Research Paper

From '*Kodrat*' to Code: Women Ride-Hailing Drivers Redefining Javanese Womanhood in the Gig Economy

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ABSTRACT

Digital platforms have reconfigured labor economies in Indonesia, reframing intersections between technological affordances and established gender constructs that have historically circumscribed women's spatial mobility and economic agency. Contemporary scholarship on technological embodiment offers limited analytical depth of technological integration within cultural contexts where gendered boundaries remain a highly contentious issue. This paper examines how women ride-hailing drivers in Surabaya negotiate and redefine Javanese womanhood through digital platform labor, proposing technological embodiment as cultural negotiation rather than technological adoption – a framework that questions prevailing Western theoretical perspectives. We further point out how women contest economic imperatives through technological appropriations, collective resistance strategies, and identity reformulations that subsequently problematize familial and communal gender dynamics. We extend embodiment theory by interrogating technological integration into gendered corporeality in non-Western contexts; disrupt binary frameworks positioning technology in opposition to tradition; and introduce a critical approach to gender reconstruction as movement from '*kodrat*' (natural destiny) to code (technological self-determination). This theoretical reframing fundamentally ruptures conventional understandings of how digital technologies both preserve and reconfigure gender relations across contrasting cultural formations.

Keywords: women's empowerment, platform labor, technological embodiment, gendered mobility, Indonesia

The transformation of global labor markets through digital platform proliferation represents a significant sociotechnical phenomenon, with ride-hailing applications constituting one of the most visible manifestations of the emergent gig economy paradigm (Graham et al., 2017; Rosenblat, 2018). In Indonesian urban centers such as the Province of East Java's Surabaya, these technological developments have precipitated novel economic opportunities that interrogate both established gender normativities and cultural prescriptions. The integration of digital technologies into quotidian economic practices has thus engendered both potentialities and tensions for women balancing the intersection of traditional expectations and contemporary forms of labor market participation.

The phenomenon of women ride-hailing drivers in Java presents a particularly encapsulating case study for examining technological embodiment – conceptualized as the process through which technology becomes integrated into human ontology, praxis, and corporeal experience (Ihde, 2002; Verbeek, 2015). As Ihde (1990) articulates in his post-phenomenological theoretical framework, humans and technologies exist in a state of mutual

co-constitution, wherein technologies function not merely as extrinsic instruments but as mediating entities that reconfigure our perceptual and engagement modalities with the lifeworld. Contemporary scholarship on digital embodiment interrogates how technologies become incorporated into lived experience – reconstituting identities and extending human capacities across physical and virtual domains (Čičigoj et al., 2025; Hayles, 2013; Richardson & Harper, 2002).

Within the specific contextual parameters of platform labor, critical scholarly discourse has documented how digital platforms inherently reconfigure work praxis and labor relations (Nardoni, 2025; Rosenblat, 2018; van Doorn, 2017). Feminist technology studies have further mapped how technological design, adoption, and utilization patterns are completely shaped by gender relations and power dynamics (Haraway, 1991; Wajcman, 2010; Wessalowski et al., 2025). These theoretical frameworks facilitate comprehension of how women ride-hailing drivers in Java incorporate digital platforms, motorcycles, and navigation systems not merely as utilitarian tools but as extensions of their agential capacity and identity formation processes.

For these women subjects, ride-hailing platforms offer potentialities for economic participation that may reconfigure traditional gender expectations – however, these opportunities emerge within the persistent sociocultural framework of '*kodrat wanita*': the conceptualization of women's natural destiny or innate characteristics that has traditionally circumscribed them within domestic roles as mothers and wives in Javanese society (Blackburn, 2004; Brenner, 1998). Indonesian women's relationship to technology and public economic participation has been characterized by well-developed cultural negotiations that neither constitute simple rejection nor full embracement of modernity (Ford & Honan, 2019).

This paper contributes to critical discourses at the intersection of technology studies, gender theory, and labor analysis by examining how technological embodiment takes shape within contexts of cultural specificity. Following scholarly injunctions for attentiveness to how globalized technologies interact with localized gender regimes (Ong, 2010), we investigate how women ride-hailing drivers engage with digital interfaces, acquire distinct embodied competencies, and construct professional identities within particular cultural constraints. Drawing on theoretical approaches that conceptualize technology as inherently gendered and embedded within social relations (Bray, 2007), we analyze how these women's technological practices both reflect and potentially transform gender normativities in contemporary Java.

EMBODIED TECHNOLOGY IN CONTEXT: GENDER, MOBILITY, AND DIGITAL LABOR IN THE INDONESIAN RIDE-HAILING ECONOMY

The concept of technological embodiment provides a critical framework for understanding how women ride-hailing drivers in Java incorporate digital technologies into their everyday lives through adaptation and resistance. Phenomenological approaches (Merleau-Ponty, 1962) establish the body as the primary site of human experience, while post-phenomenological theories (Ihde, 1990, 2002) address how technologies mediate human experience and reshape perception. Contemporary scholarship extends these frameworks to digital contexts, examining how platform technologies restructure embodied practices in the gig economy through algorithmic governance (Altenried, 2020; Heiland, 2021; Richardson, 2020). Algorithms create new forms of embodied experience that transform workers' relationships to time, space, and their own bodies through constant technological mediation (Chen, 2018; Qadri, 2020; Wood et al., 2025).

The process of bodily transformation through digital interfaces shows how virtual systems become seamlessly integrated into physical practice as conceptualized by Hayles (2000) as posthuman embodiment. Platform labor studies document this integration by tracing how workers develop entirely new sensory capacities through constant app interaction, creating hybrid human-machine assemblages (Bucher et al., 2021; Shapiro, 2020). For ride-hailing drivers, embodiment manifests as simultaneous navigation of digital maps, physical streets, and algorithmic demands that structure every aspect of their working experience (Attoh et al., 2019; James, 2024; Wells et al., 2021). Yet understanding these practices requires examining how gender fundamentally shapes technological incorporation, particularly in contexts where women's mobility faces cultural restrictions.

Feminist technology scholarship has long recognized that technologies embody gendered assumptions, with contemporary researchers building upon Haraway's (1991) cyborg feminism and Wajcman's (2010) technofeminism to expose how algorithmic management systems reproduce inequalities through seemingly neutral technical mechanisms (Churchill & Craig, 2019; Raval & Dourish, 2016; Veen et al., 2020). As Čičigoj et al. (2025) argue in their analysis of feminist techno-imaginaries, platform technologies perpetuate labor exploitation through hegemonic designs that lack proposals for radically different futures. The materialization of gendered algorithms produces distinctly different bodily disciplines as women develop specific embodied strategies – maintaining heightened alertness, calibrating emotional responses, and managing physical positioning – reflecting both safety concerns and cultural expectations (Cameron, 2020; Cameron & Rahman, 2022; Ferrari & Graham, 2021; Milkman et al., 2021).

Indonesia's transportation landscape encapsulates how local gender hierarchies intersect with global platform technologies to create unique challenges for women drivers, with both car ownership (symbolizing middle-class masculine achievement) and motorcycles (dominating ride-hailing due to urban congestion and economic accessibility) remaining culturally coded as male domains (Kusno, 2020). Traditional *'ojek'* services operated exclusively by men for decades, establishing enduring patterns where women's urban mobility depended entirely on male drivers (Ford & Honan, 2019). Women entering this masculine space as drivers rather than passengers confront multiple forms of resistance: cultural skepticism about their technical abilities, documented patterns of sexual harassment, and expectations of polite feminine behavior that complicate boundary-setting (Christie & Ward, 2019; Irawan et al., 2020). As Sinha Roy (2018) demonstrates in her analysis of South Asian women's spatial mobility, these gendered boundaries are constituted not only by sharp contrasts with what lies beyond but also by continuous interactions across colonial and postcolonial temporalities.

The persistence of traditional gender ideologies such as *'kodrat wanita'* creates profound tensions as women navigate between cultural expectations and economic opportunities in the platform economy. Javanese cultural frameworks historically positioned women firmly within domestic spheres, limiting their public economic participation and spatial mobility (Blackburn, 2004; Brenner, 1998). Contemporary research documents how platform work disrupts these frameworks alongside the reinforcement of certain gendered constraints, as women must negotiate their presence in public space through technological mediation (Ford & Honan, 2017; Irawan et al., 2020). Indonesian women's collective strategies – blending digital tools with cultural knowledge and community networks – differ markedly from Western contexts that emphasize individualized technological solutions (Ford & Honan, 2019; Kanagasabai & Phadke, 2023).

Despite rapidly expanding platform labor scholarship, research specifically examining Indonesian women ride-hailing drivers remains limited given the phenomenon's significance. Initial studies documented the overwhelmingly male composition of Indonesia's driver workforce and identified cultural barriers limiting women's participation (Nastiti, 2017), while recent work explores emerging patterns of collective organization among women drivers (Ford & Honan, 2019; Irawan et al., 2020). This study examines technological embodiment within Java's specific cultural context, contributing to calls for culturally situated platform research that avoids universalist assumptions. By analyzing how platform technologies create economic possibilities while generating tensions with established gender norms, the research advances understandings of technological embodiment while offering insights for inclusive platform design. The investigation shows how Javanese women's experiences inform broader questions about gender, technology, and labor in the Global South, where cultural specificity shapes seemingly universal digital transformations.

METHODOLOGY

This qualitative study employed a phenomenological approach to examine how women ride-hailing drivers in Surabaya, East Java, Indonesia, incorporate digital technologies into their embodied practices while navigating cultural expectations within their specific social context. Following Giorgi's (2020) descriptive phenomenological method, we captured detailed descriptions of women's lived experiences with platform technologies to identify essential structures of technological embodiment as they manifest within Javanese cultural contexts.

Research site and participants

The research was conducted in Surabaya, Indonesia's second-largest city with approximately 3 million residents, between December 2023 and October 2024 when ride-hailing services had become well-established in the urban transportation landscape. Surabaya's unique combination of rapid technological adoption alongside traditional Javanese cultural values made it an ideal location for examining how women navigate between emerging digital labor opportunities and deeply established gender norms. During this research period, ride-hailing services were well-integrated into urban transportation systems but remained relatively unconventional occupational choices for women due to persistent cultural expectations about women's appropriate work domains.

We recruited 28 women ride-hailing drivers aged 28-52 using purposive and snowball sampling techniques through local community organizations working with gig economy workers and informal driver networks at common waiting areas. All participants had worked as drivers for at least six months, ensuring they had developed sufficient experience with technological platforms and had encountered the cultural challenges inherent in this work. Most participants worked for multiple platforms simultaneously, primarily Gojek and Grab, while five worked exclusively with a single platform to maintain consistent income streams. Participants represented diverse family situations including married women with children, single mothers, and unmarried women, with educational backgrounds ranging from middle school completion to university degrees (see **Table 1**). This diversity reflected the multiple pathways through which Indonesian women entered platform-based work as economic circumstances, family needs, and technological access converged to create new employment possibilities. Recruitment continued

systematically until we reached theoretical saturation, the point where additional data collection no longer yielded substantially new insights regarding our main theoretical categories.

Table 1

Socioeconomic characteristics of women ride-hailing driver participants

Pseudonym	Age	Education	Family Status	Prior Work	Monthly Income (IDR)	Experience as Driver	Special Circumstances
Maya	38	High School	Single Mother	Informal	2-4 million	1-2 years	Primary income source
Yuni	42	Middle School	Widow with Children	Informal	2-4 million	>2 years	Primary income source
Sari	38	High School	Single Mother	Formal	2-4 million	1-2 years	Primary income source
Ratna	35	Vocational	Married with Children	Formal	>4 million	1-2 years	Supplementary income
Diana	30	High School	Married with Children	Informal	2-4 million	6-12 months	Primary income source
Sutami	41	Middle School	Married with Children	Informal	2-4 million	1-2 years	Child with special needs
Lestari	43	High School	Single Mother	Formal	<2 million	>2 years	Child with special needs
Farah	36	High School	Married with Children	Informal	2-4 million	1-2 years	Primary income source
Nisa	39	Middle School	Married with Children	Informal	2-4 million	1-2 years	Primary income source
Hani	34	Vocational	Married with Children	Formal	2-4 million	6-12 months	Primary income source
Wulan	47	Middle School	Married with Children	Informal	<2 million	>2 years	Elderly care responsibilities
Indah	32	University	Unmarried	Formal	>4 million	1-2 years	Supplementary income
Rini	45	High School	Married with Children	Informal	2-4 million	>2 years	Primary income source
Dewi	31	High School	Married with Children	Informal	2-4 million	6-12 months	Primary income source
Rina	37	High School	Single Mother	Formal	2-4 million	1-2 years	Primary income source
Wati	44	Middle School	Married with Children	Informal	<2 million	>2 years	Elderly care responsibilities
Tari	29	Vocational	Unmarried	First-time	>4 million	6-12 months	Supplementary income
Ayu	33	High School	Married with Children	Informal	2-4 million	1-2 years	Primary income source
Suwarni	49	Middle School	Widow with Children	Informal	<2 million	1-2 years	Primary income source
Lina	35	High School	Single Mother	Formal	2-4 million	6-12 months	Child with special needs
Winda	40	Middle School	Married with Children	Informal	2-4 million	1-2 years	Primary income source
Dina	28	University	Unmarried	First-time	>4 million	6-12 months	Supplementary income
Putri	36	High School	Married with Children	Formal	2-4 million	1-2 years	Primary income source
Endah	51	Middle School	Widow with Children	Informal	<2 million	>2 years	Elderly care responsibilities
Nuraini	39	High School	Single Mother	Formal	2-4 million	1-2 years	Primary income source
Ida	32	Vocational	Married with Children	First-time	>4 million	6-12 months	Supplementary income
Lia	46	High School	Married with Children	Informal	2-4 million	1-2 years	Child with special needs
Jaya	52	Middle School	Widow with Children	Informal	<2 million	>2 years	Elderly care responsibilities
Mira	41	High School	Single Mother	Formal	2-4 million	1-2 years	Primary income source
Hastuti	38	High School	Married with Children	Informal	2-4 million	1-2 years	Child with special needs
Fitri	35	High School	Single Mother	First-time	>4 million	6-12 months	Supplementary income

Research site and participants

Data collection employed multiple qualitative methods to develop comprehensive understanding of women's experiences with ride-hailing technologies in their daily work lives and family contexts. We conducted four focus group discussions with 5-8 participants each, lasting approximately 120 minutes, to explore collective experiences, shared challenges, and common strategies developed by women drivers. Topics covered included pathways into ride-hailing work, daily technological practices, navigation of public spaces, collective safety strategies, work-family negotiations, and identity transformations through platform work engagement. Focus groups were conducted in community spaces familiar to participants, creating comfortable environments for open dialogue about sensitive topics related to gender, mobility, and cultural expectations.

We conducted 18 individual semi-structured interviews lasting 60-90 minutes with selected participants, allowing women to share private experiences that might not emerge in group settings due to social pressure. The flexible interview protocol ensured consistent coverage of key topics while enabling exploration of emergent themes that arose through participants' narratives about their technological incorporation and embodied practices. Interview questions focused on individual histories with technology adoption, embodied experiences of technological practice, negotiations of gender expectations within family and community contexts, transformations in self-perception, and specific strategies for navigating gendered challenges.

We conducted limited mobile ethnography with eight consenting participants, accompanying drivers during 2-4 hour work segments while excluding actual passenger rides to protect client privacy and maintain professional boundaries. Field notes documented physical interactions with technology, spatial movements through urban environments, temporal patterns of work organization, social interactions in public spaces, and integration of care responsibilities. All data collection was conducted in Indonesian (*Bahasa Indonesia*) with additional use of Javanese where participants preferred, eliminating translation-related meaning loss as all three researchers were fluent speakers.

Data analysis

All focus groups and interviews were audio-recorded and transcribed verbatim in their original language to preserve linguistic nuances and cultural meanings embedded in participants' narratives about their experiences. Following Giorgi's (2020) systematic approach, we carefully read transcripts multiple times to gain overall sense of participants' experiences before dividing data into meaning units representing distinct aspects. We employed Clarke and Braun's (2017) reflexive thematic analysis involving initial coding, developing preliminary themes, reviewing themes against the complete dataset, defining and naming final themes, and selecting illustrative excerpts. The final analytical stage integrated theoretical concepts from technological embodiment literature with empirical themes to develop culturally specific understanding of how women drivers incorporate ride-hailing technologies into embodied practices. Validation strategies included triangulation across multiple data sources, regular team debriefing sessions, member checking through participant workshops, and reflexive journaling documenting analytical decisions and researcher positionality throughout the process.

Ethical considerations

While the Postgraduate School at Universitas Airlangga did not have an established institutional ethics review committee during the research period, consistent with many Indonesian universities at that time, the research team maintained rigorous adherence to fundamental research ethics principles throughout all phases of the study (Ethics Declaration No. 4493/B/UN3.SPS/III/TP.02.02/2025). All participants provided written informed consent after receiving detailed information about study purposes, procedures, risks, benefits, and their rights to withdraw without penalty at any time. Given potential sensitivity around women's unconventional work choices in culturally conservative contexts, we implemented robust confidentiality protocols with all identifying information systematically removed during transcription and pseudonyms used consistently. To minimize disruption to participants' earnings during a period of economic uncertainty, we scheduled all research activities during their preferred times and provided appropriate compensation to offset potential lost income. Following principles ensuring research benefits participants and their communities, we organized two feedback workshops sharing preliminary findings for validation and discussion while providing practical information about platform features.

FINDINGS

The findings draw upon multiple data sources collected during our ten-month fieldwork, with interview excerpts explicitly cited using participant pseudonyms and analysis informed by ethnographic observations from mobile ethnography sessions with eight participants. These observational data collected during 2-4 hour accompanied work periods witnessing drivers' technological interactions, navigation of urban spaces, and work-

family management, provide crucial contextual understanding of embodied practices. Rather than interrupt narrative flow with repeated fieldnote citations, we integrated ethnographic insights into our interpretive analysis. Three interconnected themes emerged: economic necessity and technological empowerment; collective resilience and embodied strategies; and identity transformation and cultural renegotiation.

Economic necessity and technological empowerment: Reconfiguring mobility through digital platforms

What unfolds from women's experiences is how technological embodiment begins with economic imperatives, opening pathways to transformations in their relationships with technology, space, and identity. Maya, a 38-year-old single mother, captured this: *'If I'm not allowed to work as an online motorcycle taxi driver, will all of you bear the living expenses for me and my children?'*. Behind this challenge lies necessity as women became primary breadwinners due to divorce, widowhood, or caring for children with special needs, seeking independence through technological solutions.

These economic imperatives propel women into previously unfamiliar urban spaces, transforming platforms into gateways to new spatial knowledge and embodied confidence beyond economic survival. Yuni, a 42-year-old widow, explained: *'Since my husband passed away, I'm alone and I was determined to become an online motorcycle taxi driver, though when I first started I didn't know the streets at all, but now my knowledge has expanded and I'm brave on the streets'*. Sari echoed this: *'Before, I only knew the route to my children's school and the market near my home, but now I can go anywhere in the city without fear'*. This spatial confidence emerges from developing embodied relationships with technology and urban landscapes, disrupting gendered spatial restrictions.

This spatial expansion reshapes women's presence in public space, merging digital literacy with physical mobility in ways that transform capabilities and public perceptions about women's appropriate domains. Ratna noted: *'At first, male passengers would sometimes cancel when they saw a woman driver, but now many specifically request female drivers because they trust our careful driving and professionalism'*. Diana shared: *'When I stop at traffic lights, sometimes male drivers look surprised to see me riding a motorcycle professionally, but I just smile confidently and focus on my next passenger'*. Smartphones and motorcycles function as integrated extensions of agency, legitimizing women's presence in areas once considered inappropriate for women.

For mothers caring for children with special needs, this mobility acquires additional dimensions reshaping family care practices through platform flexibility unavailable in traditional employment with rigid schedules. Sutami explained: *'So I decided to become an online motorcycle taxi driver where I can go home, pick up my children and then go back to work or cook first as their needs require'*. Lestari elaborated: *'My son needs regular therapy sessions, and this work allows me to take him there between rides because no traditional job would give me this freedom'*. Platforms enable women to weave together economic activities with caregiving, creating movement patterns accommodating both income generation and family needs simultaneously.

This integration shows how platforms become incorporated into family systems and household communication patterns reshaping intergenerational relationships through technologically mediated care practices extending beyond individual drivers. Farah explained: *'My children now understand that when they see me checking my phone, it might mean I need to leave for a ride, and they've learned to respect my work while knowing I'm always available'*. Nisa shared: *'I've taught my teenage daughter how to use the app to track where I am during work hours, so she knows when I'll be home and it gives us both security'*.

Technological skills developed through ride-hailing work transfer to other domains, expanding capabilities beyond driving and challenging assumptions about women's technological competence. Hani stated: *'Now I use online banking, food delivery apps, and even help my children with their online homework assignments because technology feels natural to me after daily platform work'*. Wulan, 47, noted: *'I've learned to read digital maps so well that my relatives now ask me for directions to places they can't find using traditional navigation methods'*.

Community formation manifests as women develop networks of knowledge sharing and mutual support creating collective technological citizenship. Indah explained: *'We have a WhatsApp group where we warn each other about road closures or dangerous areas, and sometimes we meet at food stalls between rides to share tips about app updates'*. Rini described: *'When I was new, an experienced female driver showed me which areas have the most ride requests during different times of day, and now I do the same mentoring for newcomers'*. These collective practices transform individual technological experiences into shared knowledge systems enhancing economic opportunities and physical safety, creating foundations for identity transformations extending beyond economic necessity.

Collective resilience and embodied strategies: Navigating gendered challenges

As women expand their presence in public space through ride-hailing platforms, they encounter resistance manifesting in various forms of gender-specific challenges requiring strategic responses blending technological tactics with embodied knowledge. Dewi, a 31-year-old mother, shared: *'Some male passengers try to sit too close or touch my shoulder while I'm driving, and others question my ability, asking if I really know the route or suggesting they should drive instead'*.

Rina described more subtle forms: *'They ask personal questions about my marital status or why I'm working this job instead of staying home with my children'*. These frictions create situations demanding repertoires of defense mechanisms women develop through experience.

The strategies women develop signal sophisticated integration of technological features with bodily practices as they learn to navigate both digital and physical dimensions of platform work. Wati, 44, explained: *'I always check the passenger rating before accepting a ride, and if I notice anything uncomfortable during the trip, I make sure to give a low rating so other female drivers are warned'*. Tari described physical strategies: *'I position my motorcycle mirrors so I can see if the passenger is sitting appropriately behind me, and I keep a comfortable distance that feels professional'*. Experience transforms novice uncertainties into intuitive knowledge as women read both digital cues and physical signals while maintaining professional boundaries.

The emotional dimensions point to challenging forms of affective labor integrated into technological practice requiring careful calibration of warmth and authority in every interaction. Ayu, 33, explained: *'Sometimes I need to appear more serious than I am naturally, especially with male passengers who might misinterpret friendliness as something else'*. Suwarni, 49, captured this balancing act: *'Smile, let's just smile. Even though the heart is crying'*. Lina elaborated: *'I've learned to speak confidently about routes and driving decisions, using a professional tone that discourages inappropriate conversations'*. Every ride becomes a performance requiring emotional choreography as demanding as physical navigation.

These embodied strategies develop through collective networks transforming individual challenges into shared knowledge systems where experienced drivers mentor newcomers in both technological skills and gendered survival strategies. Winda noted: *'We have to be patient with passengers, have to be patient, and we have to make conversation that's enjoyable'*, using 'we' language reflecting collective identity. Dina, 28, explained: *'When I first started, I joined a group called "Speed" where experienced female drivers taught us how to handle different situations with passengers and how to use the app efficiently'*. Individual vulnerabilities transform into collective strength through these communities of practice.

Knowledge sharing encompasses both technological expertise and embodied strategies for safety and boundary maintenance extending across multiple domains of knowledge and practice. Putri shared: *'An older driver taught me to always text my location to our group when I take a ride to a remote area, and another showed me how to position my body on the motorcycle to maintain appropriate distance from the passenger while still driving safely'*. Endah, 51, described learning professional demeanor: *'The experienced drivers explained that we should dress modestly but not too conservatively, speak confidently but politely, and maintain eye contact without seeming too familiar'*.

The technological platform becomes integrated into collective safety practices as women leverage app features in creative ways beyond designers' intentions. Nuraini explained: *'We use the emergency button feature for its intended purpose, but we've also developed our own system of checking in with each other through the app's messaging function'*. Ida described: *'If I'm going to an unfamiliar area, I'll sometimes arrange for another female driver to accept a ride request nearby, so we're working in the same neighborhood'*. Lia shared: *'We've figured out how to read the surge pricing patterns to identify which areas might be less safe at certain time'*.

The emotional support these networks provide proves as valuable as practical knowledge, creating spaces where women validate each other's experiences and build resilience against social disapproval. Jaya, 52, observed: *'Sometimes I return home eling discouraged after difficult passengers, but when I share these stories in our group, I find strength to continue'*. Mira noted: *'When male passengers or even family members question why we do this work, we remind each other of our accomplishments and independence'*.

These collective practices generate new forms of gendered technological identity extending beyond individual economic empowerment into broader cultural transformations reshaping norms around mobility and technological competence. Hastuti stated: *'Together, we're showing that women can master this technology and succeed in this work'*. Fitri reflected: *'Our group has become like a second family, where we understand each other's struggles in ways our own relatives sometimes cannot'*.

Identity transformation and cultural renegotiation: From '*kodrat*' to code

The most profound dimension of women ride-hailing drivers' experiences emerges in how their technological practices transform not just economic circumstances or spatial mobility but their fundamental sense of self and social positioning. Diana, 30, reflected: *'I've become a different person since starting this work – now I'm resilient, brave, and more independent'*. Suwarni, 49, described her evolution: *'I used to cry easily. Now I'm braver on the streets'*. Nisa captured this transformation: *'Before, I was just someone's wife and mother. Now I'm also a businesswoman who controls her own schedule and income'*. These narratives suggest deeper reconfigurations of how women understand their capabilities, agency, and position within social hierarchies.

These identity transformations occur not through rejecting traditional values but through sophisticated renegotiation of what Javanese womanhood can encompass in the digital age. Diah explained: *'There's a particular satisfaction in this work – I can divide my time between making money and being a housewife, between family and work'*. Farah noted: *'When I return home from driving, I'm still the same mother to my children, but I bring a different energy – I have stories about the city, about interesting passengers, about solving problems on my own'*. Women's narratives weave together seemingly

contradictory elements of traditional domesticity and technological modernity, creating hybrid identities that maintain maternal roles while expanding into new domains.

The technological interface becomes integrated not just into economic activities but into how women conceptualize and perform their gender identity within family and community contexts. Wati, 44, observed: *'My phone is now as essential as my kitchen tools – I check the app while cooking, plan my driving routes around my children's schedules, and use my earnings to improve our home'*. Maya shared: *'My husband was uncomfortable at first, but now he helps me clean my motorcycle and even checks the app sometimes to see how my workday is going'*. The technological practice becomes domesticated into family life even as it enables women to transcend domestic boundaries.

This integration shows how ride-hailing work allows women to fulfill traditional responsibilities in new ways rather than abandoning them entirely, reconceptualizing maternal care beyond physical presence alone. Hastuti shared: *'My children are proud that their mother is different from other mothers – they see that I still care for them but also contribute financially to their education and future'*. Lia noted: *'In some ways, I'm more present for my family now than when I worked fixed hours in a factory job – I can attend school events and be home for important moments, while still earning what we need'*. Platform flexibility enables reconceptualization of maternal care encompassing both economic provision and physical presence.

The physical experience of navigating urban spaces transforms embodied confidence that permeates other aspects of women's lives beyond their work as ride-hailing drivers. Sari explained: *'Now I speak up in community meetings where before I would stay silent – driving through difficult traffic and managing different types of passengers has taught me to trust my voice'*. Rini observed: *'My posture has changed – I stand straighter and walk more confidently, and my relatives noticed this difference before I did'*. The technological practice becomes literally embodied, reshaping how women carry themselves.

Women's technological mastery challenges assumptions about gendered capabilities that have traditionally limited their opportunities and disrupts narratives about women's technical abilities. Wulan, 47, explained: *'People are surprised when they see how quickly I can navigate the app, calculate fares, and find efficient routes – they didn't expect a middle-aged woman with little education to master digital technology'*. Fitri shared: *'My teenage son was shocked when I showed him tricks for using the map features that even he didn't know'*.

The economic autonomy gained induces broader renegotiations of power within family structures as financial contribution transforms into decision-making authority enhancing women's position in hierarchies previously dominated by male authority. Ayu shared: *'My husband now consults me on financial decisions since I contribute significantly to our household – before, he would simply inform me after making decisions himself'*. Nuraini noted: *'When relatives ask for financial help, I can now decide whether to assist them based on my own judgment, not just passing along their request to my husband'*.

These transformations represent selective reconfiguration of cultural values through technological practice rather than wholesale rejection, as women reimagine what Javanese womanhood can encompass. Yuni emphasized: *'I still believe in the importance of caring for my family – this hasn't changed – but what's changed is my understanding that I can fulfill this responsibility while also developing myself as a person with skills and income'*. Endah reflected: *'Our culture has always valued women's contribution to family welfare, but now this contribution can take new forms enabled by technology'*. The movement from *kodrat* to code reimagines cultural identity.

DISCUSSION

The experiences of women ride-hailing drivers in Surabaya tell us how technological embodiment unfolds through cultural negotiation in ways that both build upon and challenge existing theoretical frameworks about platform labor and gender. While platform labor studies often emphasize algorithmic control and economic precarity, our findings suggest that in the Javanese context, platform technologies operate simultaneously as tools of economic necessity and as catalysts for meaningful gender transformations (James, 2024; Wood et al., 2025; Grimalt-Álvaro et al., 2025; Webb, 2026). This dual function develops not through opposition to cultural norms but through careful negotiations that selectively reshape traditional concepts such as *'kodrat wanita'* within digital frameworks, offering culturally specific patterns of technological incorporation.

The economic necessity that initially brings women to ride-hailing work opens pathways to deeper transformations than platform economy literature typically recognizes, reconfiguring both spatial mobilities and gender identities in ways shaped by local cultural contexts and gender regimes (Schefers, 2026). Our study points to how technologies become woven into culturally specific gender performances as drivers mediate between childcare responsibilities and driving shifts, between digital interfaces and physical mobility, engaging in embodied negotiations of ongoing tensions between modernization and traditional gender expectations (Čičigoj et al., 2025; Acar et al., 2025). These negotiations reflect broader patterns identified across Global South contexts where women navigate between technological opportunities and persistent cultural constraints on their mobility and economic participation.

These negotiations appear most distinctly in spatial practices that challenge traditional restrictions on women's mobility while simultaneously accommodating their continuing familial and community responsibilities shaped by

Javanese cultural values (Zandi-Navgran et al., 2026). Unlike Western studies of digital labor that often assume relatively unrestricted mobility, women drivers in Surabaya incorporate technological systems within cultural landscapes where women's movement has historically faced significant constraints due to gender ideologies and spatial segregation. Their embodied technological practices – managing digital interfaces while moving through traditionally male-dominated spaces – capture gendered mobilities with distinctly Javanese characteristics that preserve valued cultural identities while expanding economic possibilities (Sinha Roy, 2018). The ride-hailing application functions as a spatial mediator, providing technological legitimacy for women's presence in public spaces without requiring rejection of family obligations or fundamental cultural identities.

The collective aspects of technological embodiment observed in our study contribute important insights to embodiment theory, clarifying how technological integration occurs not just individually but through shared knowledge networks and communal safety practices that reflect specific gender positions and cultural locations (Happel-Parkins et al., 2024). Our findings present embodiment as fundamentally social – developed, reinforced, and transmitted through collective networks specific to gender and cultural position rather than purely individual adaptation to technological systems. As women exchange strategies for leveraging platform features to enhance safety and cultivate shared expertise in managing both digital interfaces and gendered constraints, they enact technological embodiment as socially distributed practice grounded in solidarity and mutual support (Kanagasabai & Phadke, 2023). This collective dimension deserves greater attention in embodiment scholarship, particularly for understanding how marginalized groups incorporate technologies within specific cultural constraints that shape their daily experiences.

Our study challenges binary frameworks that position technology and tradition in opposition, tracing how identity transformations women describe – becoming 'braver', 'more independent', and 'resilient' through technological practice – emerge not through rejecting traditional gender identities but through carefully reconfiguring them within digitally mediated work contexts. This pattern offers insight into how technological practices become integrated into performances of gender that preserve valued aspects of cultural identity while expanding possibilities for agency and economic participation in contemporary digital economies. When a participant describes dividing her time *'between making money and being a housewife'*, she articulates not a contradiction but a technological integration that transforms both sides of this apparent opposition into complementary dimensions of contemporary Javanese womanhood.

This pattern of cultural negotiation through technological practice distinguishes the Indonesian experience from other global contexts, documenting culturally specific manifestations of gendered challenges in ride-hailing work that cannot be understood through universalist frameworks alone. While studies from the United States report algorithmic discrimination and safety concerns addressed primarily through platform features, and research from Brazil documents risks of physical violence requiring individual protection strategies, Indonesian women experience additional layers of cultural negotiation around gender propriety and family honor (Milkman et al., 2021). Similar to findings from other Asian contexts like India – where women drivers must navigate between family honor and economic need – our participants confront questions about the appropriateness of their work choice alongside practical safety concerns that pervade their daily experiences. However, unlike Western contexts where women drivers rely heavily on app-based safety features and individual precautionary measures, Indonesian women develop collective, community-based knowledge systems that blend technological tools with cultural wisdom accumulated through shared experiences and mutual learning.

Our findings refine technological embodiment theories by challenging Western assumptions of gender equality and foregrounding culturally specific negotiations within Javanese gender frameworks that shape how women incorporate technologies into their lives. While technofeminist scholarship addresses gender-technology mutual shaping, our study positions this as culturally specific, with Javanese women's embodied strategies – from motorcycle positioning to emotional management – capturing technological incorporation as cultural practice requiring navigation of local gender norms and expectations (Wessalowski et al., 2025). This specificity carries methodological implications, mapping dimensions of human-technology relationships obscured by universalist approaches that assume similar patterns across diverse cultural contexts and national boundaries. The *kodrat*-to-code movement represents complex cultural negotiation rather than rejection of tradition or technological determinism, with these women's daily navigations between tradition and transformation offering crucial insights into how technologies integrate into gendered bodies and cultural systems across diverse contexts requiring attention to local specificities.

CONCLUSION

This study has sought to understand how women ride-hailing drivers in Surabaya, East Java, Indonesia incorporate digital platform technologies into their embodied practices while negotiating traditional gender expectations within culturally specific contexts. By examining technological embodiment within Javanese gender

norms, we aimed to extend theoretical frameworks largely emerging from Western contexts while documenting how technology becomes integrated into women's identities, spatial practices, and economic strategies.

Through our analysis, we find that technological embodiment unfolds as cultural negotiation rather than simple technological adoption, with women incorporating ride-hailing platforms not by rejecting traditional gender identities but by selectively reconfiguring them. This journey from *kodrat* (natural destiny) to code (technological self-determination) represents not linear progression but sophisticated renegotiation of what Javanese womanhood can encompass in the digital age, challenging binary frameworks positioning technology and tradition as inherently oppositional.

Three key findings emerge from this cultural negotiation, tracing how technological embodiment operates within specific cultural contexts shaped by local gender regimes and mobility traditions. Economic necessity initially serves as entry point for technological incorporation, transforming women's relationship to urban space and public mobility in ways previously constrained by gender ideologies. Women then develop collective resilience through knowledge-sharing networks that convert individual practices into shared resources for navigating gendered challenges, creating socially distributed forms of technological citizenship grounded in solidarity. Finally, technological mastery catalyzes broader identity transformations extending beyond economic empowerment to reconfigure women's positions within family hierarchies and community relationships previously structured by male authority.

These patterns suggest practical implications for multiple stakeholders invested in supporting women's participation in platform economies while respecting cultural specificities shaping their experiences. Platform companies should incorporate safety features specifically designed for women drivers while acknowledging collective dimensions of technological practice extending beyond individual users to community networks. Policymakers must support rather than constrain women's technological participation while addressing persistent safety concerns emerging from gendered vulnerabilities in public spaces navigated through platform work. Community organizations could enhance existing driver networks to provide additional resources for women navigating between traditional expectations and new economic roles.

We acknowledge important limitations to our research approach suggesting caution in generalizing findings beyond our specific context and participant group. The geographic focus on Surabaya provides analytical depth but limits generalizability to other Indonesian regions with different cultural frameworks and gender norms. Our participant group included mostly middle-aged women supporting families, potentially overlooking younger, unmarried drivers' experiences that might reveal different patterns of technological incorporation. Our focus on women who successfully integrated into ride-hailing work may not capture barriers preventing others from participating.

The stories of these drivers encapsulate significant reimagining of gendered technological citizenship worth broader consideration beyond Indonesian contexts or platform labor specifically. As they traverse urban spaces once considered forbidden territory while maintaining traditional care responsibilities, these women embody nuanced technological integration that neither romanticizes traditional gender roles nor uncritically embraces technological disruption. Their experiences offer insight into how technologies can be selectively incorporated into cultural practices in ways that honor tradition while creating new possibilities for agency and autonomy, providing compelling templates for understanding technology not as disruptive force but as medium through which cultural values can be thoughtfully renegotiated for digital age.

Ethical statement

Ethical approval for this study was granted by the Postgraduate School of Universitas Airlangga (Ethics Declaration No. 4493/B/UN3.SPS/III/TP.02.02/2025). All participants provided written informed consent. Pseudonyms were used and identifying information removed to protect participants' privacy.

Competing interests

The authors declare no competing interests.

Author contributions

Reni Astuti contributed to research conceptualization and design, data collection, data analysis and interpretation, manuscript writing, critical revision of the article, and final approval of the manuscript. *Fendy Suhariadi* contributed to manuscript writing, critical revision of the article, and final approval of the manuscript. *Erna Setijaningrum* contributed to research conceptualization and design, data collection, data analysis and interpretation, manuscript writing, critical revision of the article, and final approval of the manuscript.

Data availability

Due to the qualitative nature of the study and ethical commitments to participant confidentiality, the data are not publicly available. Selected anonymized excerpts may be provided by the corresponding author upon reasonable request.

AI disclosure

No artificial intelligence tools were used in the research design, data collection, data analysis, interpretation, or writing of this article.

Biographical sketch

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