Reframing AI Design Through African Women's Livelihood Intelligence: A Review and Conceptual Framework for SME Contexts

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Abstract

This paper develops a conceptual and methodological foundation for designing inclusive and context-aware artificial intelligence (AI) systems grounded in women's livelihood practices, particularly within small and medium enterprises (SMEs). While existing AI systems are often optimized for efficiency and profit, they frequently overlook the complex, value-laden decision-making processes that characterize women's everyday economic activities. Drawing on an interdisciplinary literature spanning feminist economics, sustainable livelihoods, value sensitive design, and feminist human–computer interaction, the paper synthesizes current knowledge on how women navigate constraints related to care, safety, informality, and resource access. It argues that these practices embody forms of contextual, moral, and embodied intelligence that remain underrepresented in AI design. The paper proposes a research design that combines qualitative inquiry and participatory methods, including interviews, value elicitation workshops, and co-design approaches, to systematically translate women's lived experiences into AI design principles and evaluation metrics. A multi-layered conceptual framework is introduced to connect livelihood practices with sociotechnical systems and AI development processes. By bridging livelihood studies and AI design, this work contributes a novel research agenda aimed at advancing equitable, human-centered, and contextually grounded AI systems for women-led SMEs in Africa.

Keywords: Women's livelihoods, Value sensitive design, Participatory design, Context-aware AI

1. Introduction

Artificial intelligence (AI) is increasingly shaping economic activities across sectors, including small and medium enterprises (SMEs), through applications such as decision-support systems, credit scoring, demand forecasting, and digital platforms Schönberger (2023). These technologies promise improved efficiency, scalability, and data-driven decision-making. For SMEs—particularly in resource-constrained environments—AI holds significant potential to enhance productivity, market access, and financial inclusion.

However, current AI systems are largely designed around optimization logics that prioritize efficiency, profit maximization, and standardized decision-making Ekundayo (2024). Such approaches often abstract away from the complex, context-dependent realities in which

economic activities are embedded. As a result, they frequently fail to account for the nuanced ways in which individuals—especially women—navigate uncertainty, risk, care responsibilities, and social constraints in their livelihood practices.

This gap points to a critical problem: the underrepresentation of women's lived livelihood experiences and decision-making processes in the design and evaluation of AI systems. Women operating SMEs, particularly in informal or semi-formal contexts, employ forms of contextual, moral, and embodied intelligence that remain largely invisible within dominant AI paradigms. Ignoring these dimensions risks reinforcing existing inequalities and limiting the relevance and effectiveness of AI-driven solutions.

In response, this paper aims to develop a conceptual and methodological foundation for integrating women's livelihood intelligence into AI system design. It is guided by the following research questions:

1. **RQ1: Judgment and Intelligence** How do women make livelihood decisions that balance survival, safety, dignity, and care under conditions of constraint, and what do these decision-making patterns reveal about contextual, moral, and embodied forms of intelligence that are not adequately captured by current AI systems?

2. **RQ2: Values and Design Implications** What values, strategies, and forms of intelligence guide women's livelihood practices, and how can these insights be translated into design principles for more inclusive, context-aware, and culturally grounded AI systems?

3. **RQ3: Co-design and Alternative Metrics** How can co-designing AI systems with women surface alternative definitions of value, efficiency, and fairness, and what implications do these alternative metrics have for shaping more equitable digital economies and sociotechnical futures?

2. Literature Review

2.1. Feminist Economics and Livelihood Decision-Making

The objective is to investigate how women engaged in micro, small, and medium enterprises (MSMEs) in low-income contexts make livelihood decisions that balance survival, safety, dignity, and care under conditions of constraint, and to conceptualize these decision-making patterns as contextual, moral, and embodied forms of intelligence that can inform the design of AI systems.

Dwomoh et al. (2023) conducted a cross-sectional quantitative study in Ghana to investigate how inequality in access to agricultural productive resources-specifically credit, land, and inputs-affects household food security. Drawing on a sample of 600 rural households across multiple districts, the researchers used structured surveys and applied ordered probit regression models to quantify inequality and identify determinants of food security. The findings revealed stark gender disparities: only 28% of women accessed credit compared to 62% of men. Yet, female-headed households were 15% more food secure than male-headed households, demonstrating that women's livelihood judgments often prioritize food security

despite resource constraints. Geographic location and socioeconomic status were significant mediators of inequality, underscoring the structural barriers women face in sustaining livelihoods.

The study's strengths lie in its large sample size and rigorous econometric modeling, which provide robust evidence of gendered inequality in agricultural resource access. However, its limitations are equally important: women's reasoning was treated purely as economic behavior, with no attention to stress, resilience, dignity, or embodied intelligence. The cross-sectional design restricted understanding of how women's judgments evolve over time, and the study did not attempt to connect these findings to broader questions of moral intelligence or AI system design.

For our proposed study, Dwomoh et al. (2023) is highly relevant because it demonstrates that women's decision-making under constraint reflects contextual intelligence that econometric models alone cannot capture. Building on this, we will integrate both qualitative and quantitative approaches-combining surveys with in-depth interviews, life-history trajectories, ethnographic observation, and participatory decision-mapping-to capture not only measurable outcomes but also the lived reasoning behind them. By incorporating mental well-being measures such as the WHO-5 Well-Being Index and the Perceived Stress Scale, and by theorizing women's judgments as embodied intelligence, our study will extend Dwomoh's work beyond economics into the moral and contextual dimensions of livelihood practices. This extension will also allow us to translate these insights into AI design principles for SME and livelihood support systems, ensuring that women's contextual and value-driven intelligence is recognized and embedded in technological solutions.

Olwanda et al. (2024) conducted a qualitative study in Kakamega County, Kenya, to explore women's autonomy in maternal health decision-making and its implications for service delivery reform. The study engaged women of reproductive age, health workers, and community stakeholders through semi-structured interviews, focus group discussions, and participatory workshops. Using thematic analysis informed by feminist economics and health systems frameworks, the authors examined how women navigate constrained health systems and social expectations when making livelihood-linked health decisions.

The findings revealed that maternal and neonatal outcomes in Kakamega remain poor, with a maternal mortality rate of 316 per 100,000 live births and a neonatal mortality rate of 19 per 1,000 live births. Decision autonomy was limited: only 35% of women delivered at home, 28% in primary care facilities, and 37% in hospitals. Women reported that financial dependence, cultural norms, and health system inefficiencies constrained their autonomy. Caregiving responsibilities often delayed or prevented timely health decisions, while dignity and respectful care emerged as central values guiding choices.

The strength of this study lies in its participatory design, which validated findings with community stakeholders and captured lived experiences beyond statistics. However, several gaps remain. Mental well-being-stress, resilience, and psychological impacts of constrained decision-making-was not systematically measured. Women's reasoning was described but not theorized as embodied or moral intelligence. The cross-sectional design missed how autonomy and values evolve over time, and there was no attempt to connect these insights to AI system design for health or livelihoods.

For our proposed study, Olwanda et al. (2024) is highly relevant because it demonstrates that women's maternal health decisions are deeply value-laden, balancing survival, safety,

dignity, and care under constraint. Building on this, we will integrate both qualitative and quantitative approaches, combining surveys with life-history interviews, ethnographic observation, and participatory decision-mapping to capture not only outcomes but also the reasoning behind them. By incorporating validated mental well-being measures (WHO-5 Well-Being Index, Perceived Stress Scale) and theorizing women's judgments as embodied intelligence, our study will extend Olwanda's work to show how these decisions can inform AI design principles for SME and livelihood.

Niemann et al. (2024) conducted a qualitative systematic review to examine gender relations and decision-making in climate change adaptation across rural East African households. The review synthesized 42 peer-reviewed studies published between 2010 and 2023, covering Kenya, Uganda, Tanzania, and Ethiopia. Using grounded theory and thematic synthesis, the authors explored how women navigate risk, uncertainty, and care responsibilities when making livelihood decisions in agriculture and household resource management.

The findings showed that women consistently prioritized risk reduction and food security over profit maximization. For example, crop diversification was adopted by more than 60% of women farmers as a survival strategy. However, caregiving responsibilities constrained adaptation: women spent 3-5 hours daily on unpaid care, limiting their ability to adopt climate-smart practices. Stigma also emerged as a barrier, with women in some communities facing social disapproval when engaging in "male" adaptation practices such as irrigation. These decisions reflected embodied intelligence, as women balanced survival, dignity, and care simultaneously under conditions of constraint. The strength of this review lies in its broad coverage across multiple countries and its thematic synthesis, which highlights common patterns in women's adaptation strategies. However, several gaps remain. Mental well-being-stress, resilience, and psychological impacts of adaptation decisions-was not measured. Women's reasoning was described but not theorized as a form of intelligence. The participatory dimension was missing, as the review relied on published studies rather than direct co-design with women farmers. Finally, there was no attempt to connect these insights to AI system design for agriculture or climate resilience.

For our proposed study, Niemann et al. (2024) is closely relevant because it demonstrates that women's livelihood decisions in climate adaptation are value-driven and contextual, prioritizing safety, dignity, and care over profit. Building on this, we will integrate both qualitative and quantitative approaches-combining surveys with ethnographic observation, life-history interviews, and participatory decision-mapping-to capture evolving strategies across time. By incorporating validated mental well-being measures (WHO-5 Well-Being Index, Perceived Stress Scale) and theorizing women's judgments as embodied intelligence, our study will extend Niemann's work to show how these decisions can inform AI design principles for SME and livelihood support systems.

Hajara and Sule investigated women's entrepreneurship and livelihood sustainability in Nigeria's Federal Capital Territory, Abuja, with a focus on small and medium enterprises (SMEs) in low-income urban contexts. Employing a mixed-methods design, the study combined quantitative surveys with qualitative interviews and focus group discussions to capture both measurable outcomes and lived experiences. The results showed that women's SMEs contributed significantly to household income and food security, but their sustainability was shaped by social and institutional constraints. Caregiving responsibilities and stigma influenced how women managed their businesses, while structural barriers such as limited

access to credit, weak representation in decision-making, and inadequate policy support restricted growth opportunities. Despite these challenges, women entrepreneurs demonstrated resilience and value-driven reasoning, often prioritizing household survival and dignity over profit maximization.

The study's strength lies in its holistic approach, integrating economic, social, and institutional dimensions of livelihood practices. However, several gaps remain: mental well-being indicators such as stress, resilience, and dignity were not systematically measured; women's reasoning was described but not theorized as contextual, moral, or embodied intelligence; and the study did not connect findings to AI system design or broader questions of non-instrumental intelligence. Furthermore, the cross-sectional design limited insights into how livelihood strategies evolve over time.

For our proposed study, this Nigerian case provides important grounding by showing that women's entrepreneurial strategies are shaped by survival, dignity, and care responsibilities. We will extend this work by integrating both qualitative and quantitative approaches-surveys, life-history interviews, ethnographic observation, and participatory decision-mapping-to capture not only outcomes but also the reasoning behind them. By incorporating validated mental well-being measures (WHO-5 Well-Being Index, Perceived Stress Scale) and theorizing women's judgments as embodied intelligence, our study will build on Abubakar and Sule's findings to demonstrate how women's contextual reasoning can inform AI design principles for SME and livelihood support systems.

Dwomoh et al. (2023) used econometric methods to measure gendered inequality in agricultural resource access in Ghana. They found that inequality was higher among women than men. It was also higher among women with low decision-making empowerment. However, the study treated women's decisions as a function of measurable variables alone. It did not capture qualitative reasoning about dignity, care, safety, or embodied knowledge. This gap matters for AI design. An AI system trained only on econometric patterns would learn from observable variables like location, asset ownership, and empowerment scores. Such a system would have no understanding of moral or contextual intelligence. When deployed for credit scoring or agricultural advice, the AI would fail to recognize strategies driven by care or safety concerns. It might misclassify women's survival behaviors as irrational. The AI would optimize for profit or productivity. It would lack the ability to encode non-economic trade-offs. This would reinforce the very inequalities the study documents.

Similarly, Olwanda et al. (2024) studied maternal health decision-making in Kenya. They examined three types of agency: individual, immediate relational, and distance relational. They found that previous birth experiences, self-esteem, and social support increased agency. Financial control and respectful partner communication also helped. Long waiting times and limited staff reduced agency. The study engaged with values like dignity and respectful care. However, it did not measure mental well-being outcomes like stress or resilience. It also did not theorize women's reasoning as embodied or moral intelligence. These gaps affect AI design directly. Consider an AI system for maternal health triage. Without well-being metrics, the AI might optimize for clinical efficiency alone. It would not account for psychological safety or dignity. Without a framework for embodied intelligence, the AI cannot model why a woman might choose a home birth over a facility birth. This choice may reflect bodily knowledge, past trauma, or safety concerns. The finding

about long waiting times would become a simple optimization problem. The AI would miss the deeper agency-preservation strategy.

The gaps in both studies are not minor. They are fundamental limitations. If unaddressed, AI systems will be technically efficient but socially harmful. They will optimize measurable outcomes while devaluing the intelligence women exercise under constraint. Across the four studies reviewed, clear research gaps emerge that our proposed cross-sectional study will address. Dwomoh et al. (2023) provided robust econometric evidence of gendered inequality in access to agricultural resources in Ghana, showing that female-headed households were more food secure despite constraints, but the study treated women's reasoning as purely economic, overlooking stress, resilience, dignity, and embodied intelligence. Olwanda et al. (2024) examined maternal health decision-making in Kenya and highlighted values of dignity and respectful care, yet mental well-being was not systematically measured, women's reasoning was not theorized as intelligence, and implications for AI systems were absent. Niemann et al. (2024) synthesized climate adaptation decisions across East Africa, showing women prioritized risk reduction and food security over profit, but psychological impacts, participatory co-design, and AI relevance were missing. Hajara and Sule investigated women's SMEs in Nigeria, finding that caregiving responsibilities, stigma, and institutional barriers shaped sustainability, but mental well-being was not measured, reasoning was not theorized as embodied intelligence, and AI design implications were not explored.

Our proposed cross-sectional study will capture these gaps by integrating both qualitative and quantitative approaches. We will combine surveys with in-depth semi-structured interviews, life-history trajectories, ethnographic observation, and participatory decision-mapping to document not only outcomes but also the reasoning behind them. By incorporating validated mental well-being measures such as the WHO-5 Well-Being Index and the Perceived Stress Scale, and by applying thematic and interpretive analysis informed by feminist economics, STS, and AI ethics, we will theorize women's livelihood judgments as contextual, moral, and embodied intelligence. This approach will allow us to generate design-relevant insights that identify where and why AI systems fail to align with lived decision-making, ensuring that women's value-driven reasoning is recognized and embedded in technological solutions (Dwomoh et al. (2023); Olwanda et al. (2024); Niemann et al. (2024); Hajara and Sule).

2.2. Value Sensitive Design and Inclusive AI

Research on AI systems increasingly recognises that technical performance alone is insufficient for ensuring socially beneficial, inclusive, and sustainable outcomes. This recognition has given rise to a growing body of work on human-centred AI, socio-technical systems, value-sensitive design, and participatory approaches to technology development. These literatures are directly relevant to the present research question: What values, strategies, and forms of intelligence guide women's livelihood practices, and how can these insights be translated into design principles for more inclusive, context-aware, and culturally grounded AI systems?

Women's livelihood practices—particularly in informal, resource-constrained, or non-Western contexts—are shaped by complex value systems, embodied knowledge, social re-

lations, and adaptive strategies that are often invisible to dominant AI design paradigms. This related-work section synthesises insights from three interlinked strands: (1) Value Sensitive Design (VSD) and its critiques, (2) extensions of VSD to AI and AI-for-Social-Good contexts, and (3) socio-technical and participatory design traditions that foreground lived experience and local knowledge. Together, these works provide a conceptual and methodological foundation for translating women's lived values and intelligences into AI design principles.

Value Sensitive Design (VSD) is a foundational framework for incorporating human values into technology design through conceptual, empirical, and technical investigations (Friedman et al. (2013)). VSD's core contribution lies in its explicit rejection of technological neutrality and its attention to both direct and indirect stakeholders. Values such as autonomy, privacy, accountability, and fairness are treated as ethically significant and are intended to inform design decisions throughout the development process. Despite its influence, VSD has been criticised for how values are identified and operationalised in practice. Le Dantec et al. (2009) argue that VSD often privileges predefined "values of ethical import," thereby constraining the discovery of values as they are lived and negotiated in everyday contexts. This critique is particularly salient for research on women's livelihood practices, where values such as dignity, reciprocity, care, resilience, and collective responsibility are enacted through daily survival strategies rather than articulated as abstract ethical principles.

The authors propose reframing values as lived experience, emphasising empirical engagement as the starting point of design. Using photo-elicitation studies across diverse contexts—including homelessness, domestic technologies, and public perceptions of ubiquitous computing—they demonstrate that locally salient values frequently exceed or complicate canonical ethical categories. This empirical-first orientation challenges designers to derive values inductively from situated practices before mapping them onto broader normative frameworks (Le Dantec et al. (2009)).

The rise of machine-learning–based AI systems has prompted renewed scrutiny of whether traditional VSD adequately addresses AI-specific challenges such as opacity, adaptation over time, and large-scale social impact. Umbrello and van de Poel (2021) extend VSD to AI by integrating principles from the AI-for-Social-Good (AI4SG) literature. They argue that AI systems pose unique risks because they may evolve in ways that undermine initially embedded values, particularly when trained on biased or incomplete data. Their framework introduces design norms that translate high-level values into actionable requirements, drawing on widely recognised AI ethics principles such as fairness, transparency, non-maleficence, and explicability. Importantly, they distinguish between values that AI systems should respect (e.g., avoiding harm, preserving autonomy) and values they should actively promote, such as social well-being and sustainability. Promoted values are explicitly linked to the United Nations Sustainable Development Goals, positioning AI systems as contributors to positive societal outcomes rather than merely harm-avoiding tools (Umbrello and Van de Poel (2021)).

For women's livelihood contexts, this distinction is critical. Livelihood-oriented AI systems often intervene directly in economic decision-making, resource allocation, and risk management. However, without grounding these promoted values in local definitions of well-being and success, AI4SG approaches risk reproducing externally imposed develop-

ment priorities. This underscores the continued importance of empirical value discovery emphasized by critiques of VSD.

Socio-technical systems theory conceptualises technology as inseparable from the social, institutional, and cultural contexts in which it is embedded. Rather than treating AI as a standalone artifact, this perspective emphasises the co-evolution of technologies, users, norms, and power relations. Such an approach is essential for understanding women's livelihoods, which are deeply embedded in informal economies, social networks, and gendered divisions of labour.

From a socio-technical standpoint, intelligence is distributed across people, practices, and artifacts rather than residing solely in computational models. Women's livelihood strategies often demonstrate anticipatory planning under uncertainty, ethical reasoning grounded in care, negotiation within constrained power structures, and the ability to balance economic and social obligations. These forms of intelligence challenge AI paradigms that prioritise optimisation, efficiency, and scalability while neglecting relational and moral dimensions of decision-making.

The reviewed literature cautions that AI systems designed without attention to these dynamics may reinforce structural inequalities, for example by undervaluing informal labour or care work that is poorly represented in formal datasets (Le Dantec et al. (2009)). Participatory Design (PD) offers methodological tools for engaging stakeholders as co-designers rather than passive users (Schuler and Namioka (1993)). Originating in Scandinavian labour movements, PD emphasises democratic participation, mutual learning, and the redistribution of design authority. These commitments align strongly with research on women's livelihoods, where experiential knowledge and collective sense-making are central.

Le Dantec et al. (2009) use of photo-elicitation exemplifies how participatory and interpretive methods can surface values that may not emerge through interviews or surveys alone. Feminist HCI further extends these ideas by foregrounding embodiment, care, reflexivity, and power, arguing that design is inherently political and situated (Bardzell (2010)). Together, these traditions emphasise that values cannot simply be extracted from communities but must be co-interpreted and continuously negotiated.

These insights resonate with calls for lifecycle-oriented value-sensitive AI, where stakeholder engagement continues beyond initial deployment to monitor value drift and unintended consequences (Umbrello and Van de Poel (2021)). Across the reviewed literature, a consistent theme emerges: values relevant to technology design are contextual, dynamic, and enacted through practice. While VSD provides a foundational vocabulary for addressing values, its evolution—through empirical reorientation, AI-specific extensions, and participatory methods—is essential for engaging women's livelihood practices. For the present research question, these works collectively suggest that women's values, strategies, and forms of intelligence should be treated as design resources rather than constraints. Socio-technical and participatory perspectives further emphasise that inclusive, culturally grounded AI systems must be co-produced with women whose livelihoods they seek to support, recognising their expertise, agency, and situated knowledge.

2.3. Sociotechnical Systems Perspective

Research done on women's livelihoods in Africa highlights the central role of micro, small and medium enterprises within informal economies, where women's economic activities are shaped by constraints such as limited access to capital, information, and infrastructure, alongside gendered unpaid care responsibilities. Within these contexts, livelihood decisions are not guided largely by profit maximization but by the need to balance economic survival with household stability and social obligations. Studies emphasize that women's participation in microenterprises reflects adaptive strategies aimed at managing risk and sustaining well-being under conditions of uncertainty, rather than linear trajectories of business growth (Malanga and Banda (2021)).

Across the studies, women's livelihood decision-making is shown to prioritize non-financial forms of value, including flexibility, autonomy, and social connectedness. Malanga and Banda (2021) demonstrate that women micro-entrepreneurs engage with information and communication technologies (ICTs) not simply to increase profit, but to reduce transaction costs, improve access to information, and strengthen social and informational capital. These findings challenge dominant economic models that equate efficiency with productivity or profit maximization, instead highlighting livelihood decisions rooted in stability, empowerment, and sustainability within informal economic systems.

In contrast, research on artificial intelligence and digital systems indicates that technological designs are often shaped by narrow assumptions about rationality, efficiency, and fairness. Kubes (2025) critiques human centered AI for treating the human as a universal and neutral subject, arguing that such approach overlook power relations, care work and gendered forms of labor. AI systems are frequently developed using assumptions that overlook the lived realities of women in informal economies. Slesinger et al. (2024) argue that fairness in AI cannot be treated as a purely technical attribute, as it is shaped by whose knowledge, experiences, and values are included in the system design. When affected groups are excluded from early design stages, AI tools risk reproducing existing inequalities rather than addressing them.

Recent work on participatory and co-design approaches to AI offers an alternative framework by actively involving marginalized groups in shaping technological systems. Slesinger et al. (2024) show that co-creation processes, particularly when combined with training on AI concepts, enable participants to articulate context-specific concerns and redefine fairness in ways that reflect their lived experiences. Similarly, Ozor et al. (2025) demonstrate that design-by-inclusion approaches in African agricultural AI initiatives led to improved relevance, usability, and trust among women users. These studies suggest that co-design can surface alternative definitions of value that extend beyond efficiency metrics to include trust, accessibility, and social impact.

Despite these advances, a significant gap remains at the intersection of women's livelihoods, informal MSMEs, and AI system design. While livelihood studies provide rich insights into how women define value and make economic decisions under constraint, and AI research increasingly acknowledges the importance of participatory design and co-creation, there is limited empirical work that directly connects women's livelihood logics to the co-design of AI systems that shape future economies. In particular, few studies examine how involving women in MSMEs as co-designers might fundamentally reshape prevailing def-

initions of efficiency and fairness within AI-driven economic systems in African contexts. Addressing this gap is essential for developing AI tools that align with women's lived experiences and contribute to more inclusive and equitable economic futures.

3. Research Design and Methodology

Our study will adopt a mixed-methods research design guided by interpretivism and pragmatism. Interpretivism will enable an in-depth understanding of how women construct meaning around their livelihood decisions, while pragmatism supports the integration of both quantitative and qualitative approaches to address our research questions effectively. The study will follow a cross-sectional design, collecting data at a single point in time to provide a snapshot of women's livelihood decisions under constraints. The study framework will be informed by participatory design and co-creation design, as well as feminist AI and design justice framework, to ensure that participants are actively engaged and their experiences are meaningfully represented.

3.1. Participant selection criteria

Participants will be women entrepreneurs operating in Micro and Small Enterprises (MSEs) within informal or semi-formal economic sectors (such as retail services, and light manufacturing). The study will focus on women based in Nairobi, Kenya and Lagos, Nigeria, two urban contexts with vibrant informal economies. The study aims to include approximately 50 participants, allowing for in-depth qualitative exploration while still generating meaningful quantitative insights. Inclusion criteria are as follows. Women must self-identify as the primary owner or manager of their business. The business must have been active for at least 12 months. Participants must be between 18 and 65 years of age. Stratification will ensure diversity across four variables: age group, business sector, household type, and education level. This stratified purposive sampling ensures the study captures varied experiences while remaining focused on MSME contexts Tipton (2012). Participants will be recruited through local networks, women's business associations, and community organizations. Ethical considerations will be central to the study as informed consent will be obtained from all participants, and measures will be taken to ensure confidentiality, privacy, and respectful treatment of participants throughout the research process.

3.2. Sample size justification

The proposed sample of 50 women follows established guidelines for mixed-methods research. For the quantitative survey, 50 participants provide adequate variation for descriptive analysis. For the qualitative interviews, we will select 30 of these women. Qualitative methodologists find that saturation in studies with a relatively homogeneous population and clear research objectives is often reached within 15 to 30 interviews Hennink and Kaiser (2022). This ensures we capture a full range of experiences without unnecessary data collection. For co-design workshops, we will recruit 20 women total across two workshops, with 10 women per workshop. This workshop size allows all participants to contribute meaningfully to prototyping activities Sanders and Stappers (2008).

3.3. Integration of surveys, interviews, and workshops

The three methods work together in a sequenced design. Phase one is the quantitative survey, which identifies patterns and variation in well-being, stress, and resource access. Phase two involves semi-structured interviews with 30 women selected from the survey sample. Interview findings then shape the design of workshop activities. Phase three consists of two co-design workshops with 10 to 12 women each. This sequential design follows established mixed-methods approaches where each phase directly informs the next Creswell and Clark (2017). The result is a set of AI design principles grounded in women's lived experiences.

3.4. Preliminary Study

For a preliminary study with 20 women entrepreneurs, a Cross-Case Comparative Analysis was carried out. We compared across business types, marital status, access to credit and education level and observed patterns such as: Do women with credit access show different risk behavior?, Does education affect definitions of "success"? and Do married women prioritize care differently?

In terms of Credit Access vs Risk Behaviour, there is no strong divergence yet between women with and without credit access, but both groups lean toward risk aversion. This suggests that risk behaviour is structural, not just access-driven and even when credit is available, trust, fear of loss, and instability dominate decisions. From responses, Credit is not just financial (it is perceived risk exposure). Women often associate loans with: loss of control, social pressure and business instability. This implies access to credit does not automatically translate to risk-taking behavior.

In terms of Education Level vs Risk Orientation. The observed pattern are that post-graduates are very risk-averse. Women with lower diplomas exhibit mixed but high risk avoidance. Women with first degrees exhibit moderate risk. This is interesting and slightly counterintuitive. Higher education does not reduce risk aversion. In some cases, it may increase caution. More educated women better understand financial risks, are more aware of market volatility and may prioritize stability over aggressive growth on "Definition of Success", less educated women emphasize income and survival while more educated women emphasize stability, work-life balance, personal fulfillment and reputation. This implies that education broadens the definition of success beyond profit.

In terms of marital status vs care prioritization, there is no major difference in risk between married and single women, but that's not the key variable. From responses to: "Who depends on this work?", "Factors influencing decisions" and "Why this business?", married women place strong emphasis on: family dependency, children and stability. Business choices are often location-constrained and time-flexible. Single women make references to passion, skills and opportunity. This shows a clear pattern: Married women prioritize care and stability more explicitly in decision-making.

The dominant business types in the pilot study include Fashion & Creative, Food & Catering and Digital/Online categories. In terms of business type vs behaviour, women in Food & Catering make more references to daily income needs and Customer uncertainty. This is likely due to survival-oriented and short-term decision cycles. Women in Fashion & Creative show strong links to passion and skill identity. This is likely due to more

growth aspiration and brand orientation. Women in Digital/Online business make mentions of market volatility and capital constraints. This indicates that the business type shape decision horizon (short-term survival vs long-term growth)

We observe three patterns: Pattern 1 - "Constrained Optimizers", Pattern 2 - "Aspirational but Cautious" and Pattern 3 - "Network-Dependent Survivors". Married women with no credit and in the Retail/Food business exhibit Pattern 1. They have high care responsibilities, high risk aversion and take Stability-first decisions. Educated women in the Creative/Digital business space exhibit Pattern 2. They have characteristics such as growth-oriented mindset, they value autonomy and identity yet still avoid financial risk. Women with Lower education and operating in informal sectors exhibit Pattern 3. They rely on their family, community and have limited formal financial engagement

Preliminary key insights show that for the women entrepreneurs, (1) Risk is contextual, not financial. Risk perception includes family impact, social consequences and emotional stress. (2) Credit does not equal Empowerment. Credit access alone does not change behaviour - trust, fairness, and system design matter more. (3) Care is a structural variable. Its not just a "value", it actively shapes business type, growth limits and risk decisions. (4) Success is multi-dimensional. Across cases, women value stability over growth. Respect, dignity, and flexibility also matter strongly.

4. Conclusion

This proposed study seeks to advance understanding of women's livelihood decision-making within Micro and Small Enterprises. By focusing on women entrepreneurs in Nairobi and Lagos, the research is positioned to capture diverse experiences across dynamic informal and semi-formal economic contexts. Through the integration of quantitative and qualitative methods, as well as participatory and co-creation approaches, the study aims to provide a holistic understanding of how women navigate economic decisions under constraint. The study is expected to make both theoretical and practical contributions. Conceptually, it foregrounds women lived experiences and values (such as dignity, fairness, and care) as central to understanding livelihood decision-making. In doing so, it challenges dominant economic and technological paradigms that prioritize efficiency and growth without sufficient attention to social and contextual realities. Practically, the study has the potential to inform the development of more inclusive, human-centered, and context-sensitive approaches in areas such as policy design, development practice, and artificial intelligence systems. The study faces certain limitations despite its anticipated contributions. The cross-sectional design will provide a snapshot of experiences at a single point in time, limiting the ability to capture changes and dynamics over the long term. Additionally, the use of purposive sampling, while appropriate for in-depth qualitative study, may limit the generalizability of the findings beyond the specific contexts studied. The interpretive nature of qualitative analysis also requires careful attention to reflexivity and transparency to ensure rigor. Future research could build on this study by adopting longitudinal approaches to explore how women's livelihood decision-making strategies evolve over time, particularly in response to changing economic and technological conditions. Comparative studies across additional geographic contexts could further enhance the applicability of findings, while expanded methodological approaches, including larger samples or mixed-method variations,

could strengthen empirical generalization. In conclusion, this study provides a robust and context-sensitive research design that integrates methodological rigor with practical relevance. By centering women's experiences and critically engaging with existing economic and technological frameworks, it lays a strong foundation for generating meaningful insights that can inform more equitable and inclusive systems.

5. Data Availability Statement

No data are associated with this article

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