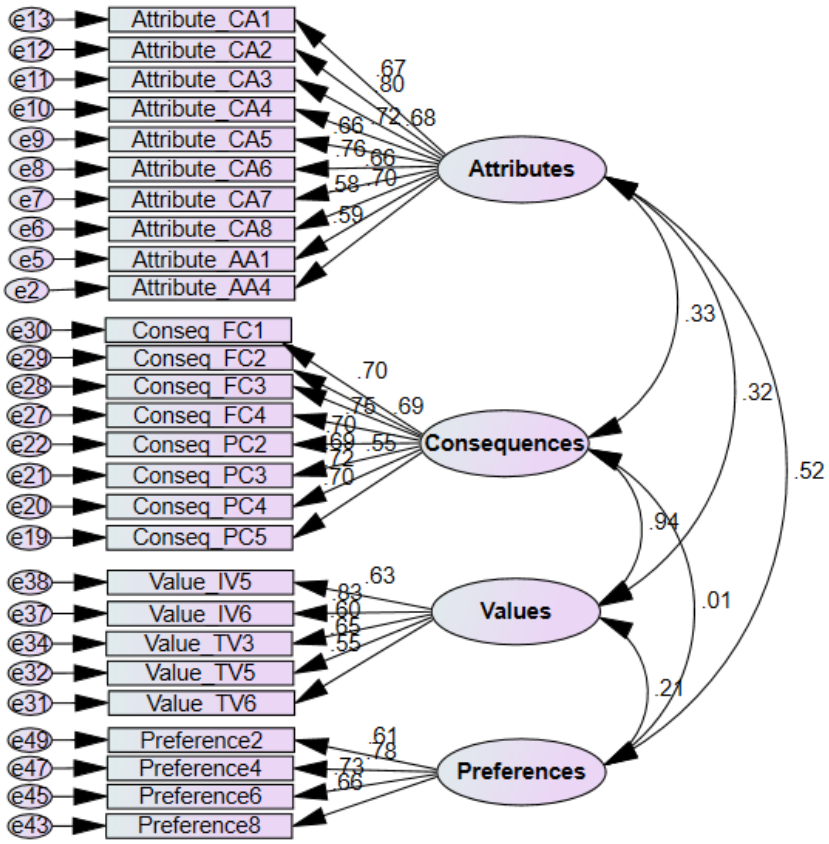

FIGURE 2. Variables with significant factor loadings (own studies)

Results and discussions

The first-order confirmatory factor analysis factor loadings

The IBM® SPSS® Amos™ software version 22 was utilized for the first-order CFA and the subsequent second-order SEM. The CFA commenced with a path diagram drawn with four latent constructs of attributes, consequences, values, and preferences, each with their respective number of observed variables and error terms, as presented in Figure 2.

The observed variables were loaded into the four latent constructs of attributes, consequences, values, and preferences, where 27 of the variables were returned significant, with standardized regression weights of 0.5 and above.

CFA model fit

Variables with weaker loadings were systematically eliminated during the CFA model assessment, while the recommended model fit indices were checked in the output mode. A model fit was eventually realized

TABLE 3. First-order CFA model goodness-of-fit based on recommended indices (own studies)

Goodness-of-fit	Chi-square group			Absolute fit	Incremental fit	Incremental fit	Absolute fit	Standard *RMR*
Fitness indexes	C_{min}	*df*	C_{min}/df	*CFI*	*IFI*	*TLI*	*RMSEA*	*RMR*
Recommended value	> 0.05 sig.		< 3.0	> 0.90	> 0.90	> 0.90	< 0.08	< 0.08
This model	140.426	59	2.380	0.933	0.934	0.912	0.057	0.689

The CFA model is accepted for meeting acceptance levels.

with acceptable indices, as shown in Table 3. Though a perfect CFA model fit should have a significant chi-square value greater than 0.05, the larger-sample hallmark of SEM most times affects its significance (Pahlevan Sharif & Sharif Nia, 2018; Achoba et al., 2021). In line with Kline (2016) and Malhotra (2020), other indices that fit a model's goodness-of--fit index (*GFI*) include comparative fit index (*CFI*), Tucker–Lewis index (*TLI*), normal chi-square per degree of freedom (C_{min}/df), root-mean-square error approximation (*RMSEA*), and standardized root mean square residual (*SRMR*). Table 3 presents the fitted first-order CFA model according to recommendations (Kline, 2016; Pahlevan Sharif & Sharif Nia, 2018; Malhotra, 2020).

Reliability and validity of the CFA model

Reliability refers to how a scale produces consistent results if repeated measurements are made (Malhotra, 2020). In SEM, a construct can be measured with composite reliability (*CR*), maximum reliability [max*R*(*H*)], Cronbach's alpha (α), or omega (ω), where all are expected to have a value greater than 0.70 (Pahlevan Sharif & Sharif Nia, 2018). This model is reliable as all values for constructs' composite, and maximum reliability is above 0.70 acceptable minimum, as shown Table 4.

On the other hand, validity may be seen as the extent to which observed disparities in scale scores represent actual variances between matters on the feature being assessed rather than a systematic or random error (Malhotra, 2020). Two types of validity are measured in SEM: convergent and discriminant. While the convergent validity in SEM can be assessed through average variance extracted (*AVE*), which is expected to be greater than 0.50 for all constructs, the discriminant validity, on the other hand, may be measured as maximum shared variance (*MSV*) expected to be less than the *AVE*. It can also be assessed using heterotrait-monotrait (*HTMT*) measurement, expected to be less than 0.9 for all constructs (Pahlevan Sharif & Sharif Nia, 2018). As presented in Table 4, the reliability and validity of this study's model were generated using Amos™ plugin called Master Validity Tool developed by James Gaskin and John Lim (Gaskin, James & Lim, 2019).

While the convergent *AVE* is generally expected to be viable with values above 0.50 for all constructs, it is viewed by Malhotra (2020) as being too strict a measure for the models validity. Pahlevan Sharif and Sharif Nia (2018) further explain the challenge of attaining all recommended values in new research areas, where knowledge of phenomenon is minimal, with scanty

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TABLE 4. Analysis of model reliability and validity (own studies)

	CR	*AVE*	*MSV*	max*R*(*H*)	Attribute	Consequence	Value	Preference
Attribute	0.842	0.519	0.261	0.858	0.720	×	×	×
Consequence	0.832	0.624	0.566	0.846	0.228**	0.790	×	×
Value	0.722	0.466	0.566	0.737	0.408***	0.753***	0.683	×
Preference	0.748	0.599	0.261	0.777	0.510***	–0.063	0.275**	0.774

** Values statistically significant at p level < 0.010.

*** Values statistically significant at p level < 0.001.

TABLE 5. The essential attributes, consequences, and values predicting preferences for sustainable housing transformation (own studies)

Construct	Code	Variable	SRW (λ)	Cronbach's alpha (α) > 0.7	Composite reliability (*CR*) > 0.6	Average variance (*AVE*) > 0.5
Attribute	AC2	earth-mud materials	0.697	0.832	0.842	0.519
	AC3	use of sun-dried adobe bricks	0.678			
	AC5	use of thatch roofs	0.594			
	AC6	dispersed compound setting	0.802			
	AA1	expression of culture	0.747			
	AA4	compound expresses communal living	0.667			
Consequence	CF1	insulation from heat and rainfall	0.743	0.875	0.832	0.624
	CF3	simple to construct	0.721			
	CF4	cheap and economical materials	0.800			
	CP2	feel cool within the buildings	0.693			
Value	VI5	simplicity and hospitality	0.618	0.737	0.722	0.466
	VI6	cleanliness & vigilance	0.741			
	VT3	cultural identity	0.659			
	VT5	promote communal unity	0.522			
Transformative preference	Pref2	independence & privacy	0.595	0.747	0.748	0.599
	Pref4	modernize Tiv houses	0.535			
	Pref6	integrate traditional forms in modern	0.684			
	Pref8	context-specific buildings	0.604			

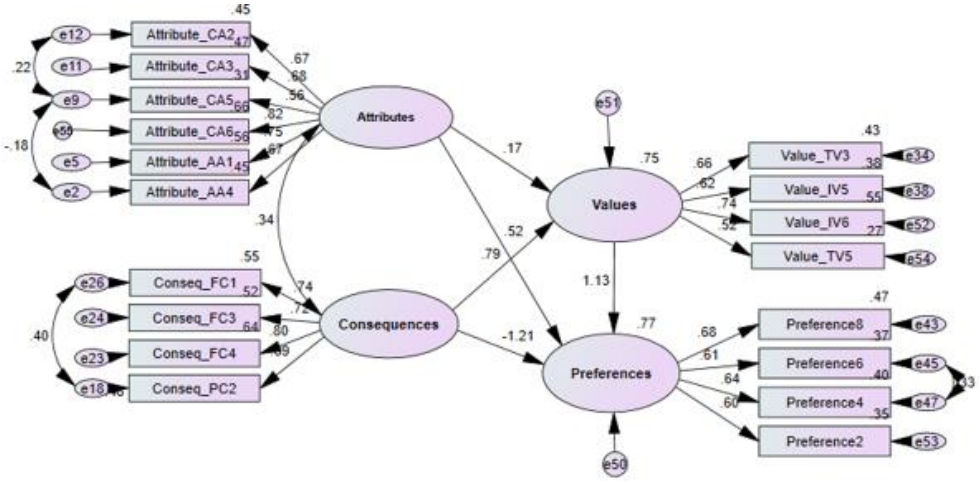
published materials. The study proposes that an *AVE* measure of more than 0.40 and other acceptable measures is deemed sufficient to establish a model's acceptability validity. Accordingly, the 18 constructs that were finally seen to be reliable and valid represent the most important attributes, consequences and values in Tiv indigenous housing, presented in Table 5.

Structural equation model

Structural equation model is the second--order analysis. Most of the variables fitted in the CFA, tested to be reliable with acceptable validity, were utilized for the final structural model and for testing the study hypothesis. The measures for goodness-of-fit such as comparative fit index (*CFI*), Tucker–Lewis index (*TLI*), normal chi-square per degree of freedom (C_{min}/df), root-mean-square error approximation (*RMSEA*), and standardized root mean square residual (*SRMR*), were also attained. Therefore, as presented in Figure 3, the second-order structural model was fit based on recommended indices (Kline, 2016; Pahlevan Sharif & Sharif Nia, 2018; Malhotra, 2020). With the second-order model fulfilling indices for goodness-of-fit, it was used to predict the relationship between the constructs.

Cultural values and sustainability preferences

The squared multiple correlations were seen to have good values for the two endogenous constructs of values



Goodness-of-fit	Chi-square group			Absolute fit	Incremental fit	Incremental fit	Absolute fit	Standard RMR
Fitness indexes	C_{min}	*df*	C_{min}/df	*CFI*	*IFI*	*TLI*	*RMSEA*	RMR
Recommended value	> 0.05 sig.		< 3.0	> 0.90	> 0.90	> 0.90	< 0.08	< 0.08
This model	265.491	125	2.124	0.920	0.916	0.901	0.068	0.693
SEM model is accepted for meeting acceptance level								

FIGURE 3. Model and fitted indices for the second-order SEM (own studies)

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TABLE 6. Significant regression weights showing valid relationships (own studies)

			Estimate	*SE*	*CR*	*p*	Label
Values	<---	Attributes	0.209	0.085	2.458	0.014	×
Values	<---	Consequences	0.626	0.086	7.276	***	×
Preferences	<---	Attributes	0.600	0.144	4.153	***	H_1
Preferences	<---	Consequences	–0.891	0.244	–3.651	***	H_2
Preferences	<---	Values	1.054	0.329	3.208	0.001	H_3

H_1: Attributes have a significant relationship with sustainability preferences.

H_2: Consequences have a significant relationship with sustainability preferences.

H_3: Values have a significant relationship with sustainability preferences.

and preferences in the second-order SEM. Generally, the SEM model in this study has good squared multiple correlations (R^2) of 0.75 for values and 0.77 for preferences. This correlation means the model explained 75% variance for the values and 77% variances for preferences. The final unstandardized regression weights (*p*-values), showing relationships of the constructs, were all tested significantly, with values less than 0.05. Apart from the consequences construct with a significant but negative correlation with preferences, the two other constructs of attributes, and values, have significant and positive relationships with sustainable preferences.

Therefore, as presented in Table 6, the three research hypotheses, H_1, H_2 and H_3, significantly correlate with preferences for sustainable housing improvements.

Conclusion

Exploring the inherent values in Nigerian indigenous housing is becoming increasingly important to articulate value--based development for identity and cultural sustainability. In this study, the mainstream indigenous housing values for the Tiv society of central Nigeria were elicited through their attributes and consequential utility. This study's subsequent ordinal scale quantitative approach was built on earlier perceptions elicited through laddering interviews. The five-point Likert scale survey data were tested and validated to have reliable results, ranking the most critical attributes, consequences, and values in Tiv indigenous housing. The correlational outcomes show that attributes, consequences, and values significantly affect people's preferences for sustainable, transformative improvements.

Future developments in the area ought to reflect society's mainstream values. Additionally, with the global solidarity to attend to poorer and vulnerable people, efforts should be made by governments, organizations, and highly placed individuals to transform and improve the Nigerian indigenous people and their built environments. While the study provides an empirical base for data-based policy, planning, and implementation of needed developments in the area in context, there is a need to explore individual constructs further to confirm the reliability of the

results. Practically applied studies on each attribute, consequence, and value should be further conducted to develop concrete scientific and technological strategies for transformative improvements.

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Summary

Exploring cultural values and sustainability preferences in housing development: A structural equation modeling approach. The study aimed to establish the relationship between values and people's preferences for sustainable improvement in Nigeria's indigenous housing context. The relationship was tested in SEM using ordinal survey data obtained between February and March 2022 with 241 valid samples. The mainstream values were statistically validated using CFA while the relationships were generated in the SEM. Results established a significant relationship between values and the people's preferences for transformative improvements. The findings provide a foundation for long-term policy formation, practical transformative experimentation, and an empirical foundation for future methodological research.