



SMART SPACES, PRIVATE LIVES: A CULTURALLY GROUNDED EXAMINATION OF PRIVACY TENSIONS IN SMART HOMES

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WHY THIS MATTERS

- Smart homes promise convenience, efficiency, and safety.
- But their design often reflects Western assumptions about privacy.
- In culturally conservative settings, these assumptions can:

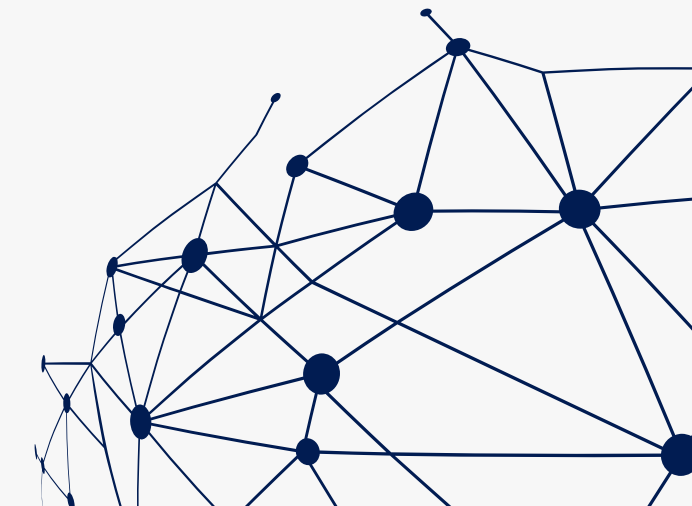
-  **Conflict with religious or social values**
-  **Create family tensions**
-  **Lead to underuse or misuse of technology**

- There's a growing need to design **culturally respectful** and **privacy-aware** smart technologies.





"My husband doesn't want anyone to see me without my hijab and abaya. I must dress when we go out, and the **same goes for my pictures in the camera.**" (SA25)



CULTURAL CONTEXT – SAUDI ARABIA

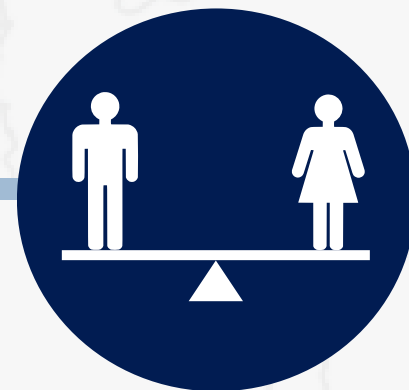
Mahram and Non-Mahram:

In Islamic and Saudi Arabian culture, the term "mahram" has a strong foundation in both religious teachings and cultural practices. It describes a male with whom marriage would be considered permanently unlawful, such as a father, brother, or son. The idea of mahram and non-mahram is deeply rooted in Islamic laws and societal norms related to gender interactions and permissible relationships, such as requiring women's body parts to be covered in the presence of non-mahram men

Collectivist Society



Gender Norms



Religious Influence



Household Structure

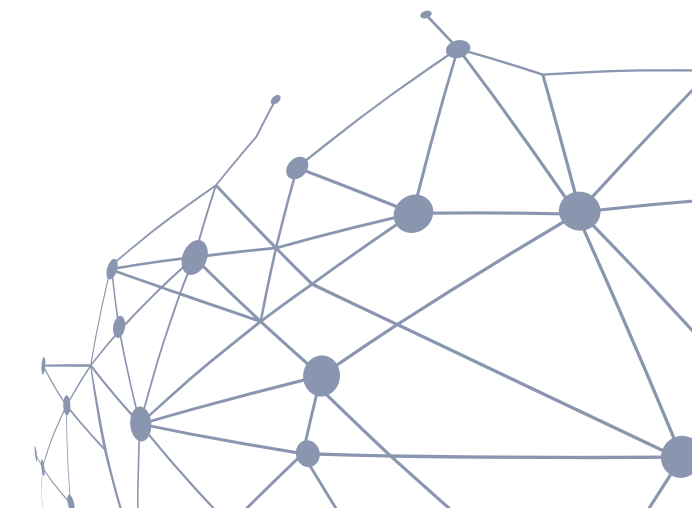




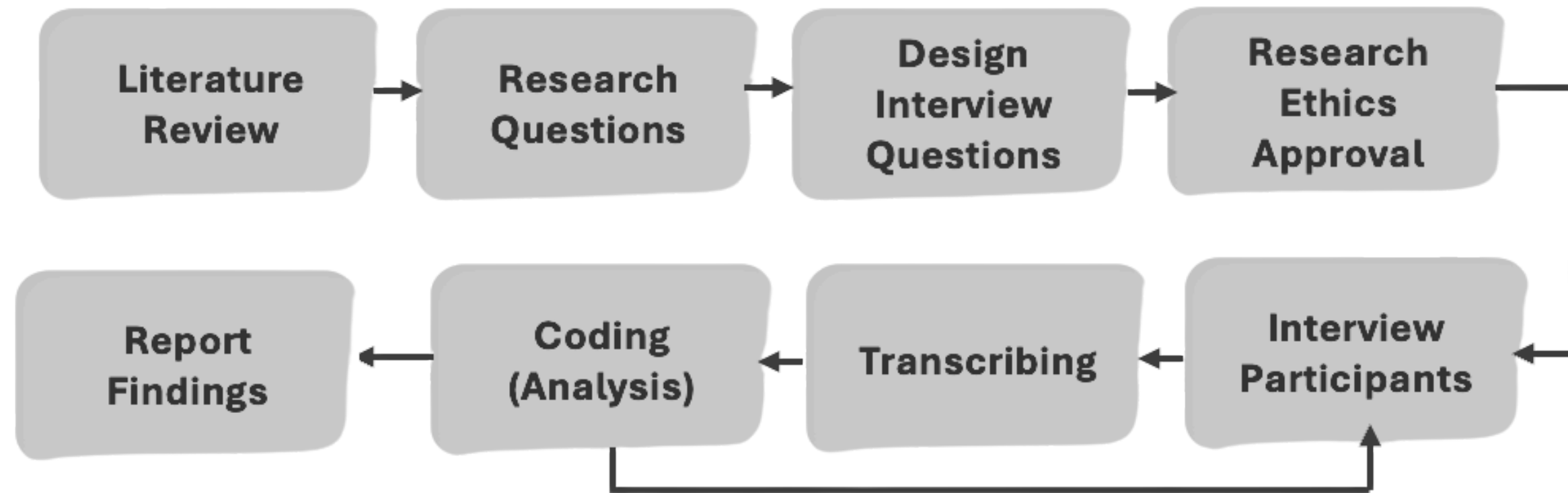
RESEARCH QUESTION



“To what extent do cultural perspectives shape device usage, privacy perceptions, and conflict resolution in smart homes?”



RESEARCH PROCESS





»» METHODOLOGY

Study Design



Constructivist Grounded Theory, Iterative interviews & coding, Focused on Saudi + U.S. participants

Participants



35 (20 initial + 15 follow-up)



20 

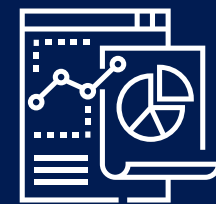
Recruited via WhatsApp, social media, referrals, Diverse in household roles and regions

Data Collection



55 semi-structured interviews, Remote (MS Teams), in Arabic or English, 420+ pages of transcripts, Iterative guide refinement

Data Analysis



NVivo 14 Pro, Open → Axial → Selective Coding, Affinity diagramming, Core concept: Culturally Negotiated Privacy Management, Member checking for validity

METHODOLOGY

Participant Demographics



Table 1: Participant Demographics

Category	Sub-category	SA (n=20)	US (n=20)
<i>Gender</i>	Man	30%	45%
	Women	70%	55%
<i>Age</i>	18-24	10%	25%
	25-34	50%	35%
	35-44	10%	15%
	45-54	15%	5%
	55 or older	15%	20%
<i>Education</i>	High school or less	0%	10%
	Some college	20%	30%
	Trade/technical/vocational training	0%	0%
	Bachelor's degree	50%	30%
	Master's degree	30%	20%
	Professional degree or Doctorate	0%	10%
<i>Employment</i>	Full-time employment	40%	40%
	Part-time employment	10%	20%
	Self-employed	25%	10%
	Unemployed	10%	10%
	Other	15%	20%
	Prefer not to answer	0%	0%
<i>IT Background</i>	Yes	60%	30%
	No	40%	70%

Table 2: Participant Demographics (Expanded Pool)

Category	Sub-category	Percentage (%)	Participants (n)
<i>Gender</i>	Women	46.7	7
	Men	53.3	8
<i>Age</i>	21-29 years	33.3	5
	30-49 years	33.3	5
	50 years or older	33.3	5
<i>Education</i>	Bachelor's Degree	53.3	8
	Graduate Degree	46.7	7
<i>Employment</i>	Employed	73.3	11
	Retired	13.3	2
	Student	13.3	2



CONCEPTUAL FOUNDATIONS: INSIGHTS FROM OPEN AND AXIAL CODING



Cultural Perspective in Privacy Perception



Unauthorized public disclosure of private life

Saudi participants expressed heightened fear of cameras exposing private life, especially affecting women's visibility and family honor, whereas U.S. participants showed mixed concern.



Privacy leak from browsing histories and recommendations

U.S. participants focused on personal embarrassment, while Saudis were more concerned with moral and cultural appropriateness of visible recommendations in shared contexts.



Unauthorized expansion of shared space's boundaries.

Sharing login credentials in smart households blurred access control, with concerns ranging from personal data leaks to unintended exposure, shaped differently by cultural expectations.

Conflict Resolution Strategies



Coordination through spatial separation

Participants avoided certain areas of the home where cameras were active or created dedicated spaces to minimize disruption and preserve privacy.



Coordination through temporal separation.

Household members coordinated usage times for shared devices or activities, allowing individuals to protect their privacy by avoiding overlap.



Shifting responsibility onto oneself

Tech-savvy or dominant users took charge of privacy management, often reinforcing existing power hierarchies, especially within culturally patriarchal households.



THEORETICAL INTEGRATION:

CULTURALLY NEGOTIATED PRIVACY MANAGEMENT IN SAUDI SMART HOMES



Table 3: Themes and Codes Summary

Themes	Sub-Themes
Sharing Dynamics	<ul style="list-style-type: none">• Reasons for adoption• Hierarchical control delegation• Risk and benefit assessment of sharing• Scenarios of sharing
Camera Identity	<ul style="list-style-type: none">• Cameras as non-mahram• Shifting perception
Interpersonal Dynamics	<ul style="list-style-type: none">• Impact of camera on family dynamics• Impact of camera on host-guest dynamics
Cultural and Religious Influences	<ul style="list-style-type: none">• Cultural influences on personal, familial, and guest privacy• Genders factor in privacy concerns and device sharing• Impact of cultural background on technology adoption and usage• Perception of smart home technology's suitability to cultural expectations• Religion impacting culture
Privacy Concerns and Conflicts	<ul style="list-style-type: none">• Chances of something bad to happen (attack, leakage)• Data collection• Recording
Resolving Privacy Issues	<ul style="list-style-type: none">• Adjustments and compromises through camera placement• Enhance privacy through technological means• Reduce shared access• Trade-off between privacy and convenience

KEY THEMES

CULTURALLY NEGOTIATED PRIVACY MANAGEMENT IN SAUDI SMART HOMES



»»» Sharing Dynamics

Smart home sharing in Saudi households is shaped by perceived benefits, device sensitivity, and hierarchical control, where convenience often coexists with privacy concerns and generational authority.

»»» Camera Identity

Smart cameras are often perceived as social actors, akin to non-mahram strangers, whose presence reshapes privacy expectations, emotional comfort, and behavioral norms over time.

»»» Cultural and Religious Influences

privacy practices are deeply shaped by communal living, gender norms, and Islamic values, influencing not only how smart technologies are adopted but also how they are perceived, shared, and morally evaluated.

»»» Interpersonal Dynamics

Smart cameras reshape interpersonal trust, often reinforcing family bonds through shared access, but also generating conflict, negotiation, and discomfort, especially across household hierarchies and in host–guest relationships.

»»» Privacy Concerns and Conflicts

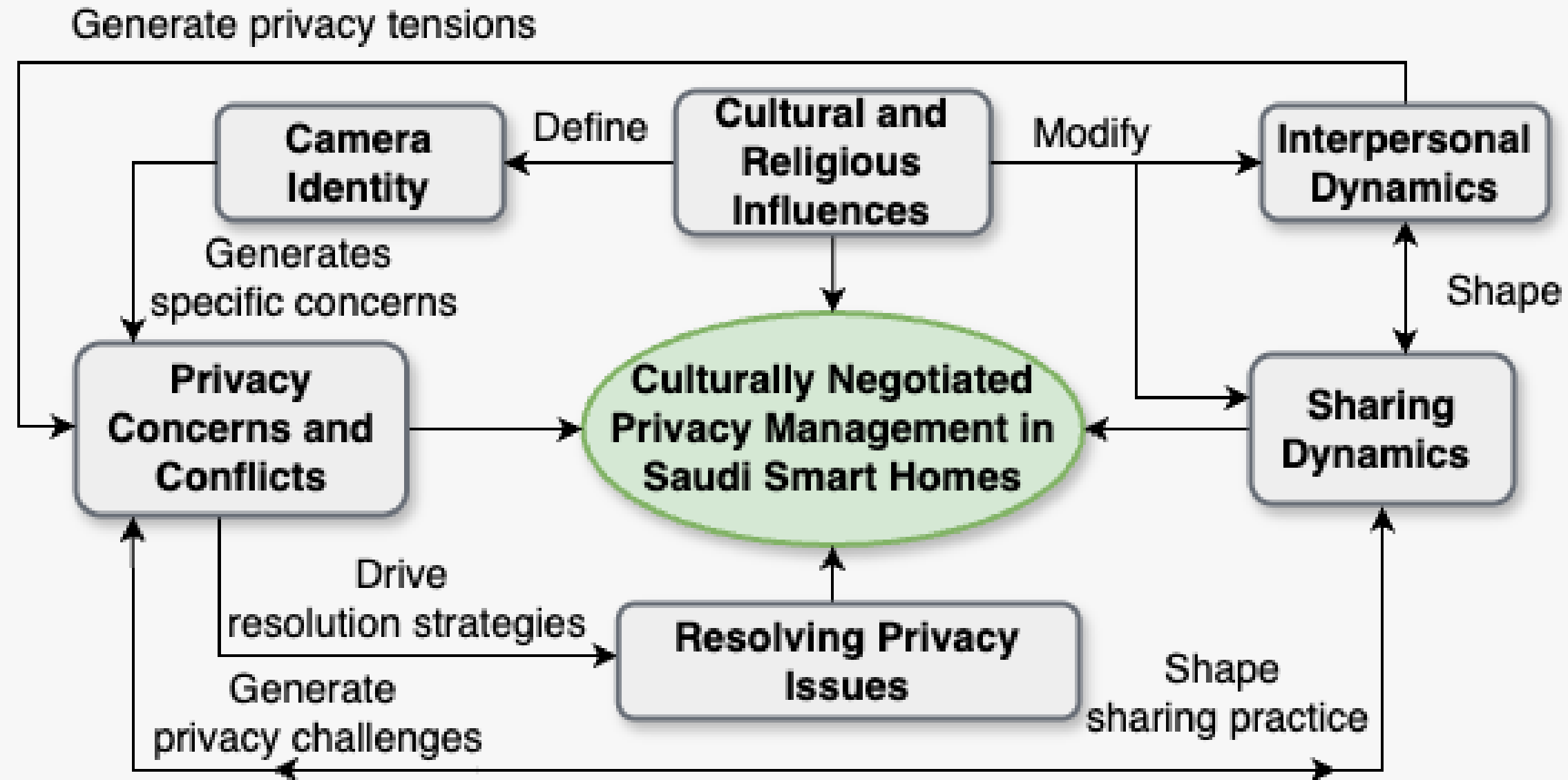
Participants voiced deep concerns about data collection, potential breaches, and lack of transparency, revealing a persistent tension between utility and trust in smart home technologies.

»»» Resolving Privacy Issues

Participants actively negotiated their privacy by adapting the use and settings of smart home technologies, striving for a balance between convenience and control.



GROUNDING THEORY MODEL



“Culturally Negotiated Privacy Management in Saudi Smart Homes.”

CORE CONTRIBUTIONS:

In Saudi homes, privacy is not just about personal boundaries, it's a shared, moral, and culturally governed negotiation.

Relational Privacy



Privacy is negotiated among household members, shaped by trust, gender roles, and authority.

Moral Dimensions



Religious and cultural ethics shape what visibility is acceptable, giving privacy spiritual weight.

Device as Social Actor



Smart cameras are perceived as social presences, not neutral tools, capable of violating norms just by existing.

Smart technologies must align with local moral frameworks and social dynamics—not just usability standards.

DESIGN OPPORTUNITIES – Culturally Aligned Affordances



Each feature addresses specific usability challenges (Norman's Gulfs) while honoring cultural values.

Guest Mode



Automatically disables cameras when guests are present.

Gulf of Execution: Simplifies action through automation or voice command.

Gulf of Expectation: Meets cultural expectations of modesty and separation.

Reduces the effort required to maintain privacy in social contexts.

Prayer Mode



Pauses data collection during prayer times (via schedule or signal recognition).

Gulf of Evaluation: Makes it clear when data is being recorded (or not).

Gulf of Expectation: Aligns device behavior with religious rituals.

Enhances clarity and trust in how/when devices collect data.

Visitor Notification



Alerts users and guests when entering monitored areas.

Gulf of Evaluation: Improves awareness of surveillance presence.

Gulf of Expectation: Signals respect for guests' agency and cultural norms.

Promotes informed consent and situational awareness.

Designing culturally aligned affordances bridges usability gaps and honors local values, enabling inclusive and respectful smart home systems.

CONCLUDING STATEMENT



To design better smart homes, we must move beyond "universal" solutions and toward adaptive, culturally embedded designs that reflect the people who use them.



THANK YOU

ANY QUESTIONS, PLEASE CONTACT:

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