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Designing an Exploratory Indigenous Knowledge Management Framework for Soil Conservation Mechanism in the Konso Community

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Abstract

In Ethiopia, there are diverse Indigenous Knowledge systems across different regions and ethnicities. The Konso people, specifically, possess unique indigenous knowledge used for various purposes, such as weather forecasting, traditional medicine, soil conservation, and environmental protection to enhance productivity. The primary objective of this research study is to explore and design an Indigenous Knowledge Management framework specifically focused on soil conservation mechanisms among the Konso people. Therefore, it is crucial to explore and design an IKM framework and develop a prototype that simplifies the processes involved in knowledge management. The research adopts an exploratory research method and a design science research design to gather knowledge from various sources. Both qualitative and quantitative research approaches were employed, utilizing data collection tools such as interviews (questionnaires), surveys, technical observations (checklists), and analysis of existing documents. The collected data revealed new insights, leading to the design and development of a newly proposed IKM framework for soil conservation, implemented using the SWI Prolog tool. Furthermore, the designed and developed IKM framework for soil conservation was evaluated and validated according to ISO-1826 I standards. The findings of this study indicate its significant importance in terms of knowledge sharing, transfer, utilization, and preservation, particularly in combating soil erosion and land degradation in Ethiopia, specifically among the Konso people. User and expert evaluations were conducted, with the results showing that 70% of respondents acknowledged the knowledge deliverability, 87.5% found the framework attractive, 75% agreed on its accessibility, and 62.5% deemed it suitable for their needs. These results strongly support the notion that the proposed IKM framework and prototype for soil conservation among the Konso people can effectively share, transfer, and preserve indigenous knowledge for future generations.

Keywords: Indigenous Knowledge, KM Framework, Knowledge Management, Knowledge Preservation, Soil conservation

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I. Introduction

Currently, the role of Indigenous knowledge (IK) which is traditional knowledge has different roles for different purposes that exist in the different ethnic groups of one country in this world. Ethiopia has more than 80 ethnic groups that own their indigenous knowledge systems. Among Ethiopian ethnicities, Konso is one very well-known ethnicity that has its different indigenous knowledge used for different purposes like weather forecasting, traditional medicine, soil conservation, etc. Accordingly, among the Konso People, soil conservation is one of the mechanisms used for environmental protection and prevention of land degradation by using their indigenous knowledge. Since the Konso people have their own localized soil conservation mechanisms, IK starting from ancient times is highly needed to be transferred to the next generation. The transfer of this very power to environmental protection that increases productivity and the use of computing technology for knowledge preservation from generation to generation is thus vital. Therefore, exploring and designing the framework for this indigenous knowledge of the Konso people's soil conservation mechanism has a great impact on knowledge sharing and preservation.

Also, this IK provides a very important input to socio-cultural capital that is essential for communities to not only survive but also to go beyond and flourish within the given contexts of that community's geography, environment, culture, and economy.

However, IK has a great role not only in solving problems but also in socio-economic development that faces one community, particularly soil erosion, based on their local norm and serves as a bridge to cultivate and tie community with its surrounding phenomena to communicate with it [1]. Hence, in this research study, the researchers explore and design the IK framework with a functional prototype for the Konso people's soil conservation mechanisms.

A. Statement of the Studied Problem

Nowadays, the soil conservation mechanism IK of Konso people is serving the community in the socio-economic activities and this knowledge has been playing a great role in the protection of the soil from erosion and the increasing of agricultural productivity. Practicing this IK of the Konso community in all parts of our country Ethiopia is very important. However, there are different gaps in how the IK access, share, and preservation tasks are carried out in the community. This is due to a lack of computing technology that captures, represents, shares, and preserves the IK of the community. To practice this IK, it is necessary for the community to first know and understand the basic principle of the mechanism and correctly apply it, but no KM approach facilitates the utilization and preservation of this knowledge.

The utilization and management of this relevant IK are still extremely poor and still not supported by the KM approach and practiced in a computing way extensively in IK sharing and preservation. Based on a

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deep review of the literature, there is a crystal-clear lack of research studies focused on managing IK using knowledge management approaches. Also, the exploration and application of the KM approach for designing the IKM framework are still not fully exploited to support soil conservation for managing and enhancing the usability of the soil conservation IK. The importance of the IK obliges a need to manage the IK for effective leverage of the IK and continued innovation, supported with computing. Here is the gap where the researcher is motivated to propose and introduce appropriate solutions by designing a framework for this IK that facilitates the full management, preservation, and usage of this IK.

Because the KM approach is not applied in this specified area, different problems have occurred like lack of Indigenous knowledge sharing, utilization, preserving, and lack of IK management approach which are the most challenging for the users. Depending on this indigenousness and the importance of this IK in the different socio-economic lives of the people in Ethiopia, the researcher is inspired to introduce suitable KM approaches that can increase the utilization of this IK.

Soil degradation in the structure due to water erosion is one of the most extreme and critical environmental problems of sub-Saharan Africa in general and Ethiopia in particular because of its consequences on subsistence agriculture upon which the livelihood of not less than 75% of the populace depends. In response to that, countless soil and water conservation practices on the grounds have been undertaken. However, the impact of the campaigns failed because the techniques that have been delivered used in soil and water conservation had been of little interest to the local community. They did not consider whether or not the neighborhood could observe and understand the techniques without problems based on their existing practices.

In addition, over the previous decades, Ethiopian government organizations have been attempting to assist higher land use and promote exclusive methods to end soil degradation and enhance peoples' living. Furthermore, the previous development efforts had given much less attention to IK practices and farmers' participation in solving their environmental problems. The past 10 years have witnessed extreme soil degradation in Ethiopia. This was because the indigenous practices have been challenged by present-day land management. Indigenous communities advance and allocate land use structures closely interconnected to their lifestyle and well adapted to their ecosystem [8].

Agricultural practices in Ethiopia have long been accompanied by soil erosion. The estimated annual soil loss in Ethiopia is approximately 1.5 billion tons [8]. Sustainable use and management of soil are thus pivotal to enhance the immense role of agriculture in the present economic development. However, soil conservation through indigenous knowledge practices is frequent in some parts of the world where the communities develop the norm of conservation practices and perpetuate it from generation to generation.

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B. Significance of the Study

In this study, we explored the IK-designed framework and a developed functional prototype that has great significance for the development of this environmental protection IK and increase of the agricultural productivity in Ethiopia by solving soil degradation and greenhouse effects. So, the Konso people and the Ethiopian government (Agriculture sector) will directly benefit from this proposed research study.

II. Literature Review

Different scholars defined Knowledge Management (KM) differently in different domains. According to [9] and [10] KM is an impression that one company or organization, group or individual collects, transfers, and arranges the knowledge and brings the importance from their understanding. Also, KM can be defined as a sharing of knowledge between enterprises, teams, or individuals that are located in the same or different locations [9].

In addition to this according to [5], IK is part KM that is a non-codified knowledge in the mind of individuals or communities' way of working and lifestyle of one or more communities to support individuals, groups, and organizations. According to some scholars' findings, IK is a knowledge that appears traditionally in one society to teach generations about knowledge of the ecosystem [6] [7].

As per [12], different scholars show in their findings Nonaka knowledge management model that Socialization, Externalization, Combination, and Internalization (SECI) are very important for the discovery, creation, capturing, sharing, utilization, and preservation of knowledge.

According to [11], knowledge representation (KR) is the process of application of logic and ontology to construct a computational model for a specific domain to solve problems like conflict resolution, reconciliation, and compensation. In this study, the researcher tries to represent extracted knowledge using the knowledge representation technique.

III. Research Methodology

A. Research Design and Approach

Different types of research designs can be used by researchers as per the purpose of the study. Furthermore, the design stands to ensure that pertinent information for the research is acquired [14]. Also, it is considered a plan of action to solve the research problem by analyzing data and drawing conclusions [15]. Accordingly, in this research study, design science research design was used and depicted in Fig.1. This research design contains different steps of action like problem identification and motivation, the definition of the objectives for a solution, design and development, demonstration, and evaluation. Fig. 2 depicts the research process design process.

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In this research study, both qualitative and quantitative (mixed) research approaches were used. Thus, a mixed research approach was used to collect data from primary and secondary sources to solve specified domain problems.

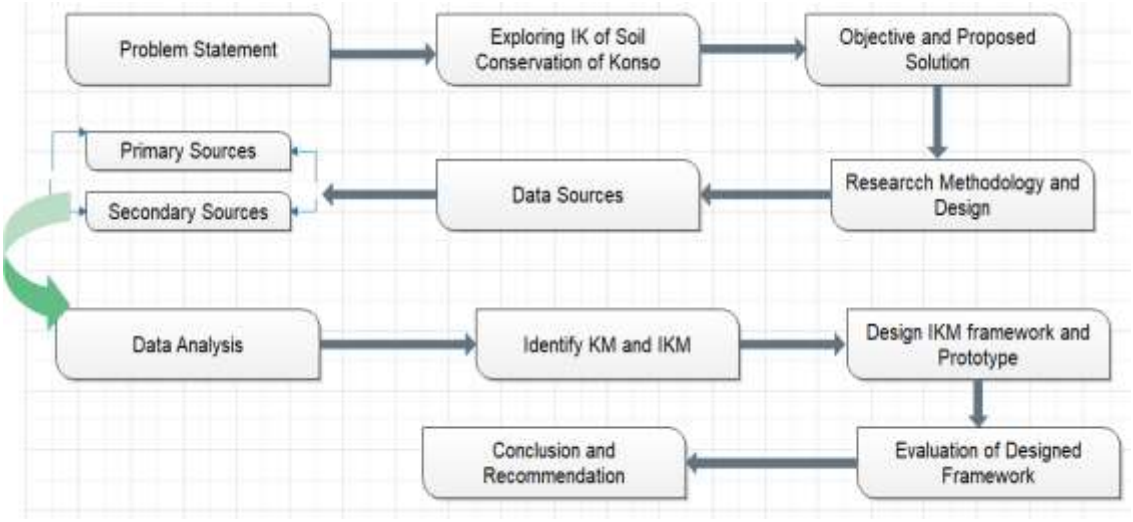

Fig. 1. Design: science research design [16]

B. Data Collection Method

In the research study, data were collected from primary and secondary sources using different data collection tools like surveys (questionnaires), interviews, technical observation (checklist), and focus group discussions. Primary data sources are community leaders, elders, community, communication, the culture and tourism office, and the environmental protection office. Also, secondary data sources used are published books, manual records, articles, magazines, and newspaper feature articles [20] about soil conservation mechanisms.

C. Tool Selections

As depicted in Fig. 2 the tool selection process is carried out to select the tools for designing the framework and develop the proposed functional prototype.

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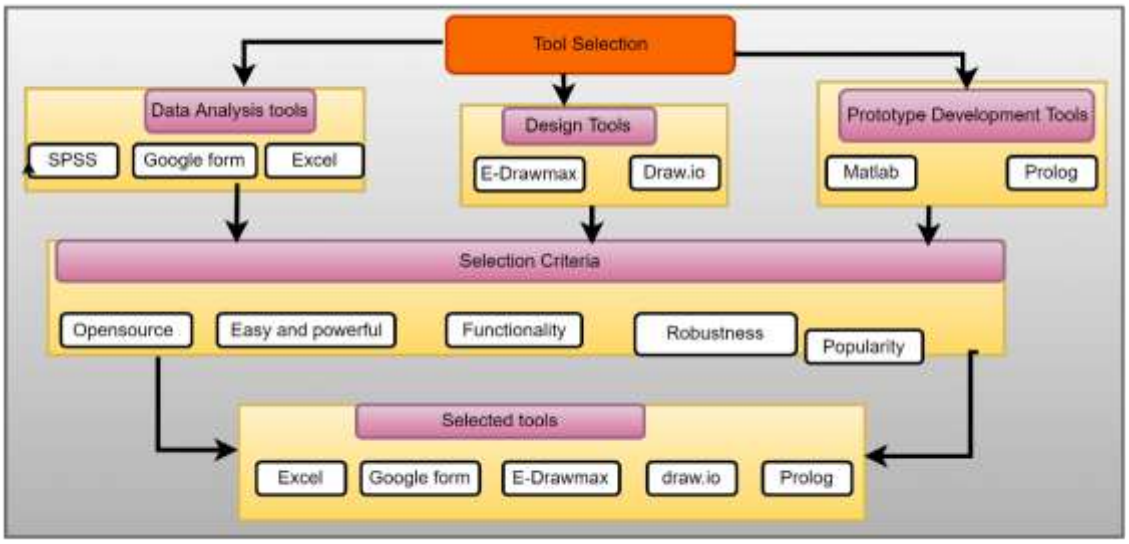

Fig. 2. Tool selection

D. Design of a proposed Indigenous Knowledge Framework

KM framework is a knowledge management application to construct (integrate) knowledge management (KM) components together to enhance the KM process performance for organizational competitiveness [22]. According to [23], the KM framework is used to connect the organization with the main area of the KM process to support the KM approach, awareness, objective, and overall planning of the organization.

In this research study, the proposed IK framework was designed, and the functional prototype was developed by combining some KM components like acquisition, capturing, storing, transferring, sharing, utilizing, and preserving IK in Konso Soil Conservation Mechanisms. Therefore, the newly proposed IK framework for oil conservation was explored, designed, and developed as depicted in Fig. 3.

IV. Result Discussion and Findings

To understand the current usage of Konso People's Indigenous Knowledge in soil conservation mechanisms, the researchers collected data from primary and secondary sources through data collection tools like survey questionnaires, structured interviews, and technical observation from the community leaders, local elders, local community, environmental protection office, communication office, agricultural extension experts, and the culture and tourism bureau in the Konso Zone. Accordingly, 40 key respondents participated in the data collection from the different offices mentioned above. Generally, the discussion results indicated in the following Table I and Fig. 4 to Fig. 5 illustrate the outcomes of the data being analyzed and discussed.

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Therefore, to design and develop the proposed IK framework for soil conservation Nonaka model was selected, because this model is used to codify knowledge and is easy to convey, share, transfer, and categorize the KM model into four stages (SECI) that are used to convert from one type of knowledge to others. Also, for the functional prototype SWI-Prolog programming tool was used for implementation, and the proposed framework was evaluated.

A. Exploring the Current Status of IK of Soil Conservation in Konso People

As depicted in Table I and Fig. 4 to Fig. 5, the findings of this research study reveal that the majority of the respondents, 21(51.2%), agreed with a high to very high response on the Konso community's IK soil conservation, which has been used as a conservation mechanism. 18(46.3%) of the respondents agreed that from low to very low about the key information about soil conservation of Konso community IK. Also, 21(53.7%) of respondents agreed on the futuristic plan for IK soil conservation with low to very low, whereas 16 (42.5) respondents responded that they agreed on the plan for the soil conservation of Konso people's soil conservation mechanisms. 26(65.8%) of respondents agreed with low to very low responses regarding the use of new technology for soil conservation whereas 13(31.3%) agreed that they are using the new technology for soil conservation.

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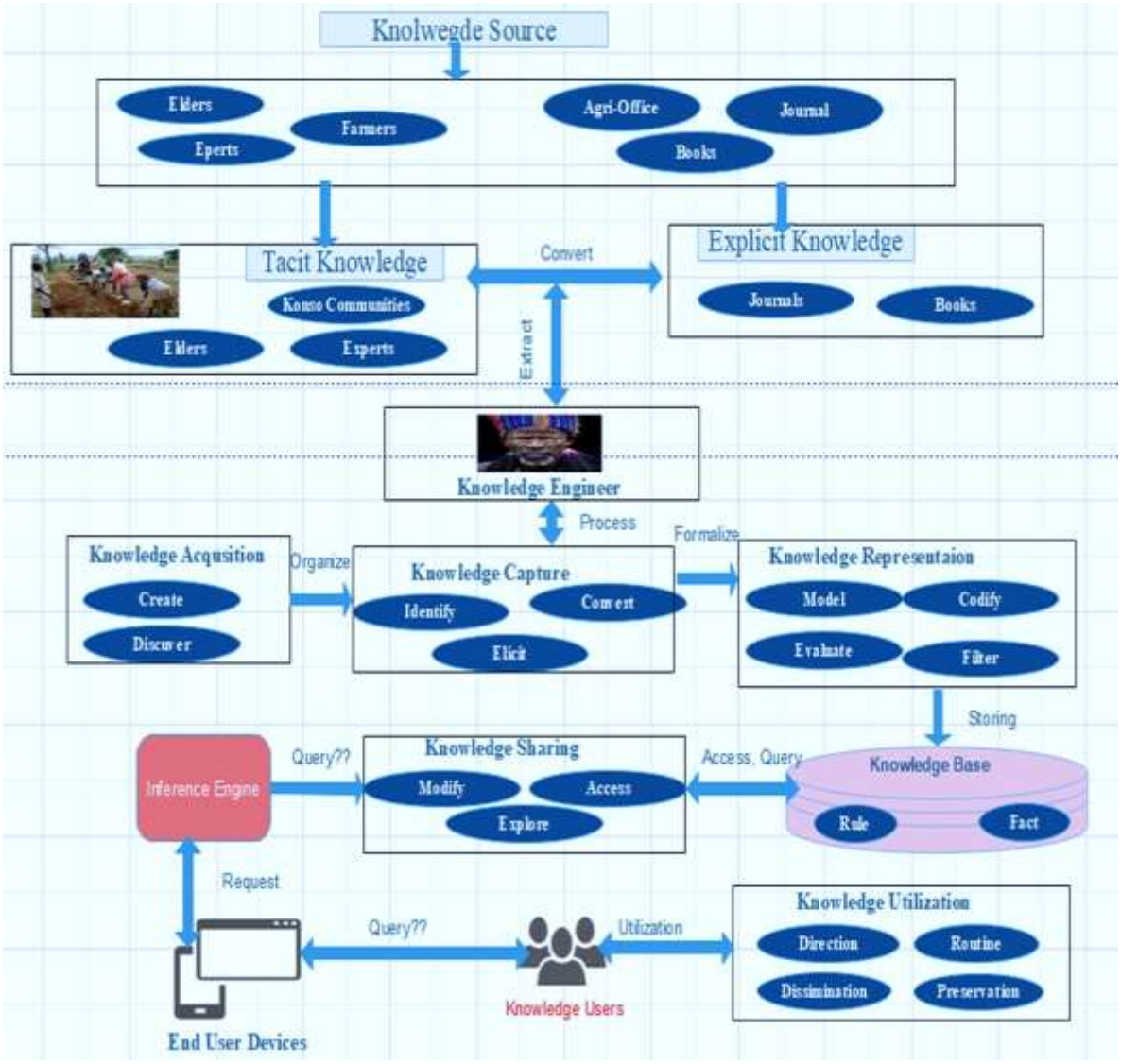

Fig. 3. Proposed indigenous knowledge management framework for soil conservation

Table I: Evaluation Standard for Current IK Framework for Soil Conservation

	Current use of IK for	Not at all	Very low	Low	High	Very high
1	Information about key soil conservation	1(2%)	8(19.5%)	10(26.8%)	16(39%)	5(12.2%)
2	Plans for soil conservation	2(4.8%)	9(22%)	12(31.7%)	12(31.7%)	4(9.8%)
3	The use of technology to preserve	1(2.9%)	6(14.6%)	20(51.2%)	11(26.8%)	2(4.5%)
4	processes sharing and dissemination	2(4.9%)	6(14.6%)	17(41.5%)	12(31.7%)	3(7.3%)
5	Information about new initiatives	1(2.5%)	9(22.5%)	21(52.5%)	5(12.5%)	4(10%)

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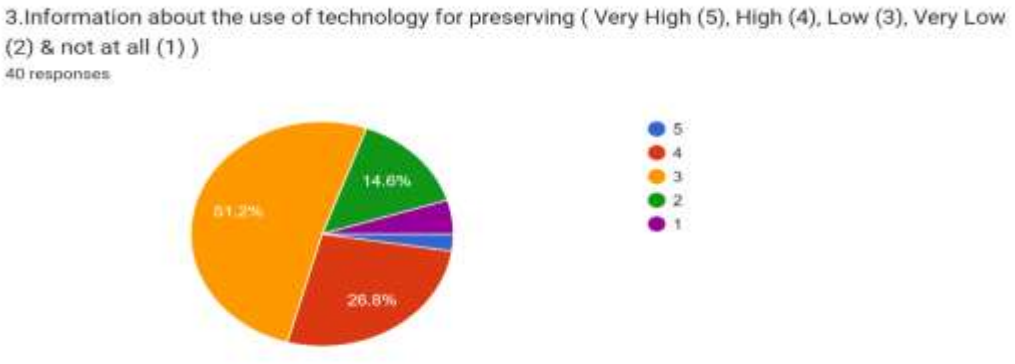

Fig. 4. The use of technology for IK preservation

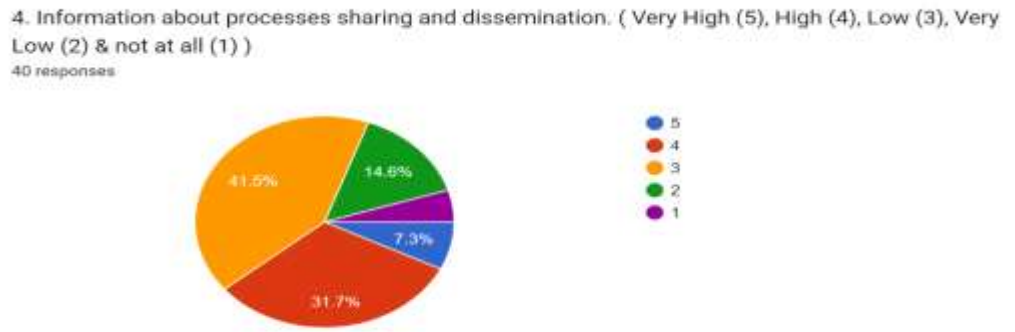

Fig. 5. The process of sharing and dissemination of IK

As shown in Fig. 4 and 5, 26(65.8%) of respondents agreed with low to very low rates regarding the use of new technology for soil conservation whereas 13(31.3%) agreed that they are using the new technology for soil conservation. In addition to this, regarding the IK sharing and dissemination of Konso people's soil conservation and new initiative of knowledge sharing and preservation of Konso people soil's conservation mechanisms, the majority of the respondents responded with low to very low 23(56.1%) and 30(75%) respectively.

B. Evaluation of the Proposed IK Framework for Soil Conservation in Konso Community

The proposed IK framework for soil conservation mechanism was validated using standard validation that ISO-9126 parameters like a) Attractiveness in IK acquisitions, b) Simplicity in IK capturing, c) Efficiency in sharing and utilization, d) Deliverability in knowledge and decision-making, e) Portability in the desired user requirement, f) Usability improvement of IK in resolving a social problem, g) Functionality appropriateness, and h) maintainability for additional requirements.

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As shown in Table II, 80% of respondents strongly agreed and 15% agreed on the suitability of the proposed framework for Soil conservation and 70% and 27.5% of respondents strongly agreed and agreed on the knowledge deliverability of the proposed framework respectively. In addition, 60% and 50% of respondents strongly agreed and agreed on the accessibility and the attractivity of the proposed IK framework for Soil conservation mechanisms respectively which is represented in Fig. 6.

1) End User Validation: In this research study, the validation of the proposed IK framework involved two aspects: evaluating it against established standards and conducting expert acceptance testing with end users. Previous research by scholars has identified various parameters including reliability, usability, maintainability, accessibility, efficiency, and functionality [24] [25], which were considered in this study. For the evaluation process, a diverse group of participants was selected, including computer science professionals, software engineers, IT professionals, and local elders. Their expertise and perspectives were invaluable in assessing the proposed IK framework for the Konso people's soil conservation. As illustrated in Table II and Fig. 6, the results revealed that 87.5% of respondents strongly agreed that the proposed IK framework is both attractive and usable. Additionally, 75% of respondents strongly agreed that the framework is simple, accessible, and functional.

Based on the user acceptance testing and the ISO 9126 criteria, it can be concluded that the proposed framework successfully meets the standards set by ISO 9126. The evaluation results indicate that the IK framework for soil conservation among the Konso people has achieved high acceptance and meets the necessary criteria for reliability, usability, maintainability, accessibility, efficiency, and functionality.

Table II: Evaluation Output for Proposed Framework

Parameters	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree	Total %
Attractive	7(87.5%)	1(12.5%)	0(0%)	0(0%)	0(0%)	100%
Simplified	6(75%)	2(25%)	0(0%)	0(0%)	0(0%)	100%
Efficiency	4(50%)	4(50%)	0(0%)	0(0%)	0(0%)	100%
Accessibility	6(75%)	2(25%)	0(0%)	0(0%)	0(0%)	100%
Portable	4(50%)	4(50%)	0(0%)	0(0%)	0(0%)	100%
Usability	7(87.5%)	1(12.5%)	0(0%)	0(0%)	0(0%)	100%
Functionality	6(75%)	2(25%)	0(0%)	0(0%)	0(0%)	100%
Maintainable	5(62.5%)	3(37.5%)	0(0%)	0(0%)	0(0%)	100%

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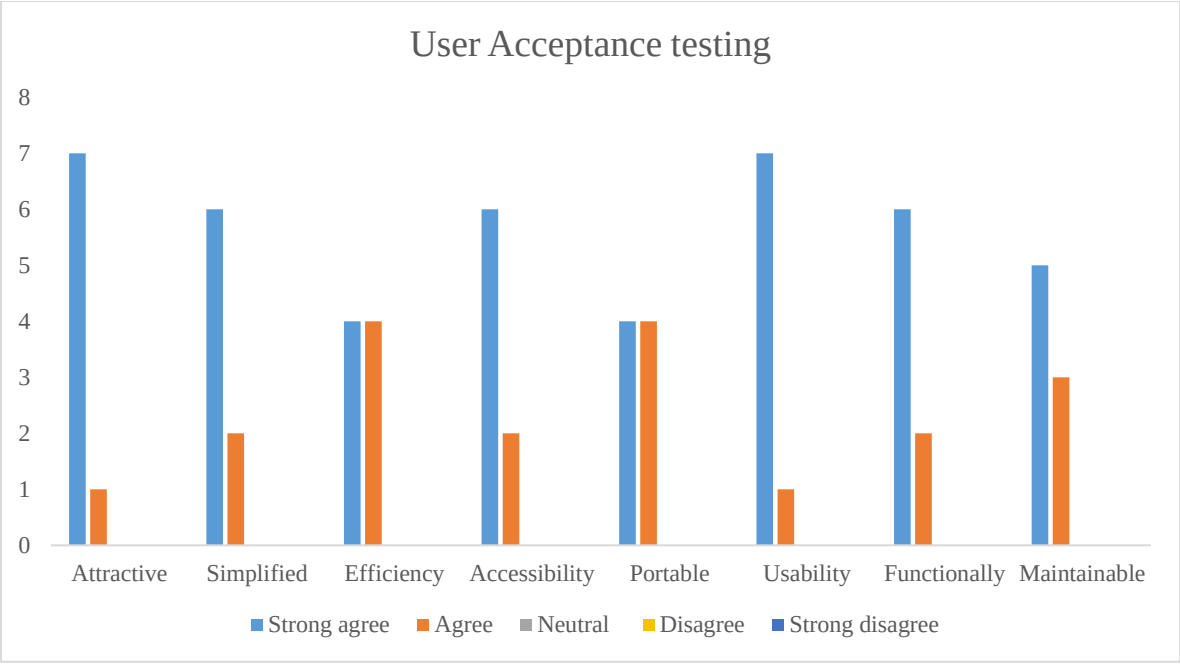

Fig. 6. Representation of proposed framework evaluation output

V. Conclusion

The developed IK management framework for soil conservation is expected to greatly enhance the sharing and preservation of Indigenous Knowledge (IK) within the Konso Community. Numerous research findings have highlighted the diverse applications of IK, such as traditional medicine, conflict resolution, weather forecasting, and soil conservation mechanisms. These types of indigenous knowledge hold significant importance in addressing socio-political issues among the Konso people and in Ethiopia as a whole.

To design the proposed IK framework, this research study utilized the Nonaka Model (SECI), which is well-suited for capturing and managing tacit and explicit knowledge. The results of the study indicated that 26 (65.8%) of the respondents expressed a low-to-very-low level of utilization of new technology for soil conservation, while 13 (31.3%) reported that they are currently utilizing new technology for this purpose.

Furthermore, the proposed IK framework for soil conservation mechanisms was subjected to validation using ISO-9126 parameters, including sustainability, knowledge deliverability, attractiveness, and accessibility. The framework was also assessed through end-user acceptance evaluation. The results of these validation processes confirmed the effectiveness and suitability of the proposed framework.

Overall, this research study concludes that the developed IK management framework has the potential to significantly contribute to the utilization and preservation of indigenous knowledge in the context of soil conservation. By incorporating new technology and addressing the identified challenges, the framework can facilitate improved practices and sustainable soil conservation efforts within the Konso community.

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Lastly, the validation of the proposed IK framework was tested by developing the functional prototype. It was implemented using SWI prolog programming language.

Recommendations

Based on the findings of this research study, the following recommendations were forwarded. As the findings of this research are revealed, the government should give attention to further study on soil conservation for the protection of soil degradation mechanisms in other parts of Ethiopia. In addition, the proposed IKMF for soil conservation is limited to the scope of the conservation only without identifying the soil properties, low land, high land, and soil types; henceforth, it is vital to extend this research to develop an integrated IKMF for the whole of Konso people's soil conservation mechanisms.

References

1. M. H. Sedato and I. Ahmad, "Oromo indigenous conflict resolution institutions: An example of African indigenous institutions," *Review of Research*, vol. 8, no. 3, p.1.Dec. 2018.
2. C. Morrill and D.S. Rudes, "Conflict resolution in organizations," The *Annu. Rev. Law Soc. Sci*, vol. 6, pp. 627–51, Aug. 2010.
3. M. H. Sedato and . I. Ahmad, "Oromo indigenous conflict resolution institutions: An example of African indigenous institutions," vol. 8, no. 3, pp. 1-2, 2018.
4. J. Adem, "Women and Indigenous conflict resolution institutions in Oromia: Experience from Siinqee of the Wayyu Shanan Arsi Oromo in Adami Tullu Jiddu Kombolcha district of the Oromia National Regional State," M.A. Thesis, Dept. of Social Anthropology, *Addis Ababa University*, Addis Ababa, Ethiopia, 2017.
5. T. Ta'a, "Gadaa: The indigenous knowledge system of Oromoo," *in Proc. of the 2nd International Conf. on Oromoo Studies*, Jimma, Ethiopia, June 2017.
6. N. W. Sheehan, "Indigenous knowledge and respectful design: An evidence-based approach," *Design Issues*, vol. 27, no. 4, pp. 68-80, 2011.
7. Y. Aredo, "Dress as a form of nonverbal communication in the context of Arsii Oromoo," *Gadaa Journal*, vol. 1, no. 1, p. 111, 2018.
8. L. P. Yulianti and K. Surendro, "Ontology model for indigenous knowledge," in *Information Technology Systems and Innovation (ICITSI*), Indonesia, 2018.
9. M. E. Jennex, "What is knowledge management," doi:10.4018/9781599042619. ch001, p. 1, 2007.
10. J. F. Sowa, "Knowledge Representation: Logical, Philosophical, and Computational Foundations*"*, New York: Brooks / Cole 2000.

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*Corresponding author- **Amin Tuni***

11. H. Mitiku, W. Jimma, and C. Diriba, "Managing indigenous knowledge for corrective and preventive cares: The case of Horro Guduru Wollega Zone, Oromia, Ethiopia," *Universal Journal of Public Health*, vol. 4. no.4., pp. 212 – 217, 2016.
12. G. Boru, "Gondooroo as an Indigenous method of conflict resolution and justice administration," *Journal of Culture, Society, and Development*, vol. 23, pp. 18 – 26, 2016.
13. K. J. Sileyew, Research design, and methodology, in *Text Mining - Analysis, Programming and Application,* Addis Ababa, Ethiopia: IntechOpen, 2019, pp.1-12.
14. V. K. Grover, "Research Approach: An Overview", *Golden Research Thoughts*, vol. 4, no. 8, p. 1, 2015.
15. E. Tefere, "A Framework for Indigenous Knowledge Management in Oromo Gada System," p. 28, 24 September 2018.
16. A. R. Hevner, S.T. March, J. Park, and S. Ram, "Design science in information systems research," *MIS Quarterly*, vol. 8, no. 1, p. 76, Mar., 2004.
17. G. Bhawna and N. A. Gobind, "*Research methodology and approaches," IOSR Journal of Research & Method in Education*, vol. 5, no. 3, p. 48, 2015.
18. V. K. Grover, "Research approach: An overview," *Golden Research Thoughts*, vol. 4, no. 8, p. 1, 2015.
19. S. M. S. Kabir, "Method of data collection," in *Basic Guidelines for Research:* An Introductory Approach for All Disciplines, Chittagong, Bangladesh: Book Zone Publication, 2016, pp. 202-274.
20. E. Tefere, "Framework for indigenous knowledge for Gada system," p. 34, 24 September 2018.
21. J.C. Mostert and M.M.M. Snyman, "Knowledge management framework for the development of an effective knowledge management strategy," *South African Journal of Information Management*, vol. 9, no 2. 2007.
22. K. Kyoratungye, J. R. Aduwo, E. Mugejjera, and J. Lubega, "Knowledge management Frameworks: A review of conceptual foundations and a KMF for IT-based organizations," in *Information Technology*, p. 41, 2009.
23. L. Bounegru and E. Karstens, "User evaluation report," Synergetic Content Creation and Communication, Rep. D7.4.1: User Evaluation Report 1.0, European Commission: *CORDISEU research results*, 2011
24. A. Abran (Ed.), "Analysis of Quality Model and Measures," in *Software Metrics and Software Metrology*, New York, USA: Wiley-IEEE Computer Society, 2010, p.208.

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