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An Examination of Tacit Knowledge Types Possessed by the Small Scale Gold Miners Towards Sustainability: A Study of Kakamega County, Kenya

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Abstract

Tacit knowledge among the artisanal small scale gold miners of Kakamega County Government remain informal. The accumulated tacit knowledge is at risk of disappearing if it is not identified, organized, stored, and distributed as part of the community heritage. The aim of the study was to examine the types of tacit knowledge possessed by the small scale gold miners for sustainability in Kakamega County, Kenya. The specific objectives were to examine the influence of technical, cognitive and social types of tacit knowledge on sustainability of Gold mining. The study was informed by Meyer and Zack knowledge management model and the theory of sustainable development by Zhang Xiangyi. The study which is qualitative in nature adopted the case study design. The target population was one thousand eight hundred and twenty two (1822) gold miners. The researcher used purposive sampling technique to select the two (2) sub-counties (Ikolomani and Lurambi) in Kakamega County where gold is mined. The researcher further used cluster sampling to sub-divide the 2 sub counties into 26 and 11 mining sites. The sample size was three hundred and thirty five (335) gold miners. Data was collected using in-depth interviews, participant observation, and focus group discussions. Data was analyzed using thematic analysis and presented using tables and graphs. The study established that the small scale gold miners of Kakamega County possess three (3) types of tacit knowledge including technical, cognitive and social tacit knowledge. The study concludes that the technical social and cognitive tacit knowledge enables the small scale gold miners to; identify gold rich areas, safely navigate the mining pits, safely handle the mining tools, safety protocol, identify and develop solutions to the mining problems. The study recommends the capturing storing and sharing of the key tacit knowledge assets for sustainability among the small scale gold miners of Kakamega County, Kenya. The study is expected to assist the small scale gold miners of Kakamega County use their technical, social and cognitive knowledge to foster sustainability.

Keywords: Gold mining, Sustainability, Tacit knowledge

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1.0 Introduction

According to Mdhluli (2021) different people within the community possess different types of tacit knowledge. Mdhluli (2021) further noted that members of the community have dormant tacit knowledge that is untapped. By recognizing the different types of tacit knowledge such as technical, cognitive and social tacit knowledge, organizations can develop tailored strategies to harness this valuable resource. Tacit knowledge management practices are linked to the norms of capturing, organizing, storing, and disseminating knowledge within a society (Mazzocchi, 2020). Miye, Huaman & McCarly (2019) also noted that respect to tacit knowledge management practices contribute to equitable development and proper management of the environment. Tacit knowledge management practices can be used as a tool for poverty alleviation, sustainability, and empowerment (Mikulecky & Lodhi, 2010). Miye, Huaman & McCarly (2019) noted that the nature of tacit knowledge makes it difficult for it to be captured, stored, and shared. Implementing practices such as documentation, mentorship, and fostering community of practice can lead to a more sustainable and efficient knowledge mining practices, benefiting both the miners and the broader community.

Artisanal small scale gold mining in Kakamega County is considered economically advantageous than other activities such as agriculture (Alwang'a, Mulinya & Mabonga, 2020). Many families in Kakamega County have shifted to the artisanal small scale gold mining in order to supplement the agricultural activities. According to Machacek (2019) artisanal small scale gold mining contributes to the growth domestic product (GDP) of the Country. However, the sector is often marred by unsustainable practices that threaten both environmental and human health. A critical yet underexploited resource in addressing these challenges is the tacit knowledge held by the miners themselves. This study examined the types of tacit knowledge possessed by the small scale gold miners for sustainability in Kakamega County, Kenya.

The objective of the study was to:

- Examine the influence of technical, cognitive and social types of tacit knowledge on sustainability of Gold mining at the Kakamega County.

2.0 Methodology

The study which is qualitative in nature adopted the case study design. The target population was one thousand eight hundred and twenty two (1822) gold miners. The researcher used purposive sampling technique to select the two (2) sub-counties (Ikolomani and Lurambi) in Kakamega County where gold is mined. The researcher further used cluster sampling to sub-divide the 2 sub counties into 26 and 11 mining sites. The sample size was three hundred and thirty five (335) gold miners. Data was collected using in-depth interviews, participant observation, and focus group discussions. Data was analyzed using thematic analysis and presented using tables and graphs.

3.0 Findings and Discussions

The objective of the study was to examine the influence of technical, cognitive and social types of tacit knowledge on sustainability of Gold mining at the Kakamega County, Kenya.

3.1 Technical Tacit Knowledge

The study sought to examine the technical tacit knowledge possessed by the small scale gold miners of Kakamega County. The findings of the study examined the gold miners technical tacit knowledge through sources of tacit knowledge, identifying gold rich veins, tools used to mine gold, and the mining procedures.

The finding of the study revealed three core sources of technical tacit knowledge that are family tradition, community knowledge and training programs.

Table 3.1: Sources of tacit knowledge

Source	Frequency	Percentage
Family tradition	24	85.7%
Community Knowledge	21	75.0%
Training programs	17	60.7%

Source: Research data (2025)

The findings of the study revealed tacit knowledge among the small-scale gold mining in Kakamega County is primarily acquired through family and community structures, forming a deeply embedded, informal knowledge system. This confirms the findings of study by (Mdhluli, 2021) that the traditional wisdom enables miners to start and sustain operations with minimal formal training. However, training programs where accessed introducing essential safety and operational knowledge, creating a bridge between indigenous and institutional learning.

The primary motivations for entering mining 'easy money and lack of employment' reinforce a pattern of learning that is fast, informal, and community-based. Quotes from participants affirm with (Mdhluli, 2021) that the gold miners' knowledge rely on is shared through lived experiences, observation, and oral transmission.

The findings of the study revealed safety (61.1%) as the most frequently mentioned training type, likely reflecting the highest informal or semi-formal awareness in the field. The finding of the study also revealed blasting (27.8%) and machine operation (11.1%), which require more technical knowledge, are significantly less represented—raising concern over risk management. The study further revealed a majority (over two-thirds) of the groups had no indication of training whatsoever, highlighting a clear need for structured intervention in the form of training programs.

The study revealed that miners use traditional, experience-based methods to determine where gold might be found. The findings of the study further revealed five key strategies used by the gold miners to identify where to construct the mining shafts. These findings confirms with Mdhluli, 2021) that technical tacit knowledge is shared informally and passed from one miner to another.

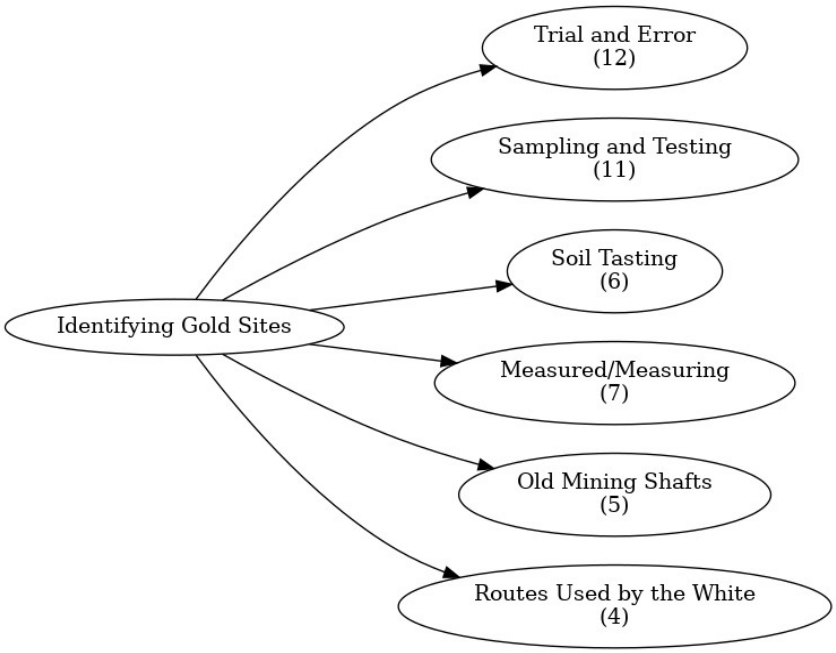

Figure 3.1: Identifying gold mining sites

Source: Research data (2025)

The most common tools used for mining include chisels, punches, 'nyundo mjinga' (a type of hammer), and compressors. These tools are integral to manual mining, with chisels and punches being the most frequently mentioned, reflecting their role in breaking rock and extracting minerals. Compressors are frequently mentioned alongside these tools, indicating that miners also rely on air-driven tools to assist with tasks that require additional force or precision. The high frequency of chisels, punches, and hammers (nyundo mjinga) shows the dominance of traditional tools in mining practices, particularly in artisanal or small-scale mining environments.

Most respondents mentioned that the special features of their mining tools were either sharp or strong, which are essential qualities for tools used in breaking rock or extracting minerals. The sharpness of tools, such as chisels and punches, is critical for ease of use and efficiency in penetrating tough materials, while strength ensures that the tools can withstand repeated impact without breaking.

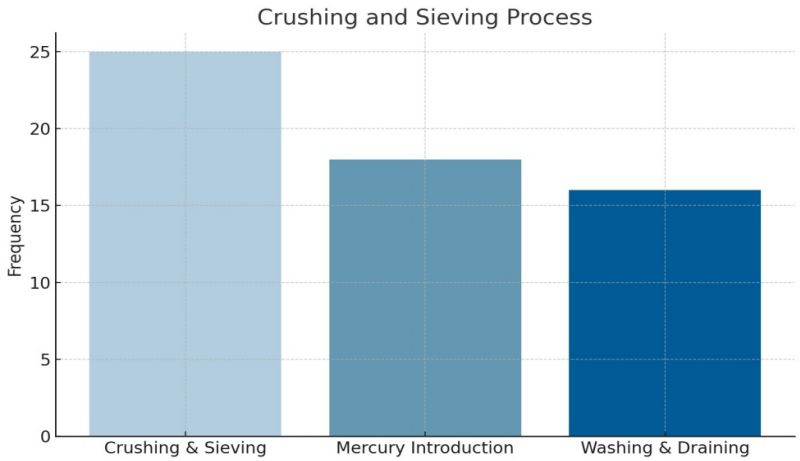

Figure 3.2: Gold mining process

Source: Research data (2025)

The core themes of Crushing and Sieving, Mercury Introduction, Washing, and Draining show that the gold extraction process is predominantly driven by traditional methods. There is a clear reliance on manual labor and basic tools, suggesting potential for introducing more modern, environmentally friendly and efficient practices into the mining sector.

The cross-referencing of steps throughout the mining procedure provides a clear picture of how each task feeds into the next, emphasizing the cyclical nature of this process. It is also evident that improving efficiency and safety, particularly with respect to mercury usage, would lead to a more sustainable and safer gold extraction method as opined by (Kannan, Mahesh and Abhijit (2021)

3.2 Cognitive tacit knowledge

The study seek to examine the cognitive tacit knowledge among the small scale gold miners of Kakamega County. Safety measures before entering the mining pits was used to examine the cognitive tacit knowledge among the small scale gold miners of Kakamega County.

Table 3.2: Word Frequency Table

Word	Frequency
Shaft(s)	40
Protective Gear(s)	32
Registration	26
Tools/Equipment	19
Well Constructed	12
Check/Inspect	11
PPE (Personal Protective Equipment)	6

Source:Reseaerch data (2025)

The data reveals that small-scale gold miners in Kakamega County possess a deep well of tacit knowledge regarding safety measures before entering the shaft. These safety practices, including shaft construction,

protective gear usage, pre-entry registration, and tool inspections, are learned informally through experience, community interaction, and observation. This form of knowledge, though not formally documented, plays a crucial role in ensuring miners' safety and sustainability in their work environment.

The redundancy of these safety measures across different respondents indicates their importance and the consistency with which they are applied, showcasing the strength of tacit knowledge in sustaining safe mining practices in Kakamega County as opined by (Hilson and Maconachie, 2020). The word frequency table further highlights the key safety practices and terminologies, emphasizing the central role of shafts, PPE, registration, and equipment inspection in the miners' safety framework.

3.3 Social Tacit Knowledge

The study sought to examine the social tacit knowledge among the small scale gold miners of Kakamega County. Gold weight determination and gold selling location were used to determine the social tacit knowledge among the small scale gold miners of Kakamega County.

The study showed an overwhelming use of digital machines (100%) suggesting that miners have adapted modern techniques, indicating a high level of experiential and technology-based tacit knowledge. Miners predominantly rely on middlemen due to accessibility and possibly established trust systems. This illustrates a social dimension of tacit knowledge critical for transaction success.

Table 3.3: Cross-tab Analysis: Gold Price vs. Selling Locations

Gold Price Type	Brokers	Middlemen	Brokers, Middlemen
ksh 80 Per unit	3	5	0
ksh 78 Per unit	2	2	0
Depends with dollar	2	5	0
Depends with weight	2	6	1

Source: Research data (2025)

The findings of the study illustrates that small-scale gold miners in Kakamega possess a deep, experience-based understanding (social tacit knowledge) of gold pricing, weighing, and selling. Their reliance on dollar value, digital scales, and middlemen reflects a hybrid knowledge system—blending traditional know-how with market dynamics and technology use. These tacit skills are fundamental for sustaining their economic livelihoods.

4.0 Conclusion

The study concludes that a majority of respondents lack professional training, which suggests that tacit knowledge remains the dominant form of mining expertise in this community. Specialized technical tacit knowledge, such as soil sampling and machine operation, is limited to a few miners, but it can have a positive impact on the effectiveness and efficiency of mining operations if more miners receive similar training.

The study also concludes that a small but notable portion of respondents' posses' cognitive tacit knowledge on safety such as construction of shafts. These could significantly contribute to sustainability by minimizing environmental degradation and improving worker safety.

The study further concludes that small-scale gold miners in Kakamega possess a deep, experience-based understanding (social tacit knowledge) of gold pricing, weighing, and the gold selling location.

5.0 Recommendation

The study gave the following recommendation

1. There is need for structured tacit knowledge management program for capturing and sharing the gold miners knowledge in Kakamega County to improve mining practices and promote sustainability

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