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Developing Indigenous Knowledge Management Process Model for Traditional Medicine: (The Case of Oromia Region)

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Abstract

The indigenous knowledge is a large body of knowledge and skills that has been developed outside the formal educational system. Traditional medicine knowledge is one part of indigenous knowledge that human intelligence is used by traditional practitioners to prepare and treat all activities that take place in the system. Though the country has much indigenous knowledge, knowledge management practices in traditional medicine and other organization is less than an expectation. The main objective of this research was to capture the tacit knowledge owned by traditional healers in Oromo Guji and to increase continuity of the traditional medicine knowledge for sharing and training of other traditional healers. To develop the model with the prototype, the required knowledge for this study was collected through interview from traditional medicine practitioners and document analysis, on headache cases and other related relevant documents. Then the case-based reasoning for headache diagnosis is designed by using jCOLIBRI programming tool integrating with Eclipse and Nearest Neighbor retrieval algorithm and Feature vector knowledge (case) representation method was adopted to establish the case base from headache. Mainly the retrieval performance of the prototype is measured by precision and recall, and the reuse performance also evaluated by using accuracy measurement and an average result of 80 % precision, 68% recall and 85% accuracy is scored. The prototype was evaluated by end users who are experts in the specific domain area and an average result of 76.46% is registered. Having these evaluation results and the result of other more specific evaluations such as case similarity evaluations the summed-up evaluation result of the diagnosis prototype is encouraging. The exploratory and constructive research design with a mixed research approach (qualitative, quantitative) has been used for collecting and analyzing the existing status of indigenous traditional medicine knowledge.

Keywords: Knowledge management; IK; KM Model; Traditional Medicine; Case-based reasoning.

Introduction

The role of experiential knowledge and technological knowledge in the primitive and modern world has been improving the lives of society throughout their daily activities. The indigenous knowledge, which is part of experiential knowledge, considered to be the knowledge held in the minds of people. In Ethiopia, there are lots of indigenous knowledge practices that the communities used in their day-to-day survival to overcome the challenges of their lives. The indigenous traditional Medicine is one of the most known parts of indigenous knowledge, which comprises a wide spectrum of indigenous medicinal practices such as Medicine Preparation, Traditional Birth Assistances, and Bone Setting, Tooth Extractions that the elders (practitioners) among communities gained this knowledge from their ancestors.

Its continued popularity, however, seems to be largely due to its biomedical benefits in dealing with many of the local health problems. Accordingly, the significant role of medicinal plants in primary health care delivery in Ethiopia where 80% of humans. And 90% of the livestock population depends on traditional medicine.

According to World Health Organization (WHO), traditional medicine defined as the sum of the knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health, as well as in the prevention, diagnosis, improvement or treatment of physical and mental illnesses. Traditional medical knowledge may be passed on orally from generation to generation, in some cases with families specializing in specific treatments, or it may be taught in officially recognized universities.

Knowledge management of traditional medicine therefore in almost area restricted at an individual level. As known, the knowledge transferring practices from grandparent to children take part in an uncommon way when certain practitioner wants to transfer at his/her old-age there are lots of mechanisms.

To rigorously discuss the concepts of indigenous knowledge in traditional medicine the terminologies and conceptual literature that would be used throughout this document have been treated as below.

In the theory of knowledge study, the major problem in epistemology is defining the knowledge. Much of the time, philosophers use the tripartite theory of knowledge to analyze knowledge as justified true belief, as a working model. Challenging analyses of knowledge have been proposed, but there is as yet no consensus on what knowledge is. This fundamental question of epistemology remains unsolved [1]. Though philosophers are unable to provide a generally accepted analysis of knowledge, the following concept had been treated here.

The second important issue in epistemology concerns the ultimate source of knowledge. According to this study, there are two traditions: empiricism, which holds that our knowledge is primarily based on experience, and rationalism, which holds that our knowledge is primarily based in reason. Although the modern scientific worldview

borrows heavily from empiricism, there are reasons for thinking that a synthesis of the two traditions is more plausible than either of them individually [2].

Present day's researchers extend several definitions of Indigenous Knowledge in different way. The broadest of these, in which the researchers intend to define IK as a "complex set of knowledge and technologies existing and developed around specific conditions of populations and communities indigenous to a particular geographic area" with an emphasis on how "these forms of knowledge have hitherto been suppressed… therefore, IKS should be brought into the mainstream of knowledge in order to establish its place within the larger body of knowledge". Essentially, Indigenous Knowledge (i.e., local/traditional/folk knowledge, ethno science) is a dynamic archive of the sum total of knowledge, skills, and attitudes belonging to and practiced by a community over generations, and is expressed in the form of action, objects and sign language for sharing.

Traditional medicine is often termed alternative or complementary medicine in many countries. Herbal treatments are the most popular form of traditional medicine and 70% to 80% of the region has used a form as primary health care. The traditional health practitioners are generally categorized into: Herbalists, Bone setters, Traditional Birth Attendants, Spiritual Healers, Diviners and Magicians

Knowledge

Authors have defined the term knowledge in the different views; accordingly, Knowledge can be defined as the fact or condition of knowing something with a considerable degree of familiarity acquired through experience, association or contact. Knowledge consists of the attitudes, cumulative experiences, and developed skills that enable a person to consistently, systematically and effectively perform a function.

This knowledge can be from scientific or traditional sources. Traditional knowledge has been defined as a collective body of knowledge, practice and belief, evolving through adaptive processes and handed over through generations by cultural transmission. Traditional medicine is used throughout the world as it is heavily dependent on locally available plant species and plant-based products and capitalizes on traditional wisdom-repository of knowledge. Thus, different local communities in countries across the world have indigenous experience in various medicinal plants where they use their perceptions and experience to categorize plants and plant parts to be used when dealing with different ailments [3].

Indigenous knowledge on traditional medicinal plants is being lost at a faster rate with the increasing of modern medicine, which has made the younger generation to underestimate its traditional value. It why the source of knowledge is not adequately documented, which impedes their widespread use, evaluation and validation.

Types of Knowledge

Having briefly inspected into the concept of knowledge and management in the process of evidence-based decision-making, it is timely to discuss the concepts of tacit and explicit knowledge.

There are two types of knowledge tacit knowledge and explicit knowledge. Explicit knowledge is expressed in symbols and words and tacit knowledge is highly personal, and involves personal beliefs, values, intuition, and insight.

The following types of knowledge have implications for indigenous knowledge (IK): tacit knowledge, explicit knowledge, and implicit knowledge. Implicit knowledge is the type of knowledge that helps individuals to know what is socially and culturally appropriate in a given situation, including shared beliefs, values and expectations [4].

The most central difference is between "tacit" and "explicit" knowledge is: tacit knowledge occupies the minds of peoples or experts and is either difficult or challenging, to codify in which it is easy to access and use. The logical tacit type of knowledge refers to an individual's rational models, skill, experiences, beliefs, standards, and perspectives (viewpoint).

Explicit (codified or articulated) knowledge exists in the form of words, sentences, documents, processed data, and computer application programs and in other forms. Explicit knowledge is formalized (codified) knowledge, i.e., knowledge recorded as video, in a document, etc. and usually covers part of the original tacit knowledge but is not a full representation of it. Explicit Knowledge (codified knowledge) refers to the type of knowledge that can be formulated and easily communicated.

Indigenous Knowledge

In this exploring a definition of IK that used throughout the document is expressions, practices, beliefs, understandings, insights, and experiences of Indigenous group or community that generated over several centuries of profound interaction with a particular territory. It is contained in and expressed through storytelling, songs, plays, folk telling (including those referred to as myths or legends), proverbs, foods, institutions, skill sets, practices, beliefs, ceremonies, innovations and adaptations, languages, codes of ethics, protocols, art forms, and laws. Indigenous knowledge is highly dynamic, changing in response to both external and internal pressures. Fundamentally experiential, relational, cumulative, and place-based Indigenous knowledge may be gained or refined through trial and error (experimentation), ritual, intuition or inspiration, observation, dreams or visions, interaction with nonhuman entities (including the land itself), apprenticeship, and peer-to-peer exchanges with other knowledge holders [5]. Transmission is imitative and demonstrative and proceeds according to Indigenous values and cultural protocols governing access, application, generation or refinement, and sharing of knowledge.

Knowledge Management

Knowledge management is the systematic management of an organization's knowledge assets for the purpose of creating value and meeting tactical & strategic requirements; it consists of the initiatives, processes, strategies, and systems that sustain and enhance the storage, assessment, sharing, refinement, and creation of knowledge.

Knowledge Management Model

This section broadly deals with knowledge management models those are prominent to have fundamental concept in of model in any discipline. The study has focused on comparing and contrasting a different model approach. And then a researcher would have developed a good model that can integrate an indigenous knowledge of tradition medicine practices in variety society various elements and show relationships in a way that is much harder to do in writing [6].

But first, what are the components of a knowledge management model? At

The most basic level, KM consists of the following steps:

Nonaka and Takeuchi Model

In their 1995 book titled The Knowledge-Creating Company, Nonaka and Takeuchi argued that knowledge is initially created by individuals and that the knowledge created by individuals becomes organizational knowledge through a process described by the theory. They described two dimensions of organizational knowledge creation —epistemological and ontological. On the epistemological side, the authors recognize two types of knowledge—tacit and explicit. "A spiral emerges when the interaction between tacit and explicit knowledge is elevated dynamically from a lower ontological level to higher levels". This spiral is created by the four modes of knowledge conversion through which knowledge is converted from one knowledge type to another. The modes of knowledge conversion include socialization (from tacit-to-tacit knowledge), externalization (from tacit to explicit knowledge), combination (from explicit-to-explicit knowledge), and internalization (from explicit to tacit knowledge). Their theory also explains how individual knowledge is "amplified" into and throughout the organization through these four modes and under five conditions that enable and promote organizational knowledge creation process. These five phases are: 1) sharing tacit knowledge, 2) creating concepts, 3) justifying concepts, 4) building an archetype, and 5) cross-leveling knowledge.

Boisot's Knowledge Category Models

In 1987, Boisot developed a model that considers knowledge as either codified or uncodified and as diffused or undiffused, within an organization. In this concept the term "codified" refers to knowledge that can be readily prepared for transmission purposes such as financial data.

In this model, codified undiffused knowledge is referred to as propriety knowledge and is deliberately transmitted to a small group of people, on a "need to know" basis. Second, "uncodified" refers to knowledge that cannot be easily prepared for transmission purposes such as experiences. The model suggests that uncodified and undiffused knowledge is referred to as personal knowledge (e.g., experiences, perceptions, views, ideas). This model suggests that there is a spread or diffusion of knowledge across organization as reflected in the horizontal dimension of the model [7].

Von Krogh and Roos model

According to this model gives a clear distinction between individual knowledge and social knowledge, following an epistemological point of view regarding knowledge management. According to this model, the following aspects should by analyze in their organization.

why and how the knowledge gets to the employees of a company

why and how the knowledge reaches the organization

what does it mean knowledge for the employee/organization?

The cognitive semiotic model

Cognitive semiotics can be defined as an interdisciplinary matrix of disciplines and methods, focused on multifaceted phenomenon of meaning. The cognitive side focuses more on the mental processes and structures. Among the methods used in the cognitive side for data gathering are prototype analysis, content analysis, artificial intelligence and computer simulation. The semiotic side is fundamentally based on the symbols and sign structure approach. The combination of a cognitive approach and a semiotic approach to represent knowledge forms the foundation of the cognitive semiotic model.

The sensory knowledge is created on the first dimension of Charles Sanders Peirce semiotics, which relies on senses and is based on awareness. There is no mediating sign associated with this knowledge and it is dependent on its context and relies on imitation (i.e., direct instruction and job training) as a mechanism for its transmission from one person to another. Hence, in the context of harvesting tacit knowledge from the traditional healer researcher used video recordings and created computer animations to capture the sensory knowledge [8]. For example, plant-harvesting mechanisms and ceremonial practices were captured by using a video camera. The second tier in the cognitive semiotic model is the coded knowledge. This dimension introduces the use of codes to which an object or an experience refers. The coded knowledge promotes the possibility of communicating knowledge without the presence of that to which the knowledge refers.

It is knowledge at descriptive level, for example describing how to apply a certain plant-based portion to a patient suffering from high fever. The third tier of the cognitive semiotic model is the theoretical knowledge.

Knowledge Engineering

It is a process of engineering knowledge and imitating the experts' or human-being intelligence and building a knowledge base that use for decision-making process. Hence, it is basis of facts from several sources, prior experiences to bring nonlinear patterns in making decisions.

Knowledge Representation

Knowledge Representation is the study of how, what we know can at the same time be represented as comprehensibly as possible and reasoned with as effectively as possibly. So, it is responsible for representing information or knowledge about the real world so that a machine can comprehend and can employ this knowledge to solve the complex real-world problems such as diagnosis a medical condition or communicating with humans in natural language.

Knowledge Representation Technique

Several sorts of knowledge representation have been used for many years in AI. Even though, the most commonly used knowledge representation methods are production rule (IF-Then), frame, semantics and ontology, case-based reasoning used on this study because no standard for traditional diagnosing disease and give medicine to patients [9].

Case-Based Reasoning

Case-based reasoning technique obtained its name from the combination of the following words and they can be defined as follow.

Case is defined as "a contextualized piece of knowledge representing of an experience that explains a lesson fundamental to achieving the goals of reasoning".

Reasoning is also defined as the process of inference through the use of facts or other intelligible information.

As Bergmann cases have to include the following main parts:

Problem Description/Situation: Gives description of a particular case when it is recorded.

Solution: tells how the particular described problem is treated or solved.

Result: Provides the final result and feedback gained from the solution.

Case-Based Reasoning uses case representation methods to represent knowledge contained in the cases for reasoning purpose in similar way as AI knowledge representation formalisms. Even though various case representation methods have been proposed, the following are the main types of case representation used in case-based reasoning.

Feature Vector Case Representation:

In this representation method cases are represented as pairs of attributes- value format and this representation method supports instance-based learning and nearest neighbor matching.

Structured Case Representation:

In this case representation method cases are represented as frame-based formalism like relational representation in machine learning.

Textual Case Representation:

In this case representation cases are represented by decomposing the text that forms the case in to information entities which might be a word or phrase contained in the text.

Case Based Reasoning Cycle

To accomplish its task successfully (to solve new problem by using earlier solved problems) the whole process of case-based reasoning is divided in to four cycles. These are:

1. Retrieve the most similar case/cases/ from the case base,

2. Reuse the case or case's solution by adapting or generating solution for the new problem,

3. Revise the proposed solution for the new problem if necessarily required and

4. Retain the new solution as a part of a new case and store it in the case base.

Nearest Neighbor algorithm

This retrieval algorithm works by measuring the similarity of new case with the stored cases-based on matching a weighed sum of features/attributes. Nearest Neighbor algorithm returns nearest match from case-based reasoning library. This algorithm best fits when the new case doesn't exactly match with the old cases and when attributes have numeric (continuous) values. But as the cases in the case base increases the retrieval time in this algorithm also increases.

Rule Based Reasoning

The two most well-known reasoning techniques in artificial intelligence are rule based reasoning and case-based reasoning. Rule based reasoning techniques reasons from general domain knowledge represented by rules. Rule based reasoning applies either forward chaining or backward chaining reasoning method when solving problems by using knowledge of domain area represented in the form of rules. In rule-based reasoning knowledge is represented by rules as follow;

IF (condition), THEN (conclusion)

Where the condition parts of the rule represent the premises formed from facts combined each other by different logical operators such as AND, OR and others whereas the conclusion part represents the corresponding result as a conclusion for the premises. Conclusions are drawn when the condition (IF part) of the rule is become satisfied and the rule is said to be active.

Comparison of Rule Based Reasoning (RBR and Case Based reasoning (CBR

In developing problem-solving intelligent systems both cases based and rule-based reasoning are the most known reasoning techniques. Even though, these reasoning techniques are independent and complementary it is possible to compare and contrast in different dimensions as follow.

In their knowledge base and knowledge representation:

In case-based reasoning system the case base is built from the collected specific previously solved cases, whereas in rule-based systems the knowledge base is built from a generalized set of IF-THEN rules

In knowledge acquisition task:

In case-based reasoning cases can be acquired easily from historical records, past cases and other sources. Whereas knowledge in rule-based systems is acquired from experts by using interview or other methods to extract set of rules and this task is usually difficult to extract the whole and complete knowledge of the experts especially in the complex domains.

In learning aspect through time:

when new problems are solved and tested in case-based reasoning systems the solutions and the cases are retained and stored to solve future incoming problems then the system learns something new from newly solved cases while the case base is going to be updated and increased over time. But, in rule-based reasoning systems such features are limited and the numbers of rules are remaining constant unless the learning capability is customized.

In reasoning with incomplete or uncertain knowledge:

New cases which may not match perfectly with previously solved cases can be solved in the case-based reasoning systems by considering and taking the similarity measurement results while in

Rule-based reasoning systems the problems to be solved should match with at least one of the stated rules perfectly unless they will fail to be reasoned and solved.

In using experiences to solve similar problems in the domain:

Rule base reasoning systems tries to solve problems starting from scratch regardless of having similar problems successfully solved in the past whereas in the other side case-based reasoning systems

reduces the problem-solving process by using similar cases solved in the past time.

Due to this type of problem-solving style case-based reasoning is advantageous over rule-based reasoning in different aspects such as; when problems at hand are unclear and difficult to understand, memorize past experience is needed, in simplifying and minimizing the task and cost of knowledge acquisition process, in representing the acquired knowledge with suitable and accurate format, in solving problems with a kind of exceptions and others.

Research Design and Methodology

The main purpose of this section is to provide a clear and concise idea on the process or research methods to be used in the proposed research for answering the research question and to achieve the objectives or goal of this research. Therefore, this chapter of the proposed research, covers the knowledge capture approaches with detailed explanation and procedure of collecting the practitioners' experience for case analysis to make decision and deriving final solutions. The following research Design and Methodology were adopted in this research work to answer the research question and to achieve the goal or objective of this Study. These methods are discussed in the following sub section of this Chapter.

In order to build case-base reasoner or model that gives solution for the current case or the problem depending on the case stored, the cases/tacit knowledge were captured and organized in appropriate format. After knowledge organized and assessed, the verification done by comparing the traditional one with modern medicine. To articulate and realize the existing or tacit knowledge, the literatures and articles on herbal medicine which focusses on knowledge management were reviewed. Moreover, discussion with traditional medicine healers has done to collect case on headache and medicinal plants that use for. From acquired or collected case or symptoms the proper attribute of case/ solution was selected for building case base or model. The researcher applied four different 4Re techniques such as Retrieval, Reuse, Revise and Retain algorithm to build a model/case-base that gathers the closet case/experience from memory to the current problem, suggests a solution depending on the previous experience and adapts it to meet the demands of new solutions and retaining or preserving the case into case-base. Though, the proposed case representation methods are many, feature or attribute vector case representation was used in this study.

Data Analysis and Discussion

In this chapter, data analysis and discussion took place in order to clearly show the status of indigenous knowledge in the traditional medicine practices. Based on the collected information and analysis of the open-minded questions that were distributed, the respondents' response analyzed. Accordingly, the current status of indigenous knowledge in traditional medicine has been investigated and analyzed by using different parameters such as knowledge manageability, knowledge availability, knowledge accessibility, awareness [10].

Status of traditional medicine Knowledge

The researcher attempted to assess the overview of the existing practices in traditional medicine to look at its current status. According to their responses the current status of knowledge practice in traditional medicine among the community found below a half, as in in figure 4.2 the 47.4% or majority of respondents accepted the status of indigenous knowledge in traditional medicine practice is low. The researcher, so supposedly identified that the knowledge of traditional medicine almost going to disappear and no longer be able to continue. So, it indicates that, even though most part of the country relied on the indigenous knowledge of medicine, until now they are in risk of losing both their knowledge and the experiences, they have used for medicines preparations.

Figure 4. 2: The known traditional medicine practice in community

Knowledge Management in Traditional Medicine

As depicted in figure 4.6 traditional medical knowledge management is so poor. That means, the experiences, skills and gained knowledge from practices among individuals from the knowledge of herbal is not managed in community. Even if the community practice (CoP) used to manage indigenous knowledge, practices of TM need to be preserved and sustained for generations. The respondents' feedback evidently justified that the practices of knowledge held on at individual level for several years. In where this study conducted, means in the Anna Sorra district, the Heritage and Tourism office involved in collecting and storing the information of medicinal trees name and its usage with respective disease name in the spreadsheet. However, the way they store information is very susceptible to be lost. Even from observation the researcher recognized that there is no clear information in which medicine uses for and which part of plants can be used in medicine preparation process. In addition to it, the way healers handed down this knowledge to generation remained at individual level. Because of the lack of medicinal knowledge manageability, losing indigenous knowledge is very high. On technical observation the research identified, the existing knowledge managing approaches used among society could not sustain and preserve knowledge even for local healers rather than using healers as source for modern medicine.

In these regards, 78.9% of respondents responded that the knowledge management in indigenous knowledge of TM is lowered at unexpected level (as mentioned in the figure 4.6).

Figure 4. 6: Knowledge Management in Traditional Medicine

Knowledge Capturing, Sharing and Modeling

This section discusses on knowledge captured, acquired from domain practitioners (Traditional Medicine Healers) that done during interview, questionnaire, by applying knowledge elicitation methods, and by using relevant documents analysis techniques which have been used to model the acquired knowledge. And then the process of knowledge acquisition to the modelling has been depicted in figure 5.1. The main target of this chapter is collecting and organizing tacit knowledge of traditional medicine from practitioners and then representing in the knowledge representation formalism.

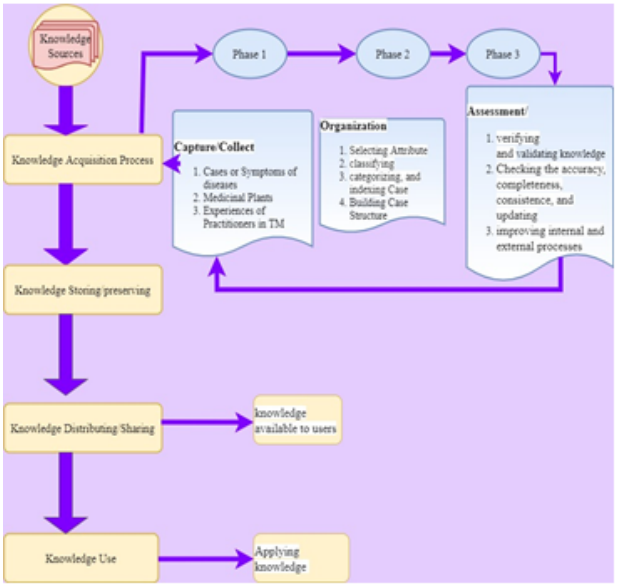
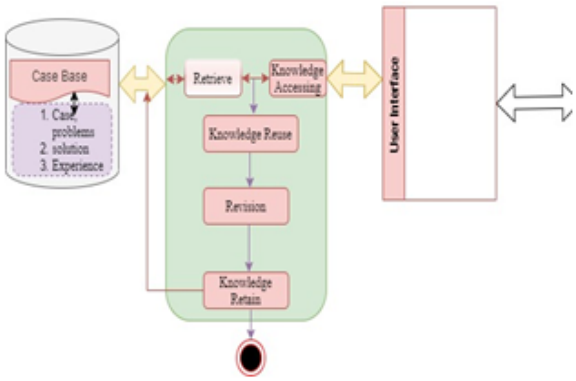


Figure 5. 1: General process of knowledge management

Knowledge Sharing

A concept of knowledge sharing is different in the different field of study; in the case of indigenous knowledge, it is about sharing information to make known about a practices or technical activities with their followers.



Developing IKM Model for Traditional Medicine

After all components of knowledge management process attempted to model, the next step is developing and building a model for IKM that traditional medicine practitioners sustained and kept for the generation. In this study, researcher has focused on knowledge capture process, knowledge preservation, knowledge sharing and application. To achieve the intended objective, CBR framework has employed to build a case-base for traditional medicine knowledge, because there is no standard used in making decision for disease diagnosis in traditional way (Figure 5.4).

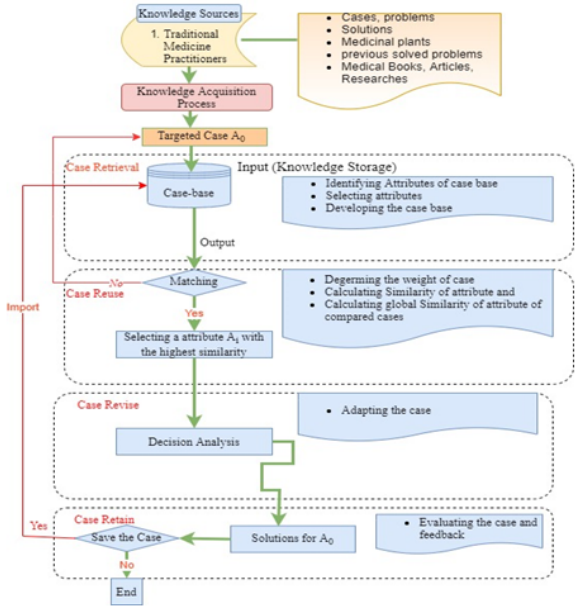


Figure 5. 4: Proposed IKM Model for Traditional Medicine

Developing a Functional Prototype

As we have seen in developing case structure section, the case representation (Knowledge representation formalism) in case-based reasoning is used to develop the experience or cases of headache that is helpful in the reasoning. There are several of case representation formalisms such as, feature-value, structured, textual and others, but

the researcher of this study selects feature-value case representation because feature value case representation represents cases as attribute-value pairs, similar to the propositional representations used in Machine Learning (ML), that support k- nearest neighbor matching (KNN Algorithm) and instance-based learning. Feature-value case representation also represents cases in suitable way to be easily understood by the programing tool (jCOLIBRI) (Figure 5.6).

Figure 5. 6: Proposed Knowledge Sharing Model for Traditional Medicine

Conclusion

Nowadays, indigenous knowledge of traditional medicine is managing in traditional methods and it is about disappearing after all. Due that factors, traditional medicine knowledge that elders or practitioners kept for so far inaccessible. The practices such as folk medicine preparations, oral diagnosis symptoms of disease, giving decision in the verbal communication, keeping medicinal plants, transferring this knowledge from generation to generation are known practices and very important core point that sustained the knowledge for many years. So, in preserving knowledge of traditional medicine and maximizing the accessibility of knowledge by using technology, could be helpful in modern medicine. In this study, an attempt has been done to develop IKM model for traditional medicine system that stores case or previously used as solution. So, researcher developed model by applying case-based reasoning.

In order to collect and analyze the primary data, the research used the questionnaires, interview technical Observation. The Questionnaires were prepared using following features/parameters-like knowledge accessibility, manageability, share ability, availability, transparency, reliability, information delivery. Interview was conducted around southern Ethiopia along Guji Zone Anna Sorra Woreda on specialized traditional practitioners.

To evaluate and validate the proposed model, this study collected the validation and user acceptance and opinions from valid sources, practitioners, and some medical experts. The functional prototype on sample of headache cases was developed to validate the conducted research.

In evaluating the performance of developed prototype different testing techniques were undertaken. Statistical analysis evaluation technique was used to measure the recall, precision and accuracy of the framework. The retrieval performance of prototype registers 89% recall and 79% precision for its retrieval of relevant cases activity. The reuse activity of prototype also registers 81.2% accuracy which is promising result and not achieved by previously conducted rule-based reasoning systems done for headache diagnosis. A testing also conducted to test different capabilities of prototype and plenty result were registered which realizes that CBR framework is able to handle the weakness observed over CBR in headache diagnosis. Again, interesting result also registered from the case similarity test of this framework. Finally, prototype is evaluated by the domain experts for its user acceptance testing by using seven evaluation parameters and an average result of 78.8% is registered from user evaluation by expert despite to their fruitful feedbacks.

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