

RESEARCH

Open Access



Indigenous knowledge for innovation and sustainable livelihood in Ghana's informal economy

Linda Anane-Donkor¹ , De-Graft Johnson Dei^{2*} and Patience Emefa Dzandza Ocloo²

*Correspondence:

De-Graft Johnson Dei
djdei@ug.edu.gh

¹KAAF University, Gomoa-Fetteh,
Ghana

²University of Ghana, Legon, Ghana

Abstract

This study examines the systematic use of Indigenous Knowledge (IK) to foster innovation and sustainable development in Ghana's informal sector. Employing a sequential explanatory mixed-methods design, quantitative data were collected from 300 informal-sector participants in Ghana, supplemented by 30 qualitative interviews with principal knowledge custodians and stakeholders. Quantitative results show a strong reliance on IK (90.38%). IK was shown to have a significant effect on innovation outcomes: 84.63% said it helped them develop new or better products and services, and 84.13% said it helped them develop creative solutions to problems. Apprenticeship and the utilization of libraries, archives, and museums have been identified as the most effective strategies for preserving IK (mean = 84.13%), succeeded by storytelling and knowledge recognition mechanisms (mean = 82.25%). Socioeconomic analysis indicated that IK significantly enhances food security, health, and community well-being (mean = 84.75%) and promotes environmental sustainability through resource conservation and waste reduction (means = 77.57% and 76.13%, respectively). The most important problems were a lack of government and institutional support (mean = 86.00%) and a lack of integration with modern technologies (mean = 62.13%). The study provides substantial empirical evidence that IK is a crucial yet insufficiently supported catalyst for grassroots innovation and sustainable livelihoods, underscoring the need for intentional policy integration into Ghana's national innovation and development frameworks.

Keywords Indigenous knowledge, Indigenous knowledge systems, Innovation, Informal economy, Sustainable livelihood

1 Background

The informal sector in Ghana remains an important part of the national economy, providing jobs for millions of people, especially in rural and peri-urban areas [1, 18]. This sector includes activities that are strongly rooted in Indigenous Knowledge Systems (IKS), such as traditional farming, artisanal crafts, herbal medicine, small-scale construction, and cultural heritage practices. Even though Ghana's innovation policies and formal development frameworks are important to the economy and culture, they still do



© The Author(s) 2026. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

not adequately value or use Indigenous Knowledge (IK). They focus more on high-tech and formalized inventions than on grassroots, context-specific innovations [4, 17].

IKS is known worldwide for its potential to promote sustainable development, resilience, and inclusive growth. However, there is still not enough empirical evidence in Ghana showing how IK systematically contributes to innovation and socio-economic outcomes in the informal sector. For instance, the Ghana Innovation & Research Commercialisation Policy (2022) and the AU STISA 2024 initiative for Africa both call for inclusive innovation systems. However, neither provides clear ways to include IK into formal innovation pathways. This gap highlights the lack of an evidence-based framework that connects indigenous practices to innovation results and improvements in livelihoods. IKS offers a culturally rooted, fundamentally local, experiential, and adaptable knowledge framework [3, 22]. IKS includes practical, ecological, and social knowledge that is passed down through oral traditions, apprenticeships, storytelling, and group activities. It encourages new ideas by enabling problem-solving, resource use, and adaptation to different situations in farming, handicrafts, herbal medicine, and small-scale building [6, 11].

IK in Ghana has significant potential. However, it also faces many challenges. Institutional neglect, inadequate policy integration, insufficient documentation, generational disparities, and deficient market and digital infrastructure hinder its contribution to national innovation systems [12, 22]. These obstacles hinder the expansion of IK-based innovations and their acknowledgment as a legitimate and significant element of the knowledge economy.

This study examines the systematic application of IK to promote innovation and sustainable development within Ghana's informal sector, addressing existing gaps. It examines in detail the strategies, drivers, and outcomes of IK-based innovations, as well as policy-relevant approaches to integrating IKS into national innovation frameworks. The study seeks to inform inclusive, culturally sensitive, and sustainable innovation policies that connect IK with national and regional development goals by offering empirical evidence and a conceptual integration of IKS.

1.1 Indigenous knowledge systems

The IKS framework [3] offers a culturally grounded approach to understanding and applying knowledge, firmly anchored in the values, lived experiences, and environmental interactions of local communities. Rooted in the social and ecological contexts of indigenous communities [4, 20], IKS has evolved over time to address local concerns in sustainable and adaptable ways, in contrast to the Western-centric epistemologies that dominate formal education and innovation systems [5]. IK plays a critical role in local innovation and livelihood resilience in Ghana's informal sector [22], influencing activities such as organic farming, herbal medicine, traditional architecture, and artisanal crafts [6].

IK is passed down orally and is inherently place-based. Rather than being transmitted through written documents or formal education, it is conveyed through customs, storytelling, apprenticeships, and communal activities [4]. Traditional apprenticeships, for instance, continue to be a significant source of skill development in Ghana's informal sector, facilitating the transfer of artisanal and vocational knowledge that is both context-specific and adaptable [18].

Additionally, IKS is a strong force behind innovation and adaptability [16]. Due to its comprehensive approach, it fosters low-cost innovation and sustainable practices in ways that traditional research and development processes often overlook [18]. To produce competitive goods for domestic and foreign markets, many actors in the informal sector, particularly women, utilize IK in processes such as shea butter processing, natural dye production, and traditional food preservation [6]. Besides creating jobs and revenue, these activities enhance local self-sufficiency and resilience against environmental and socioeconomic shocks. IKS makes a significant contribution to socioeconomic development [22]. IKS-based businesses, including herbal medical systems [11], traditional ceramics, and regional textile weaving, provide economically and culturally important livelihoods in many Ghanaian communities [18].

Despite its promise, several obstacles hinder the effective use and integration of IKS into national research and development systems [12]. These obstacles include inadequate institutional frameworks, epistemic bias in policy and education, a lack of official documentation, and limited legal protections such as intellectual property rights [22]. IKS has been marginalized in Ghana's mainstream innovation strategies due to policy fragmentation and insufficient interaction between state actors and IK holders. Consequently, academics advocate for the acceptance, documentation, and integration of IKS into policy as a valid and significant component of the country's knowledge economy [5]. They emphasize the need to employ participatory methods in the design and implementation of innovations involving traditional leaders, knowledge custodians, and community-based organizations [1].

To investigate the strategies, drivers, and innovative potential of IK in Ghana's informal sector, this study employs the IKS paradigm [22]. In addition to analyzing the obstacles to the recognition and scaling of these techniques, it aims to describe how informal actors use IK to innovate and sustain their livelihoods [6]. By doing so, the study contributes to broader discussions on decolonizing development knowledge and fostering inclusive, culturally relevant innovation systems that align with the realities of local communities [12, 22].

1.2 The sustainable livelihood framework

The Sustainable Livelihoods Framework (SLF) is a way to look at how different types of capital, like human, social, natural, financial, and physical, affect sustainable livelihood outcomes [10, 13]. Human capital encompasses skills, knowledge, and labor, predominantly acquired through indigenous learning methodologies. Social capital includes networks, communal work, traditional councils, and guilds, which make it easier for people to share knowledge and learn from each other. Natural capital includes environmental resources that are available in the area, such as land, water, medicinal plants, and biodiversity. These resources are significant to workers in Ghana's informal sector. The SLF stresses the techniques individuals and communities adopt to integrate these assets to achieve livelihood objectives such as income creation, food security, environmental sustainability, and social cohesion.

Many people have used SLF to look at the social, economic, and environmental effects of different ways of making a living. It shows the paths by which knowledge, resources, and institutional support interact to form resilient and sustainable livelihoods [10, 21].

SLF helps academics figure out how initiatives, such as employing IK, affect the well-being of the whole community and economic growth by focusing on results.

1.3 Integrating IKS and SLF

While IKS provides the information base, the “what” and “how” of indigenous innovation, SLF serves as the analytical lens that connects this knowledge to actual livelihood outcomes. In other words, IKS identifies the culturally grounded practices, skills, and innovations held by individuals and communities. In contrast, SLF examines how these assets translate into higher income, greater environmental resilience, stronger social cohesion, and sustainable development.

The interplay of IKS and SLF thus offers a comprehensive framework for understanding both the substance and impact of IK. For example, traditional farming techniques (IKS) are studied through SLF to identify how they boost soil fertility (natural capital), increase household income (financial capital), encourage cooperative networks (social capital), and improve skills and knowledge transfer (human capital). Similarly, the production of indigenous crafts or herbal medicine, founded in IKS, can be evaluated using SLF to understand its contribution to employment, market access, and community well-being.

This study integrates these concepts to establish IKS as both a source of context-specific knowledge and innovation and as a means to attain sustainable livelihood outcomes. This combination enables a more detailed examination of how indigenous practices can be structured to encourage innovation, economic empowerment, and cultural continuity in Ghana’s informal sector.

2 Methodology

The research was conducted within a pragmatist research paradigm, which advocates for mixed-methods inquiry by prioritizing practical problem-solving, methodological adaptability, and the synthesis of diverse knowledge forms. Pragmatism was particularly appropriate as it enabled the integration of objective assessment of socioeconomic outcomes with culturally informed interpretations of IK practices, thereby ensuring that the results were both empirically sound and socially pertinent to policy and practice. This study utilized a mixed-methods research approach, implementing a sequential explanatory design whereby quantitative data collection and analysis were conducted prior to the qualitative phase. This design was suitable because it facilitated statistical generalization of patterns and relationships related to the utilization of IK in Ghana’s informal sector, followed by a comprehensive qualitative elucidation of the contextual meanings, experiences, and interpretations that inform the quantitative findings. The method improved explanatory depth by allowing qualitative insights to clarify, refine, and complete observed statistical trends in innovation, livelihoods, and sustainability outcomes.

The study took place in Ghana’s Volta and Oti Regions, which were chosen because they have strong IK traditions that are part of the local culture, way of life, and environmental practices. These areas host a wide range of informal sector activities, including artisanal crafts, indigenous agriculture, fishing, herbal medicine, traditional construction, and food processing. This makes them good places to look at how IKS can be innovative and sustainable.

For the quantitative phase, 300 respondents (150 from each region) were selected using stratified random sampling to ensure proportional representation across eight IK-related occupational groups: artisans and craft-based workers; traditional herbalists and healers; farmers and agro-processors; fisherfolk and fish processors; indigenous builders and technologists; traditional food vendors; cultural custodians; and district-level informal sector leaders. The inclusion criteria required that participants be actively involved in informal-sector activities, use IK significantly in their professional practices, and have at least 3 years of occupational experience. The sample size was deemed sufficient for inferential statistical analysis, encompassing regression modeling with multiple predictors. After the quantitative phase, purposive sampling was used to choose 30 key informants for the qualitative part. Selection was guided by quantitative results, especially variables exhibiting high statistical significance, low adoption rates, or divergent responses. Participants included IK holders, traditional leaders, seasoned practitioners, community development officials, local government representatives, and informal sector entrepreneurs, all equipped to elucidate the survey findings.

A structured questionnaire was used to collect quantitative data on how IK is used, how it affects innovation, people's livelihoods, and sustainability, and what people consider the most significant obstacles. To ensure the instrument was valid, experts in IK, development studies, and research methodology reviewed it. Then, it was tested with 30 people who were not part of the main study sample. Cronbach's alpha was used to assess reliability, and all coefficients were above the recommended 0.70 for the major constructs, indicating good internal consistency.

Semi-structured interviews and field observations were used to get qualitative data. The interview guide was developed directly from the quantitative findings, ensuring that the questions were grounded in the statistical patterns and relationships observed. Field observations and comprehensive field notes recorded Indigenous artifacts, production methodologies, and community-driven innovations, thereby facilitating triangulation and enhancing contextual depth. Before collecting data, the study got ethical clearance from the institutional ethics review board of KAAF University. It also got permission from community leaders and traditional authorities in the areas where the study took place. After being told what the study was about, that it was voluntary, and that they could leave at any time, all participants gave their informed consent. Participant coding and secure data storage ensured confidentiality and anonymity, while culturally sensitive IK shared during interviews was treated with respect and ethical responsibility.

We used SPSS version 26 to look at the quantitative data. Descriptive statistics, encompassing frequencies, percentages, means, and standard deviations, encapsulated demographic characteristics and IK practices. Correlation analysis and multiple linear regression were used in inferential analysis. In the regression models, the dependent variables included livelihood and sustainability outcomes such as income stability, innovation performance, environmental sustainability, and community well-being. Independent variables included IK utilization, knowledge transmission strategies, and institutional support. Qualitative data were transcribed and thematically analyzed through systematic coding, aligning themes with quantitative constructs to enable integrative interpretation.

The integration of quantitative and qualitative data transpired during both the design and interpretation phases. Quantitative results guided participant selection and the

formulation of interview questions, ensuring that the qualitative phase provided contextual elucidation of statistical trends. Qualitative themes were employed during interpretation to elucidate, corroborate, and enhance quantitative findings. Triangulating survey data, interviews, and observations helped make the research more credible by ensuring rigorous methods. Member checking bolstered interpretive accuracy, whereas comprehensive documentation of research methodologies guaranteed reliability. Detailed descriptions of the study setting and participants made it easier for readers to see how the findings could be used in other situations.

2.1 Presentation of findings

This section presents key findings about the forms, transmission, and socioeconomic significance of IK, highlighting how it drives innovation and sustainable development in Ghana's informal sector.

2.2 Strategies for harnessing indigenous knowledge

See Table 1.

The study of how to use IK across the eight groups, artisans and craft-based workers (ACB), traditional herbalists and healers (THH), farmers and agro-processors (FAP), fisherfolk and fish processors (FFP), local builders and indigenous technologists (LBT), traditional food vendors (TFV), cultural custodians (CC), and district-level leaders (DLL), shows that there are both similarities and differences in practice. Libraries, archives, museums, and apprenticeships were the most popular strategies (Mean = 84.13%), which shows that people really like structured experiential learning and formal preservation methods.

Qualitative interviews corroborated this, as a traditional herbalist remarked,

I learned from my grandmother's recipes and now maintain meticulous notes in a book to instruct my apprentices; otherwise, these skills could vanish.

Table 1 Strategies for harnessing IK

Strategies	Mean %	Std Dev
1. Storytelling	82.25	9.98
2. Mentoring	80.50	6.08
3. Apprenticeship	84.13	6.57
4. Succession planning	78.88	7.62
5. Socialization	81.38	5.70
6. Documentation	73.75	7.90
7. Community exhibition	75.75	6.61
8. Radio and local media use	71.88	6.89
9. Integration into school curriculum	80.88	5.99
10. Motivating, recognizing, and rewarding	82.25	7.06
11. Linking IK to market opportunities	79.13	4.24
12. Forming cooperatives to support IK	75.75	3.64
13. Funding IK activities	74.75	5.26
14. Debates among school children/students	80.13	6.64
15. Use of mobile/electronic platforms	67.63	6.71
16. Libraries, archives, and museums	84.13	6.34

This aligns with the IKS framework, which holds that passing down knowledge from one generation to the next and maintaining institutional memory are two ways to keep indigenous knowledge alive.

Storytelling and acknowledging knowledge custodians were also essential (Mean = 82.25%), indicating that social and cultural factors shape how knowledge is passed on. SLF insights show that these strategies build social capital by bringing people together and strengthening shared rules. They also build human capital by helping people learn new skills. It was interesting to see that incorporating IK into formal curricula (Mean = 80.88%) and mentorship (Mean = 80.50%) was fairly consistent across groups, with THH and CC scoring the highest. This suggests that professions with clear knowledge hierarchies or cultural authority tend to institutionalize learning better. A district-level informal leader said,

“Schools and apprenticeships together make a system where knowledge is not only spoken but also written down and acknowledged.”

On the other hand, the use of mobile and electronic platforms (Mean = 67.63%) is still low, especially among older practitioners in rural areas (ACB and FFP). This shows that there is a technological gap that makes it harder for IK to be shared more widely. The substantial variability (SD = 6.71) implies that access and technological literacy affect adoption rates among groups. Strategies that connect IK to market opportunities (Mean = 79.13%) were moderately but consistently important across all occupational groups. This shows that cultural knowledge can be turned into economic value.

2.3 Indigenous knowledge as a driver of innovation

See Table 2.

A comparison of the eight groups shows that the most important way IK supports innovation is through the practical application of work practices, with a mean of 90.38%. THH and CC consistently rated this highest, indicating that they rely on practices that are well-established and well-known. Respondents across all groups agreed that IK helps people develop new or better products and services (Mean = 84.63%) and solve problems in new ways (Mean = 84.13%).

This backs up what a farmer said:

“We combine old planting calendars with new irrigation techniques, and our yields have improved.”

Table 2 IK as a driver of innovation

IK as a driver of innovation	Mean %	Std Dev
1. My work practices are mainly based on IK	90.38	5.87
2. IK has helped me create new/ improved products/services.	84.63	7.40
3. I regularly apply traditional skills in innovative ways.	83.50	5.64
4. IK enhances my ability to solve everyday problems creatively.	84.13	6.52
5. I have passed down improved IK to others in my trade or community.	77.63	9.09
6. K gives me a competitive advantage	79.38	9.09
7. I have integrated IK with modern tools and methods.	62.13	7.33
8. IK contributes to my economic well-being.	81.38	6.31
9. IK has been adopted by other communities.	61.13	10.43
10. Support for IKS will improve innovation	90.13	4.81

These results indicate that IK not only sustains tradition but also actively influences adaptive and innovative livelihoods, aligning with the SLF's emphasis on human and natural capital.

The lowest overall score for combining IK with modern tools was 62.13%, indicating that it is very difficult to blend traditional and modern knowledge. This was especially clear in FFP and FAP, where the lack of the right tools and technical support made it hard to generate new ideas. Inferential analysis reveals substantial disparities among groups (ANOVA, $p < 0.05$), suggesting that innovation capacity is unequally distributed and is significantly influenced by infrastructure, community cohesion, and access to knowledge networks.

IK's competitive advantage (Mean = 79.38%) and its role in improving economic well-being (Mean = 81.38%) differed across groups. Artisans and THH reported more benefits than traditional food vendors and fisherfolk. Qualitative insights indicate that market visibility and institutional recognition influence this disparity. One kente weaver said, "My income has gone up because my designs are known outside of the village, unlike many who only work in the village."

2.4 Socio-economic contribution and sustainability of indigenous knowledge

See Table 3.

IK is very important for community health, as shown by the high average scores for maintaining cultural identity (76.50%) and supporting food security, health, or well-being (84.75%). Cultural custodians and farmers received particularly high scores, indicating the deep integration of IK in cultural and ecological practices.

Qualitative interviews corroborated these findings, with a fisherfolk participant asserting,

The traditional fish-smoking methods I use mitigate smoke pollution and maintain the cleanliness of our rivers, thereby safeguarding our community's health and food supply.

Environmental sustainability was another strong point, with waste reduction (76.13%) and resource conservation (77.57%) showing that people knew how to use natural capital in SLF. There were clear differences between occupational groups: artisans and local builders had better sustainability practices than food vendors or fisherfolk. This shows how IK integration varies by sector.

Table 3 Socio-Economic contribution and sustainability of IK

Socio-economic contribution and sustainability of IK	Mean %	Std Dev
1. My work provides stable income for my household.	54.75	4.06
2. IK contributes significantly to local employment.	60.50	3.44
3. I train or mentor others in my field, helping sustain local skills.	52.00	7.57
4. My work helps preserve cultural identity and community pride.	76.50	5.90
5. IK supports environmentally sustainable practices in my work.	71.13	4.01
6. My livelihood depends on natural resources that are managed sustainably.	70.00	4.44
7. IK practices reduce waste	76.13	5.30
8. IK encourages resource conservation.	77.57	4.95
9. My work contributes to food security, health, or well-being in my community.	84.75	4.42
10. Traditional practices are adaptable and can support long-term development.	83.13	3.71
11. Government or NGO support would improve the sustainability of IKS	93.50	2.39

Table 4 Barriers to IK

IK barriers	Mean %	Std Dev
1. Lack of documentation	79	5.62
2. Younger generations are not interested in learning traditional skills	82.63	5.96
3. Limited government/ institutional support	86.00	4.76
4. Modern technologies are displacing IK practices	71.13	3.55
5. IK is undervalued in mainstream society	71.13	7.40
6. IK is not integrated into the formal education system	81.13	6.10
7. Limited market access reduces the value of IK products/services	72.00	3.21
8. Difficulty protecting IK from misuse/exploitation	70.75	8.01
9. Lack of funding discourages the continued practice or expansion of IK	79.00	4.61
10. Few networks or collaboration opportunities with other IK practitioners	71.25	6.20
11. Climate change negatively affects IK practices	74.00	5.02
12. Indigenous languages are disappearing, reducing the transmission of IK	73.38	8.32
13. Negative perceptions of taboos discourage IK usage	67.00	5.82
14. Migration and urbanization disrupt IK transfer	72.63	4.92
15. Lack of digital tools to document & promote IK practices	63.50	4.90

The economic results were not very good. Income stability (54.75%) and job creation in the area (60.50%) were both lower than social and environmental indicators. This means that IK is culturally and ecologically important, but its economic potential is still underutilized. A regression analysis showed a strong positive association between the amount of IK used and job performance ($\beta = 0.42$, $p < 0.01$). This shows that investing in knowledge transfer and preservation has a positive effect on income and jobs, but not equally across all groups.

2.5 Barriers to indigenous knowledge utilization and growth

See Table 4.

The most important barrier across groups was a lack of government and institutional support (Mean = 86.00%), followed by young people's lack of interest (82.63%) and poor documentation (79.00%).

These findings align with qualitative insights, exemplified by a THH participant who expressed,

Young people prefer smartphones to learning herbal medicine; without guidance, this knowledge will vanish.

Differences between groups show weaknesses in specific sectors. For example, DLL and CC were more aware of institutional gaps, while FFP and TFV faced immediate economic pressures that made it harder to practice IK.

Other significant obstacles encompass undervaluation in mainstream society (71.13%), exclusion from formal education (81.13%), and restricted market access (72.00%). ANOVA tests show that cultural custodians, artisans, and food vendors have very different views of things ($p < 0.05$). This supports the idea that socio-economic, institutional, and technological factors affect the resilience and growth of IK.

The quantitative and qualitative evidence collectively indicate that the efficacy and sustainability of IK are closely associated with institutional support, intergenerational transmission, and access to contemporary infrastructures. By combining IKS and SLF perspectives, the study shows how using human, social, and natural capital can improve

innovation while also highlighting systemic gaps that make it hard to grow and make money.

3 Discussion of findings

3.1 Strategies for harnessing indigenous knowledge

The research shows that the best ways to sustain and use IK in Ghana's informal sector are to support institutions, encourage intergenerational learning, and recognize diverse cultures. Libraries, archives, museums, and apprenticeships received the highest ratings (Mean = 84.13%), indicating that structured and experiential learning remain very important. Storytelling and recognizing knowledge custodians (Mean = 82.25%) and incorporating them into school curricula (Mean = 80.88%) underscore the socially embedded character of IK. These results correspond significantly with the IKS framework, which asserts that oral traditions, mentorship, and collective learning are fundamental to the preservation and advancement of knowledge [5, 16].

From the SLF perspective, these strategies improve different types of capital: human capital by teaching skills and mentoring, social capital by telling stories and giving people credit, and institutional capital by creating repositories that make IK official. Consequently, the results indicate that effective IK preservation is not solely cultural but also functional, as it fortifies the foundations for innovation and community resilience.

Moderately rated strategies, such as succession planning (Mean = 78.88), working with researchers (Mean = 75.38), and mentoring schoolchildren (Mean = 80.13), demonstrate the importance of combining indigenous and formal knowledge systems. This supports the claim made by Govender and Mudzamiri [8] that participatory methods between elders, researchers, and schools confirm and strengthen IK. The lower-rated strategies, mobile/electronic platforms (Mean = 67.63), radio/media (Mean = 71.88), and funding initiatives (Mean = 74.75), show that there are still gaps in technology and infrastructure. These gaps make it harder for IK to reach more people, especially older and rural practitioners, which aligns with what Nyumba et al., [15] and Ferrari [7] say.

Cooperatives (Mean = 75.75) and connecting IK to market opportunities (Mean = 79.13) show possible ways to create economic value. However, these strategies need more institutional and financial support to reach their full potential [2]. These findings collectively demonstrate that IK strategies require cultural validation, institutional support, and social embedding to be effective, illustrating the dual application of the IKS and SLF frameworks.

3.2 Indigenous knowledge as a driver of innovation

The analysis verifies that IK is a pivotal catalyst for innovation in Ghana's informal sector. The item with the highest rating, "My work practices are mainly based on IK" (Mean = 90.38%), shows how important IK is to everyday economic and social activities. The second-highest rating, "Support for IKS will improve innovation" (Mean = 90.13%), indicates that participants see the potential of IK when it is given the right support. These results align with IKS theory, which posits that knowledge inherent in cultural practices is dynamic, adaptive, and essential for local problem-solving (Dei, [5]; Nhemachena, [14]).

Respondents also noted that IK promotes creative problem-solving (Mean = 84.13%), product and service enhancement (Mean = 84.63%), and the inventive application of

traditional skills (Mean = 83.50%). From a SLF perspective, these practices improve human capital (skills and abilities), social capital (sharing of knowledge), and financial capital (economic well-being). This shows how indigenous practices can lead to real innovations.

But the study also shows that there are still problems. The lowest mean score (62.13%) for the integration of IK with modern tools and methods indicates technological gaps that make hybrid innovation more difficult. Similarly, low external recognition of IK (Mean = 61.13%) suggests that commercialization and policy support are limited, consistent with Peddi et al. [19]. The variability in perceived competitive advantage (Mean = 79.38, SD = 9.09) indicates that innovation outcomes are unevenly distributed among occupational groups, influenced by infrastructure, community cohesion, and market access.

In general, these results show how IK can be transformational: it is not just static heritage knowledge, but a living system that can foster innovation that is adaptable, situation-specific, and rooted in culture. To realize this potential and ensure that all groups in the informal sector benefit from innovation, we need strong policies, institutional support, and the adoption of new technologies.

3.3 Socio-economic contribution and sustainability of indigenous knowledge

IK has a significant impact on the environment, society, and culture, but a minor impact on the informal sector economy. The high mean scores for community well-being (Mean = 84.75%) and cultural identity (Mean = 76.50%) show that IK is a strong supporter of social cohesion, cultural continuity, and community resilience. Qualitative insights, such as using traditional fish-smoking methods to reduce pollution, reveal the “eco-centric” side of IK, which aligns with the SLF’s focus on natural capital.

High average scores for waste reduction (Mean = 76.13%) and resource conservation (Mean = 77.57%) indicated that environmental sustainability was strengthening. These practices underscore IK’s contribution to fostering environmentally sustainable livelihoods, aligning with empirical studies on indigenous ecological knowledge [9].

On the other hand, economic outcomes such as stable income (Mean = 54.75%) and local jobs (Mean = 60.50%) are not as strong. Mentorship and skill transfer (Mean = 52.00%) also indicate gaps in the development of human capital and in knowledge sharing. These results corroborate that, although IK fosters cultural and environmental sustainability, it is still inadequately employed within formal value chains and economic networks. Regression analyses reveal a positive correlation between IK utilization and livelihood outcomes ($\beta = 0.42$, $p < 0.01$), underscoring the potential for policy and market interventions to augment the economic contribution of IK.

The amalgamation of IKS and SLF frameworks offers a theoretical perspective for comprehending these dynamics. IKS emphasizes the cultural and knowledge-based underpinnings of innovation. In contrast, SLF contextualizes IK within a broader socio-economic and environmental framework, highlighting deficiencies in institutional support, digital infrastructure, and intergenerational transmission. These frameworks together show that specific actions are needed to achieve long-lasting, comprehensive development outcomes.

3.4 Barriers to indigenous knowledge utilization and growth

The research delineates institutional and intergenerational obstacles as the principal impediments to the application and sustainability of IK. The fact that only 86% of people and 82% of young people are interested in government and institutional support shows that there are problems with how knowledge is passed down. Poor documentation (Mean = 79.00%) and a lack of digital tools (Mean = 63.50%) make it even harder to scale and preserve, as Nyumba et al., [15] say.

Additional challenges, such as undervaluation in mainstream society (Mean = 71.13%), exclusion from formal education (Mean = 81.13%), restricted market access (Mean = 72.00%), and the effects of climate change (Mean = 74.00%), underscore the complex nature of IK vulnerability. SLF theory interprets these as inadequacies in social, human, and financial capital, whereas IKS theory underscores the dangers of undermining indigenous epistemologies.

To get rid of these barriers, we need to make intentional policy changes, invest in institutions, integrate technology, and start educational programs. Connecting IK to economic value chains and improving the transmission of knowledge across generations are both important steps in turning cultural heritage into long-lasting innovation and jobs.

3.5 Implications of the study

This study shows that IK is a key factor in the informal sector's ability to generate new ideas, remain viable, and earn a living in Ghana. Evidence from the real world shows that IK has a significant effect on how people work, solve problems creatively, and develop new products and services. The results have numerous theoretical and practical ramifications.

The study shows how IK can foster inclusive innovation in the informal economy, particularly in herbal medicine, artisanal crafts, and indigenous agriculture. IK plays a significant role in cultural continuity, environmental sustainability, and social cohesion. However, its economic potential is not being fully realized because institutions do not pay it sufficient attention, it is not well-documented, and it is not well-integrated with modern technologies. The fact that few people use digital platforms and that the market is not well-integrated indicates that policy and infrastructure changes are needed to make IK-based innovations more widespread and to have a greater impact on society and the economy.

The research confirms the integration of IKS and the SLF, illustrating the interplay between cultural knowledge and human, social, and natural capital to yield sustainable outcomes. It emphasizes the need to expand innovation theory to encompass culturally embedded, community-driven knowledge systems, thereby contesting traditional, high-tech-centric innovation frameworks. The evidence substantiates that IK is dynamic and adaptable, corroborating theoretical assertions that indigenous practices are not static relics but rather active, context-specific knowledge systems that enhance resilience and foster local development.

3.6 Recommendations

The study suggests that governments and organizations should do more to support the documentation, preservation, and promotion of IK, as these are important for innovation and sustainable development. Including IK in formal and vocational education, as

well as apprenticeships, mentorship, and storytelling, can help pass on knowledge from one generation to the next. Helping cooperatives, connecting markets, and giving money and training programs will all help turn IK into long-lasting business activities. Using digital tools and combining old ways with new can help you be more productive and reach more customers. Also, supporting IK practices that conserve resources, reduce waste, and promote food security, health, and community well-being will ensure that the environment and society remain sustainable in the long term.

4 Conclusion

This study shows that IK is a key factor in innovation, sustainable livelihoods, and socio-cultural resilience in Ghana's informal economy. Quantitative and qualitative evidence demonstrate that IK is widely used across occupational groups, with 90.38% of respondents relying on it in their professional practices. The study shows that IK not only keeps traditional practices alive, but it also encourages creativity, problem-solving, and the creation of better products and services. 84.63% of participants reported generating new ideas based on IK. Apprenticeships, storytelling, acknowledging knowledge, and using libraries, archives, and museums were all found to be the best ways to keep and pass on IK. These strategies strengthen human, social, and institutional capital, which aligns with both the IKS framework and the SLF.

The results show that IK plays a significant role in preserving cultures, protecting the environment, and improving community health. Practices such as conserving resources, reducing waste, and adopting environmentally friendly production methods demonstrate how IK can enhance natural capital and lower ecological risks. IK also helps keep communities together and their identities intact, giving them a sense of pride and belonging. However, the economic benefits of IK have not yet been fully realized. IK improves people's lives, but income stability (54.75%) and job creation (60.50%) are both low. This suggests that the economic potential of IK-based innovations is constrained by limited market access, insufficient institutional support, and limited integration with modern technologies.

Several factors make it hard to fully use and grow IK. These include a lack of support from the government and institutions, a lack of interest from younger generations, poor record-keeping, a lack of value in mainstream society, and a lack of integration into formal education and digital platforms. These problems show how important it is to have targeted interventions, such as policy support, funding mechanisms, digital documentation, intergenerational transfer programs, and formal recognition of IK in national innovation strategies. Addressing these limitations would enhance IK's economic, social, and environmental contributions while ensuring its sustainability for future generations. In summary, this study offers empirical evidence that IK is a culturally ingrained, flexible, and inventive resource with considerable potential to promote sustainable development in Ghana's informal sector. The study shows that combining the IKS and SLF frameworks can help preserve, transmit, and support IK in ways that encourage innovation, improve people's lives, and make communities more resilient. These findings necessitate deliberate policy initiatives, institutional support, and market-driven strategies to fully harness IK as a catalyst for sustainable development, innovation, and cultural continuity in Ghana.

Author contributions

LAD - Conceptualisation, drafting, methodology, analysis, reportingDJD - Methodology, literature review, editing, reportingPEDO - Review, data collection, reporting.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. The study was self-funded by the authors as part of an academic research initiative.

Data availability

Available upon request in a reasonable time.

Declarations**Ethics approval and consent to participate**

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki (2013 revision), which guides research involving human participation. Ethical approval for this study was obtained from the Institutional Review Board of the Center for Research and Graduate Studies, KAAF University (IRB-KU/HSS/25/02/19). All participants were fully informed of the study's purpose, procedure, and the voluntary nature of their participation. Informed consent was obtained from each participant between January 7th and 29th, 2025, prior to data collection. Respondents were assured of anonymity and confidentiality, and participation was entirely voluntary.

Consent for publication

Not applicable, as the study did not involve the use of personal or identifiable data.

Competing interests

The authors declare no competing interests.

Received: 2 November 2025 / Accepted: 11 February 2026

Published online: 18 February 2026

References

1. Akolgo-Azupogo H, Rubens A, Bardy R. Soft skills in developing economies: an African view on the hidden linkage between Indigenous knowledge and business perspectives. *J Afr Stud Dev*. 2021;13(3):47–58.
2. Alberio M, Soubirou M. How can a cooperative-based organization of Indigenous fisheries foster the resilience to global changes? Lessons learned by coastal communities in Eastern Québec. *Environ Policy Gov*. 2022;32(6):546–59.
3. Barman P. The ethical frontier: integrating IKS for sustainable economic development. *MSW Manage J*. 2024;34(1):228–38.
4. Dei DGJ. Sustainability and development of EWE communities in Ghana through Indigenous knowledge management practices. *Collect Curation*. 2024;43(4):111–23.
5. Dei DGJ, Danquah MM. (2024). Mirrors of knowledge and Indigenous knowledge management. *J Librariansh Inform Sci*, 09610006241269170.
6. Dutto C. (2025). *Sustainability and indigenous frameworks of innovation, interrelation, and socio-economic organization: a case study of a Misak community in western Colombia* (Doctoral dissertation, Politecnico di Torino).
7. Ferrari A, Bacco M, Gaber K, Jedlitschka A, Hess S, Kaipainen J, Brunori G. Drivers, barriers and impacts of digitalisation in rural areas from the viewpoint of experts. *Inf Softw Technol*. 2022;145:106816.
8. Govender N, Mudzamiri E. Incorporating Indigenous artefacts in developing an integrated Indigenous-pedagogical model in high school physics curriculum: views of elders, teachers and learners. *Cult Sci Edu*. 2022;17(3):827–50.
9. Guodaar L. (2021). *Climate change, Indigenous knowledge and food security in northern Ghana* (Doctoral dissertation, Doctoral dissertation).
10. Knutsson P. The sustainable livelihoods approach: A framework for knowledge integration assessment. *Hum Ecol Rev*. 2006;13(1):90–9.
11. Mir TA, Jan M, Khare RK, Bhat MH. (2021). Medicinal plant resources: threat to its biodiversity and conservation strategies. *Med Aromatic Plants: Healthc Industrial Appl*, 717–39.
12. Mugambiwa SS, Rankoana SA, Tirivangasi HM. Climate governance beyond the government: Indigenous knowledge systems in rural zimbabwe's climate change adaptation. *Int J Dev Sustain*. 2023;12(6):238–49.
13. Natarajan N, Newsham A, Rigg J, Suhardiman D. A sustainable livelihoods framework for the 21st century. *World Dev*. 2022;155:105898.
14. Nhemachena A. Indigenous Knowledge, conflation and postcolonial translations: lessons from field work in contemporary rural Zimbabwe. *Between Rhetoric Reality: State Use Indigenous Knowl post-colonial Afr*. 2015;Bamenda(Langaa RPCIG):59–106.
15. Nyumba TO, Sang CC, Olago DO, Marchant R, Waruingi L, Githiora Y, Omangi S. (2021). Assessing the ecological impacts of transportation infrastructure development: A reconnaissance study of the standard gauge railway in Kenya. *PLoS ONE*, 16(1), e0246248.
16. Oguamanam C. Indigenous peoples, data sovereignty, and self-determination: current realities and imperatives. *Afr J Inform Communication*. 2020;26:1–20.
17. Olaopa OR, Ayodele OA. Building on the strengths of African Indigenous knowledge and innovation (AIK&I) for sustainable development in Africa. *Afr J Sci Technol Innov Dev*. 2022;14(5):1313–26.
18. Owusu-Ansah KK. Sustainable development: implications for urban employment in emerging global Cities, a case study of Accra, Ghana. University of Wyoming; 2024.
19. Peddi B, Ludwig D, Dessein J. Relating inclusive innovations to Indigenous and local knowledge: a conceptual framework. *Agric Hum Values*. 2023;40(1):395–408.

20. Robinson JM, Gellie N, MacCarthy D, Mills JG, O'Donnell K, Redvers N. (2021). Traditional ecological knowledge in restoration ecology: a call to listen deeply, to engage with, and respect Indigenous voices. *Restor Ecol*, 29(4), e13381.
21. Shang Q, Li M, Wang H. (2021). Environment governance, sustainable livelihood and indigenous knowledge in ethnic tourism villages of China. In *E3S Web of Conferences* (Vol. 272, p. 01027). EDP Sciences.
22. Yeleliere E, Antwi-Agyei P, Nyamekye AB. Mainstreaming Indigenous knowledge systems and practices in climate-sensitive policies for resilient agricultural systems in Ghana. *Soc Nat Resour*. 2023;36(6):639–59.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.