Ontology-based knowledge management framework in business organizations and water users networks in Tanzania

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Chapter 20

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1. Introduction

Todays' economy is considered knowledge economy this is because formation and utilization of facts is crucial and plays a major part in the creation of wealth. Economic achievement is progressively founded upon the actual consumption of invisible assets such as knowledge, skills and innovative potential as the crucial source for competitive advantage (Barkhordari et al., 2019). This emerging economic structure is thus referred to as the knowledge economy (ESRC, 2005). The current movement of globalization has necessitated the world, regions, and countries in particular to aggressively participate in the world-wide economy; thus, rivalry is the foremost influence in the process. This was based on the understanding and recognition that the traditional factors of production (Land, Labor, and Capital) which were plentiful, available and were regarded as prime in attaining economic gain have limitations. Knowledge received scanty attention and thus of less importance in attaining competitive advantage, currently, it is the knowledge-based economy characterized by the use of information technologies that counts more (Kefela, 2010). Thus, this implies that, earlier well recognized factors of production are presently not sufficient to sustain a firm's competitive advantage as knowledge plays crucial role. Most organizations understand the relevance of available information in attaining sustained competitive edge than others. Knowledge-dependent economy is founded on the invention, sharing and application of knowledge and information. Yoong and Molina (2003) opined that one means through which business organization can thrive in today's tempestuous commercial setting is through appreciating, the recognition and utilization of knowledge in the organization. Organizational effectiveness in both business and water or irrigation networks likewise hinge upon making good use of this knowledge, which needs to be established, apprehended and exchanged (knowledge management) so as to form firm capital (Omotayo, 2015). Thus, individual enters and leave, but firm preserve knowledge over time. Or as articulated clearly by Fitz-Enz (2000), company capital knowledge remains with the organization when the workers quit. Human capital is the cognitive asset that leaves the company every night and so cannot easily be manipulated. This is because they choose where and how they want to invest their knowledge. Consequently, knowledge management (KM) turns out to be a serious action in realizing outcomes.

Ontology is overt provisions of a collective operationalization. An operationalization is an intangible model of realities in the earth by recognizing the pertinent thoughts of the phenomenon. Explicit refers to the form of notions applied and the restraints on their application are openly demarcated. Shared knowledge mirrors the idea that an ontology reflects consensual knowledge, that is, it is not isolated to the person, but consented by the group. Basically, the role of ontology in the knowledge management process is to affluence the creation of a field model. It offers a terminology of terms and association in a precise domain. In making a knowledge management system, deuce sorts of knowledge are desirable. First is field knowledge: knowledge concerning the unbiased truths in the field of attention (objects, relations, events, states, causal relations, etc. that are gotten in some areas) and second problem-solving knowledge: knowledge concerning the use of particular knowledge to realize numerous end results, the knowledge normally presented in form of problem-solving method (PSM) that can facilitate attainment the goals in a dissimilar field.

In the case of business organization and water user networks or co-operatives, knowledge needs to provide solution of non-acceptance of particular product in the market or behavior of users. With the intention to manage the knowledge, ontology has crucial role in enabling the converting and distribution of knowledge amid experts and knowledge beneficiaries (Sureephong et al., 2008). Along with actors described earlier, it also offers a communal and reciprocated comprehending of a sphere that can be linked across individuals and utilizing systems.

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Business organizations are legal units through which stockholders and business persons offer goods and services as well as co-operate with each other to realize viable goals. Utilization of knowledge properly is key to firm's existence and prosperity in competitive international markets and has crucial contribution to critical thinking, selecting course of action, company performance and invention (Huang, 2008). Thus, business organizations are currently using knowledge to withstand continuing competitive advantage. At the moment knowledge is key management asset since knowledge permits organizations to apply and nurture organizational capitals, augment competitive aptitude and advance maintainable competitive gain.

Water users' networks or co-operatives are farmers' societies which are autonomous and governed by members (owners) who contribute both monetary and human capitals for their socio-economic benefits as well as conservation of a cognizable water body (Mosha et al., 2018). Since it is the knowledge, skills, and abilities of the individual that make value, emphasis ought to be on mechanism on how knowledge is acquired, exchanged and disseminated. Thus, knowledge management is a prerequisite if the business organizations and water users' networks have to attain roles for which they are established for (Omotayo, 2015). Knowledge management refers to stowage and distribution of the knowledge and understanding accrued in an organizations, association or networks concerning procedures, methods and actions. It considers knowledge as significant source in realizing members content (Gonzalez and Martins, 2017).

Knowledge management put emphasize on persons and the means they obtain, interchange and circulate knowledge. With the fast advancement of information technology and applied utilization of unconventional thoughts, a diversity of tacit, explicit, organized and unorganized knowledge is rising exponentially. How to successfully gather and classify these multifaceted, varied and multiple knowledges and, means to reacquire and reiterate them sensibly to form new standards for cultivating the competitiveness of firm. The relevance of knowledge management as key tool in business organizations and water users association cannot be overemphasized. Teng and Song (2011) and Omotayo (2015) assert that the importance of knowledge management is from recognizing that firms compete on their knowledge-based asset, even government institution (non-competing organizations) success or failure is dependent on the capacity to leverage their knowledge asset and that knowledge management is not only relevant in high tech industry only but also in all spheres of the economy. Despite the importance of knowledge management on enhancing business organizations competitive advantage, in particular, the aspects of Ontology-Based Knowledge Management framework in Business Organization have not been recognized if not rarely mentioned in few researches works.

On the aspect of water users' networks, water users networks are very vivacious sector toward ensuring food safety and poverty lessening particularly in Tanzanian's rural household's communities. About 45% of Tanzania's GDP is subsidized by the agrarian sector and around 30% of forex is through shipping of food items, while engaging more than 70% of rural inhabitants. As a result, the agriculture subdivision endures to be the engine for advancing the economy in the country (URT, 2011). Even though agriculture is the mainstay of the country's economy, still it is reckoned by a number of challenges; to mention a few, are intermittent drought, undependable rainfall due to natural catastrophes such as overflows and drought (URT, 2011). Based on this fact, water users' networks or irrigation associations are regarded as crucial means to battle food insecurity, upsurge food production and make food security amongst the domiciliary societies. However, in Tanzanian situation, food security is amid the national disasters. For the period between 2019 and April 2020, over 20% of the populace in the sixteen districts such as Tanga, Arusha, and Manyara are facing acute food insecurity. These comprise 16% and 5% suffering crisis situation, serious situation respectively. Furthermore, about 34% of people are also in IPC Phase 2 (Stress) and need livelihood sustenance. This discloses the intensity of trouble in Tanzania. While water user networks or irrigation societies was started mostly to increase agrarian production and improve food safety, the degree to which these irrigation networks advance food security in Tanzania continued to be small. It is for this reason that this chapter will document, share and propose a framework of knowledge management system. In order to assist business organization and water user networks in Tanzania to found a collective ontology that can be comprehended both by human and computer, so that employees and network members can form a common place of dissimilar notions through a better condition of knowledge recovery interface. This not only reflects the invention of knowledge but again can be used as tool for management to ensure conservation and revision of novelty knowledge on time. The system is also useful in ensuring that knowledge is shared so that it can accrue tacit knowledge continually and polymerize explicit knowledge successfully so that organizations and networks can use knowledge to outperform competitors and ensure sustained competitive advantage.

The development of this chapter was founded on the hypothetical and past study. To ensure an extensive theoretic base for this work, numerous available literatures were consulted. The study used a case study design where the experiences of business organizations and water user networks in Tanzania were explored.

2. Theoretical framework

Several interpretations on knowledge are debated in many diverse scientific forums, such as strategy, management, organization theory literature, and philosophy. Divergent interpretations on knowledge resulted to dissimilar operationalization

of knowledge management (Ferreira et al., 2018). The assumption is based on understanding that knowledge as a tactical resource. This is as stipulated by business strategy theory, explicitly the resource-based view (RBV) of the firm. The core thesis of the RBV is that competitive gain is based on valued and exceptional interior resources and capabilities that are expensive to reproduce for contestants. This implies that a resource to be a basis of competitive edge must meet three criteria. First, the results from these appreciated resources are freely procured by purchasers at a worth far higher than the charges acquired in producing it to the marketable state. Second, it is rare since it is contingent to partial supply. Thirdly, it is hard for rivals to either emulate or acquire the resources (Cardeal and Antonio, 2012). The theory further theorizes that the wanted outcome of executive effort within the enterprise is sustained competitive advantage (SCA) that permits the organization to get earnings that are beyond industry average (Mugera, 2012).

This theory sees SCA as originating from the peculiar resources of enterprise that stretches an advantage over its opponents. An enterprise such as water user network is observed as a package of particular resources that are utilized to establish advantaged market situation. Therefore, the RBT stresses tactical selections, where managers of the organization have the significant duty of recognizing, nurturing, and utilizing key resources to take full advantage of returns. In this case, organization manager must make sure that mechanisms are in place to ensure gathering, shaping, expounding, distributing and the reapplication of the information and knowledge in the entire firm. This is because the resource-based theory (RBT) places emphasis on decisions and competencies emanating from a firm rather than its environment (Barney and Arikan, 2005). Resource firm have, knowledge inclusive is a source competitive advantage. Internal influences are those that exert influence on firm owner/manager's aptitude to work competently, notwithstanding any inborn ability of the owner/manager (Amoah and Fordjour, 2012). Inner features are the individual qualities, skills, knowledge and capabilities of the discrete owner/manager which are critical on how well the business perform the unavoidable emergencies that ascend. Thus, RBT stipulate that knowledge is the main determinant of organizations performance. Knowledge management (KM) narrates the processes and set-ups organizations utilize to achieve, generate and disseminate knowledge for articulating strategy and create strategic choices that will enable a firm to gain competitive advantage. When a business organization develops knowledge strategy. It is described as the overall tactic a society intent to pursue to balance its knowledge resources and competences to the rational necessities of its strategy. A strategic boldness is essential to attain a maintainable competitive position.

From a practice, business organizations and water user networks recognize the eminence of handling knowledge if they are to persevere competition and rise. Subsequently, numerous companies universally are beginning to enthusiastically organize their knowledge and innovation. Knowledge do matter, but the enquiry is when, how and why? (Carayannis and Campbell, 2009). Today, knowledge is of more substance and in the way that are not constantly foreseeable or even controllable. Knowledge frameworks are extremely multifaceted, dynamic and adaptive (Carayannis and Campbell, 2009). This requires ontology-based knowledge management framework in business organizations and water user networks. However, RBT also does not value the synergy component among resource combinations in achieving competitive advantage (Kraaijenbrink et al., 2010). To overcome these criticisms, the system theory is preferred.

Systems theory emphases on the links amid fragments and the features of a whole, instead of plummeting a total to its segments and assessing their discrete properties (Senge, 1990). A system is described as "an object which preserves its being by the use the joint interface of its fragments Systems theory delivers a structure by which clusters of components and their characteristics can be studied together so as to comprehend outcomes". Thus, systems theory framework is important to the analysis of business firm and water users' networks and how they operate (Yari and Eslamian, 2021). A system is made up of at tiniest dual parts and correlation that holds among them. At any particular time, a system or each of its parts displays a state, defined as its pertinent features, morals or features. When considering knowledge, a significant notion in systems thinking is generative learning. Generative learning is the procedure of balancing, mixing and contextualizing prevailing knowledge to ensemble the wants of a new submission or a business organization (Chun et al., 2008). Generative learning permits advanced approaches to novel snags rather than simple reactionary and frequently ill-suited reuse of ancient philosophies to novel difficulties. A systems theory approach to KM identifies that any time one of the key knowledge developments is indorsed, there can be a ripple effect of actions and deeds that may alter the condition of other subsystems. Incident may be component of strengthening processes that results to the rise or deterioration of either wanted or unwanted consequences. Each knowledge process may result to unreceptive solutions or factual generative learning. Contingent on how four processes (the creation, storage, transfer, and application of knowledge) have been executed, they may be observed as closed, open or dynamic systems, each affected more or less by the outside setting and each interrelate and interdepend. While the systems intellectual viewpoint has been unified into the information system (IS) literature (Panagiotidis and Edwards, 2001), insufficient investigators have scrutinized the all-inclusive standpoint of systems thinking in the milieu of KM. Thus, this chapter will show and document how system theory can best explain assumption of ontology of knowledge management in business organization and water user networks.

3. Empirical literature

This section presents the reflection of previous studies in relation to the subject matter. These studies provide insights into understanding the ontology-based knowledge management framework in Business Organizations as well as identifying gaps. Huang (2008), explained how enterprise culture and structure can effectively enhance knowledge management by revising literature and demonstrating a knowledge enterprise model. The study further shows that in order to successfully utilize knowledge, the society should generate a knowledge distribution culture whose element is trust and contemplate it from the four category that is interpersonal, group, organizational and institutional. Belief ought to go through the progression of knowledge management and underscore trust to individuals and to knowledge content concurrently. Omotayo (2015) reviewed literature in the part of knowledge management and document the relevance of knowledge management in association. The paper additionally, shows that knowledge management is a critical element to objectives attainment and crucial instrument for enterprise existence, competitiveness and viability. Thus forming, handling, distribution and applying knowledge efficiently is important for society to exploit the benefit of knowledge and for organization to manage knowledge effectively concentration should be on three key factors that is people, processes and technology.

Barkhordari et al. (2019) examined the pragmatic association amid the knowledge based economy and fiscal progress in MENA countries. The study used progress model in Barro and Sala-i-Martin framework (1995) for the time frame of five years (2010–15) as well as panel data of yearly fiscal development rate for the designated MENA countries and within the hypothetical and pragmatic context of the quatern variables applied for recognizing the context of the knowledge-based economy. The outcomes show that institutions, human capital and research infrastructure and business sophistication are the pillars of knowledge-based economy that have substantial and positive influence economic development in MENA countries. The recommendation emanating from this study is that government should contemplate the knowledge connected policies for hastening passage to the knowledge-based economy and boosting economic performance. Sureephong et al. (2008) recommended knowledge management system that hold up knowledge management actions inside the organization. To attain the goals of the investigation, ontology is the key in the knowledge management development in several means as establishing reusable and quicker knowledge based and improved customs of representing the knowledge openly. The study further found that generating and depicting ontology produce problems to enterprise due to vagueness and formless origins of knowledge. Therefore, the study proposes the methodology that comprehend, generate and depict, ontology for firm or societal development by means of the knowledge manufacturing approach.

Liu et al. (2013) presented knowledge management context that tracks and combines origin information across dispersed varied system. They reinforced by the combined knowledge model that defines the field knowledge and the origin information included in the information life cycle of a certain data product and appraised the anticipated frameworks in the setting of deuce actual world water irrigation information systems.

Basing on the above empirical studies, it is clear that the studies on ontology-based knowledge management framework in business organizations have been conducted worldwide. These studies found that institutions, human capital and research, infrastructure and business sophistication as well as people, processes and technology are critical in managing knowledge effectively. Yet, little research has examined how ontology-based knowledge management framework in Business Organizations and water users networks, particularly, the extent to which business organization accrue implied knowledge continually and polymerize obvious knowledge competently, which result to improved organization and utilization of knowledge, to sustain the invention for the inventers. Therefore, relying on this fact, this study aimed to cover the existing slit by authenticating outline of a knowledge management scheme founded on ontology of knowledge management that form and explain knowledge with the ontology with the aim of creating a shared ontology whereby aspects of knowledge management such as human, computer, and people can be appreciated and discover additional association of different notions by improved mechanism of knowledge recovery interface. This will not only reflect the invention of knowledge, but apply management tools to ensure the storage and upgrade of novelty knowledge timely and thus enhance business and water users' association performance.

4. Ontology-based knowledge management framework in business organizations: A conceptual framework

Knowledge based economy raises exponentially and thus knowledge asset becomes irreplaceable to the organization. Efficient application of knowledge has come to be central to the firm's endurance and accomplishment in rivalry world-wide business and has an effective probability to problem resolution, decisiveness, enterprise performance enhancement and invention. Successful application of knowledge, as described in academia, is knowledge management. Knowledge

management refers to organized, clear and deliberately established procedures needed to manage knowledge, the intention of which is to make best use of an enterprise knowledge-linked effectiveness and form standards (Bixler, 2005). The procedure included in KM comprises gathering, sorting, illustrating, distributing, and reutilizing the information and knowledge in the entire enterprise. Concerning with knowledge is the foremost principle of knowledge management. Knowledge management is of two kinds overt and unspoken. Overt knowledge may be voiced in proper verbal and communicated among individuals while inferred knowledge contains more imperceptible features and is private knowledge entrenched in personal skills. Equally obvious and inferred knowledge must make earnings and resolve today's issues in association. Mastery of relevant and contemporary knowledge for unceasing association enhancement is main focus of KM. Effective KM has maturity, dynamic and self-development attributes. Maturity qualities purport that KM must be durable and sufficient to solve the turmoil in attaining results hitherto dynamic and adapt to deviations (Barkhordari et al., 2019). Again, KM should bring into line with enterprise policy, strategy, culture technology and structure and offer an atmosphere with well-organized, value added and pertinent knowledge to make and initiate creativity and exciting ideas. Dynamic attributes mean the information and knowledge movement should blowout through the enterprise without barricades where everybody can share and subsidies knowledge asset. Self-growth attribute implies, on one hand, KM should sense possibly valuable knowledge, seizing and stowage it to upsurge enterprise assets and on the other side it should make new knowledge relying on what an enterprise previously has had. Knowledge Management can advance organization, for example, leveraging the intellectual capital, exploiting knowledge assets, preserving cutting edge performance. In organizational perspective, it is expected that organizational policy, strategy, culture technology and structure can enhance knowledge management.

For example, organizational culture can impact knowledge management in the sense that in knowledge sharing culture, organizational culture may enable knowledge dissemination, particularly implicit knowledge. People are extra persuaded to hide what they are familiar with when are indeterminate with the consequence of dissemination, to ensure sharing is done effectively building trust is key. This is because trust involves faith to persons and faith to the knowledge content itself. Confidence to persons is important in creating collaborating and participative culture in the organization. This is expected to minimize the barriers to the knowledge sharing. On the other hand, faith to knowledge content will rise the trustworthiness of knowledge which may facilitate persons utilize knowledge without reservation and foster the trust to other individuals instantly. Research further, identified other concept of knowledge allotment culture like the possession of knowledge and obligation. Possession of knowledge can be categorized into enterprise trust. This entails that firms should facilitate the employees work, offer essential knowledge to complete their duties, be open to censure and inspire confidence. The knowledge resources not only possessed by executives, it ought to be public to everybody in the enterprise. All employees have the right to possess and recoup the knowledge asset. In addition, organizations should form environment which enable staff feel equal access to knowledge assets and accountable for facilitating change.

Furthermore, organizational structure also affects knowledge management positively. This is mainly because to implement knowledge management business organizations appoint the person responsible with for example, chief knowledge officer (CKO), knowledge engine, and knowledge manager to execute knowledge management. The organizational charts should be interacted to offer occasions for workers to co-operate and liaise with the rest and facilitate knowledge linked deed. Since it is intangibles and more pertinent to individual moods, organizing implicit knowledge is extra tricky than overt knowledge. Organizational settings must be in position implicit knowledge and change overt knowledge if needed. The organizational design must be networked to deliver chances for each staff to interrelate and liaise with others and offer knowledge associated activities in firm. Organizational frameworks should facilitate tacit knowledge and turn it explicit. In the organizational setups, there must be links amid individual enhancement and organizational development as advocate by system approach discussed earlier.

Technology is enabler, within infotech are machineries which enable the executives to distribute knowledge and data. Consequently, infotech have a crucial function on Knowledge Management creativities. Within contemporary business situation, the execution of knowledge management projects is uncomplicated with the assistance of machinery (Subashini et al., 2011). The worth of Knowledge Management increased when accessible to the accurate persons at the exact time. Thus, knowledge distribution, storage and retrieval are eased via infotech equipment such as computers, phones, e-mail, folders, data-mining systems, exploration engines, video-conferencing equipment and micro film.

Human factor is crucial to successful management of knowledge management thus human resource management assist much in managing knowledge by compounding "congruence" and "human" and "social capital" approaches. Through the integration approach human resource management mechanisms should be internally reliable in order to mutually strengthen each other, strengthen the entire management framework in the organization and "fit" with the exterior business situation. Human resource management in the field of career progression and payment systems also need special emphasize in order to effectively manage knowledge (Omotayo, 2015). By using human and social capital approach, they emphasize the

significance of "the long-term growth of skills, culture and competences in the organization" (El-Farr and Hosseingholizadeh, 2019). Considering the thesis that personnel are carriers of abundant enterprise key knowledge, they propose that human resource experts should focus upon, first, the retaining of staff. Second, they recommend that workers' know-how be built into the enterprise customs through learning procedures. Third, they advocate that devices are formulated for the sharing of profits ascending from the consumption of this knowledge.

On the other hand, Armstrong (2006) suggests ways on which human resource management influence knowledge management (i) Assist in fostering an exposed culture in which the customs and standards stress the relevance of disseminating knowledge. (ii) Endorse an environment of devotion and honesty. (iii) Recommend on the blueprint and expansion of enterprise which simplify knowledge distribution using webs and societies of practice (clusters of persons who share mutual needs about their work), and co-operation. (iv) Suggest recruitment strategies and offer supply amenities which guarantee that respected staff who can subsidies knowledge formation and distribution are captivated and reserved. (v) Offer means of inspiring persons to make their knowledge explicit and motivating persons perform those act. (vi) Aid in the establishment of performance management procedures that emphasize on the expansion and dissemination of knowledge. (vii) Formulate mechanism of collectively and discrete learning that will produce and help in circulating knowledge. (viii) Establish and conduct workshops, meetings, training and conventions which facilitate knowledge to be shared on a person-to-person base. (ix) In collaboration with infotech, form structures for seizing and, codifying overt and inferred knowledge. (x) Largely, endorse the source of knowledge organization with top executives to inspire them to apply direction and backing knowledge management creativities.

On the other hand, hydrology is the discipline of water that involves storages and fluxes in site, period and stage. Based on complexities of technical problems, it is increasing difficult to allocate water resource so as to solve problem within one organization or one site (Liu et al., 2013). Data gathering and scrutiny are done without dispersed heterogeneous. Equated with additional data-oriented discipline societies, one of the unique features of the hydrologic science communities is fact that there is countless focus on externally generated data e.g., data gathered by other organization. A noteworthy snag for field operators is to find the correct data that suit their needs and to choose means to utilize that data (Tarboton et al., 2010).

Additionally, societies have positioned greater consideration on the interacting of disseminated sensing and less on the tool to control and comprehend the data. To correctly understand data produced by external agent, the operators require to possess mastery of the source of data. Thus, water user networks in Tanzania need a mechanism of a knowledge management framework founded on ontology of knowledge management that shape and explain knowledge with the ontology with the aim of creating a shared ontology whereby aspects of knowledge management such as human, computer, culture, structure, leadership, and technology can be appreciated and create more association of dissimilar thoughts through the use improved context of knowledge reclamation interface (Fig. 1).
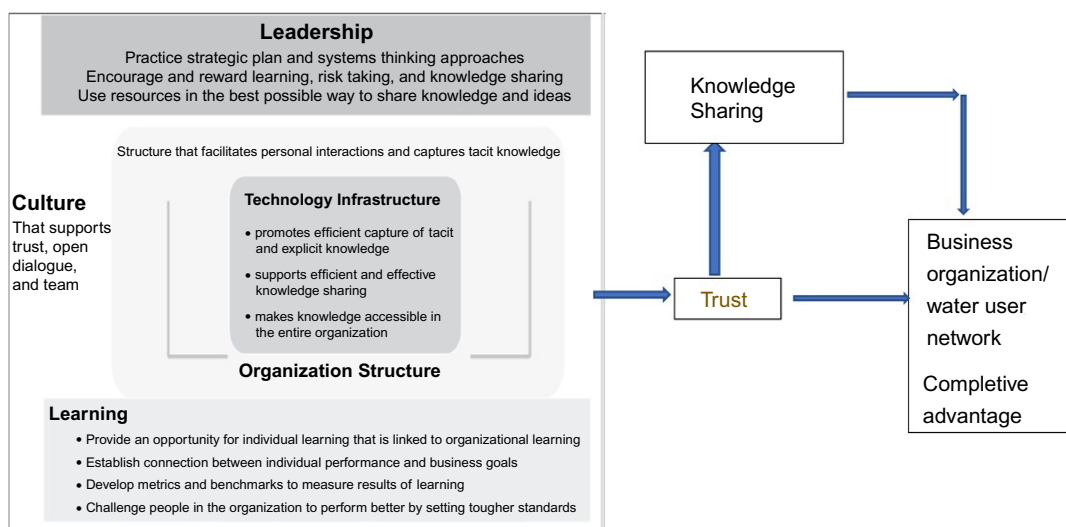

FIG. 1 Conceptual framework of ontology-based knowledge management in business organizations. *(Modified from Anantatmula, V.S., 2005. Knowledge management criteria. In: Stankoshy, M. (Ed.), Creating the Discipline of Knowledge Management: The Latest IN University Research. Elsevier Butterworth-Heinemann, Amsterdam, Boston, Netherlands, pp. 171–188.)*

5. Ontology-based knowledge management framework in business organizations and water user networks proposed system

Business organization and or water user networks are formalized structures of roles or positions to facilitate accomplishment of goals. Thus, today's society is a society of organizations. This owes itself to a dynamic of capitalism as the dominant mode of economic system. Capitalism thrives through organizational activity. Organizations have to be managed as they grow in complexity. Therefore, organization/water user networks develop to achieve goals, they involve sets of interacting positions, they involve collaborative actions of individuals, they are deliberately structured and consciously coordinated, they involve departmentalized activities following a logical pattern and they exist within the larger society (Daft, 2000). Since organizations/water users networks operate within society. They are described as open system in the sense that they are in a continuous exchange with their environments in order to survive. They receive inputs from this environment, transform them into outputs, and pour them out into the environment as goods or services and waste. Through feedback the organization gets information about what works and what doesn't work and makes the necessary correction or adjustment. Changes in the external environment require the organization to adapt accordingly. Such changes impact on strategy, structure, and culture of the organization (Fig. 2).

For the above system to operate effectively, the ontology of knowledge management is needed. This is because the core role of knowledge management scheme is to facilitate knowledge distribution inside. Thus, accession of knowledge does not reflect the commencement of the knowledge management but then crucial condition (Huang, 2008) so as to be suitable for reutilization of knowledge. Knowledge management creates clear components that are stowed in a knowledge foundation that comprises numerous organized, semiorganized, and unorganized information. The knowledge management is alienated into trio portions if it has to work effectively and attain organizational goals. That is procurement of knowledge, storing of knowledge and re-claim of knowledge as well as procedure whose key conception in ontology is connected by knowledge mining, knowledge depiction, and knowledge correlations.

Procurement of knowledge is the conceptualizing procedure founded on the perception of ontology. The procedure changes entirely essential knowledge, informal and semiformal information to the formal information. Furthermore, purchase of knowledge is actualized by knowledge mining that permits to place knowledge base, such as countless data sources, certifications, and webs in the knowledge repository afterward dealt with by knowledge detection system (KDS). Additional knowledge foundations such as data in each varieties of forum, comments on applications (comprising tacit knowledge) are initially placed in the passage repository. Subsequently organized efficiently by leaders, these repositories will be placed in the knowledge repository. Consequently, obtaining of knowledge refer to the methods of knowledge building rather than knowledge adaptation (Peng et al., 2019). Intending at changing semi organized and unorganized data to organized knowledge and store them in the knowledge bank, stowage of knowledge means the method that metadata is taken out of knowledge foundations developed atop and knowledge are noticed in means of ontology and
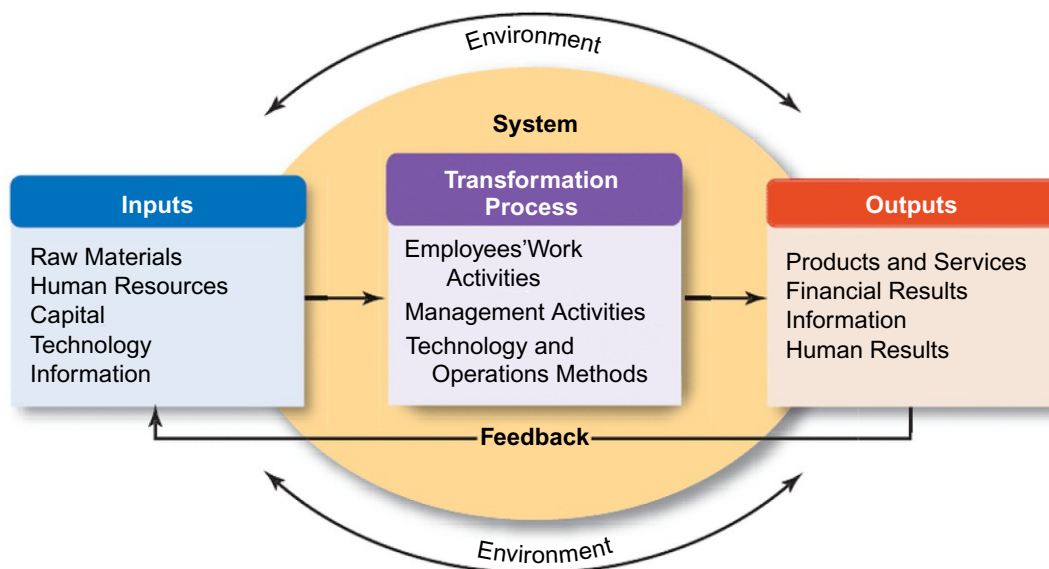

FIG. 2 Organization as open system. *(Modified from Daft, R.L., 2000. Management. The Dryden Press, Fort Worth.)*
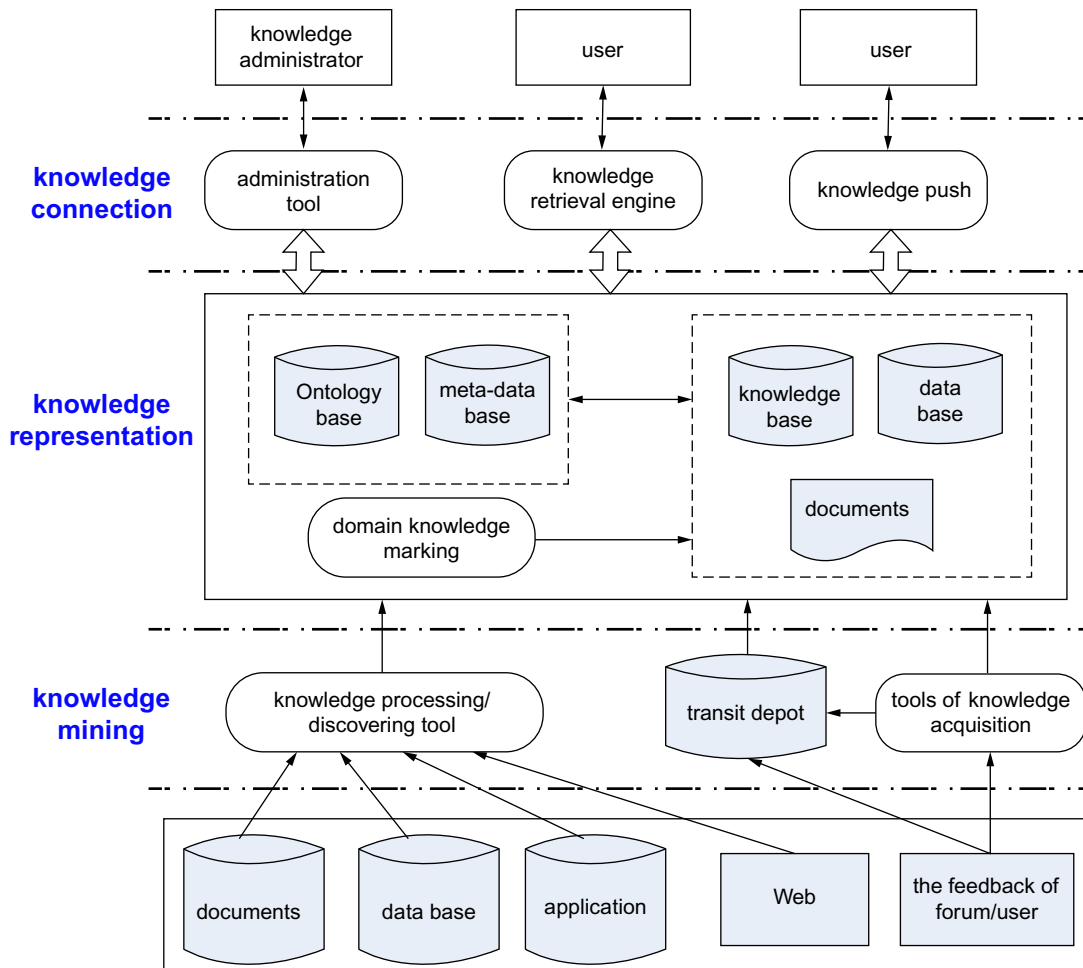
FIG. 3 Ontology-based knowledge management framework in business organizations and water user network-proposed system. *(Modified from Peng, M. Y.P., Zhang, Z., Ho, S.S.H., 2019. A study on the relationship among knowledge acquisition sources at the teacher-and college-level, student absorptive capacity and learning outcomes: using student prior knowledge as a moderator. Educ. Sci. Theory Pract. 19(2), 22–39.)*

metadata ideals. Ontology foundation comprises association of the grouped notions of field knowledge substances and extra ideas in a system. Metadata, which KMS needs is placed in the metadata bank that form the core tool to explore knowledge object successfully (Fig. 3).

Data bank and knowledge bank are kind of combined of syntax, metadata information and connection of knowledge objects (in this case information on employees or members titles, education, training, past service, present position, performance scores, pay levels, language proficiency, and capabilities and specialized skills). Separate cluster command on associated knowledge in feature of metadata store and ontology is not only the beliefs but again the basis to attain effective search and conjecture on knowledge. It was also noted that acquisition of knowledge in business organization and water user networks in Tanzania is poorly practiced. It was reported that in this company the concept knowledge management is completely new. *"We still rely on trial and error to solve problems we are yet to have knowledge management systems in place. Thus it is difficult to have information and knowledge database that can easily facilitate knowledge acquisition." Most of the knowledge are still tacit in the sense that they are yet to be retrieved from the people who own it, debated and stored in company database, debated and criticised and stored in company database.*

Reutilization of knowledge is the mechanism that knowledge is utilized in using systems. In this context, workers or members can utilize knowledge exploration engine to search needed knowledge in diverse discrete cluster in previous works. One may obtain knowledge through technique of pull. Furthermore, KMS likewise provide linked knowledge depending on individual preference and instant requirement. Under the favorable management situation, knowledge in the repository is controlled, rehabilitated as well as kept promptly by knowledge leaders, who permits that system to have competent capacity of active involvement rather than those that are limited to the still usage and close preservation.

6. The practice of knowledge organization and expression

6.1 Ontology

For organizations and water user networks to carry out its work effective ontology is necessary. Ontology is distributing abstract model of official description. In execution, it is typically accepting five different arrays to designate ontology, notion or class association, roles, axioms and occurrences. Association is the heart of ontology in five diversified arrays. Establishing a good correlated area ontology foundation is the central aspect of the knowledge management foundation on ontology.

The correlation of ontology replicates the constrains, interaction or a novel connection among thoughts, such as the identical, appositional, hyponym, configuration, interconnection and noun modified relations etc. Numerous associations can logically link each form of the knowledge node and establish a web of knowledge association base on ontology, then it can obtain the accurate knowledge node using comparative path. There are two systems of knowledge relations (i) major ontology relation and (ii) minor ontology relation (Zhang et al., 2011). The formal relation describes all the terminology concerning particular field and ontology association among each terminology; the other relation describes the outside concepts of other domain linking the terminology of major ontology relatives. Using the major and minor relations can create respectable knowledge organization and likewise retrieve knowledge proficiently and rapidly. Hypothetically all functions carried out by water user association or business organization are connected between firms to produce outline function for a web, again all properties in a firm "bind" within the associations to generate a resource gathering for a system. Lastly, the players are attached within association to form players' network. Yet, single managers cannot realize the entire pattern in which the enterprise is entrenched. For executives, it implies taking a confined sight, establishing enough intricacy into their comprehension to permit act, in order to prioritize aims across time. A part of relation network of business and water user association is presented in Fig. 4.

6.2 Knowledge representation and organization base on ontology

The kind of knowledge depiction must be positioned first. Owing to the variety and intricacy of knowledge, it is challenging to convey the knowledge in organized way. There are varied types of knowledge illustration, nonetheless there is no settled and organized technique of the knowledge depiction (Zhang et al., 2011). Additionally, the formation of an undivided knowledge base may not qualify for a conglomeration inventive plans, due to the cross and united knowledge in numerous discipline at the moment. A multi-ontology foundation concerning knowledge organization is offered. This model generates one knowledge foundation correspondingly, use the elementary typescripts of ontology and the association labeled above that appreciate the interconnectedness of many-ontology bases and lastly create a knowledge system. As shown in Fig. 5.
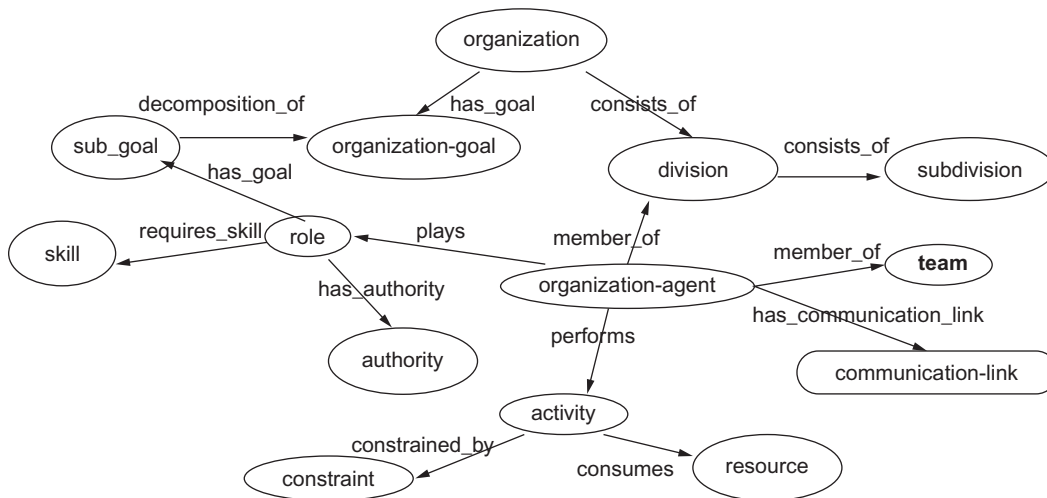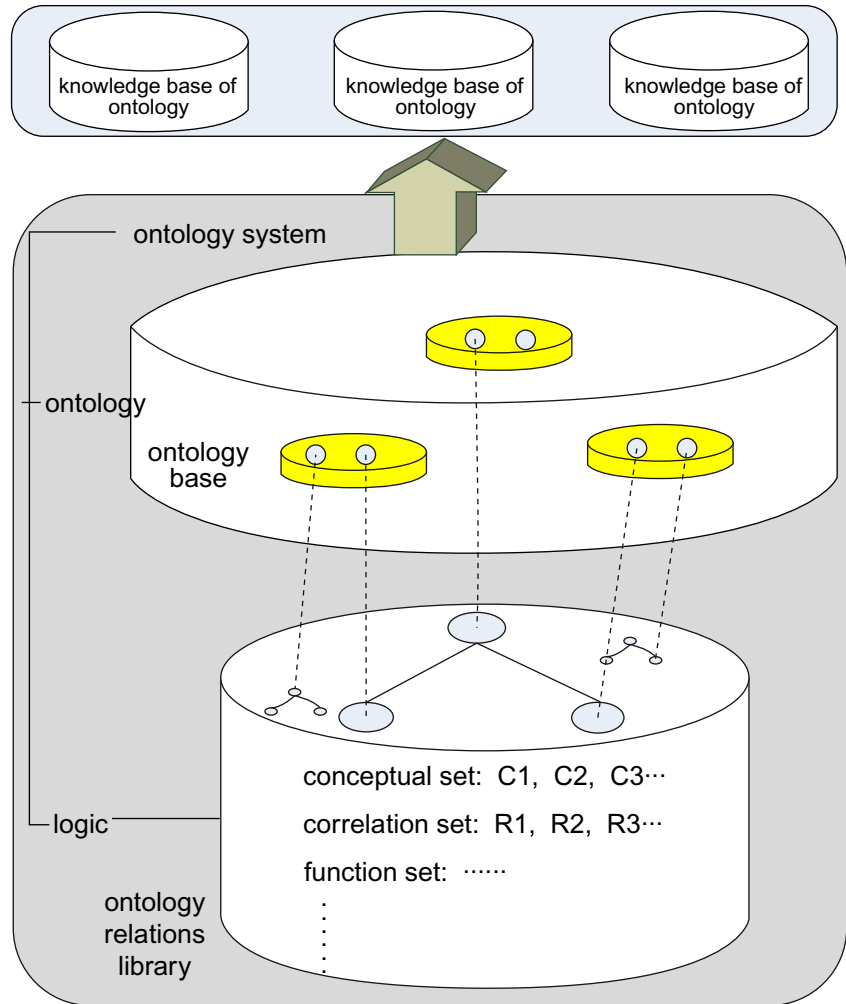
FIG. 4 Part of relation network of business and water user association. *(Modified from Grunninger, M., 2003. Enterprise modelling. In: Handbook on Enterprise Architecture. Springer, Berlin, Heidelberg, Germany, pp. 515–541.)*

The relative of ontology in rational strata is really a tree or ontology relative which occur in the in-tree shape construction. Each thought is the notion of smallest and correlate to one another through ontology links. This stratum comprises of all the notions and relative web of knowledge foundation. Moreover, it comprises quatern parts-components among each idea: instances, axioms, relation forming, relation sets attributes, etc.

Ontology strata is the higher construction of the ontology relative library. Founding on the notion of creating model of manifold knowledge centers, it created a knowledge system in the concept of comparable use to back up the plan process (Zhang et al., 2011) (for instance, the process, equipment's, approaches, guidelines in computer assisted procedure planning) and ontology association related to the occupation resemblance. It is recognized that separately knowledge web is the basic idea acts concerning correlated discipline and the knowledge system of ontology is the element of diversified ontology bases.

Moreover, diversified-ontology centers with connected domain knowledge in form of creating rational layer and ontology layer is given. For example, it may be separated in numerous portions such as domain knowledge foundation, principal knowledge foundation and unified knowledge foundation and so on. Each knowledge base of ontology is connected by lowest of constrains among every idea and designate the object, concept and semantic association concerning linked parts base on ontology.

For irrigation co-operatives in Tanzania to increase efficiency and respond to the members needs they require ontology of knowledge management (Sandelin et al., 2021). Thus, recognizing this, knowledge need to be managed in a systematic and strategic way. Irrigation and water user networks occupy noteworthy subversive and mechanical resource, of which they lack sufficient expertise. This is frightening due to the fact that irrigation co-operatives and water users' networks to be able to offer good services to its members is contingent to appropriate operation and preservation of key resource just like any other business enterprise. Knowledge asset enhancement need to be continuous action in irrigation co-operatives and ought to begin from the principle of identifying a gap between current knowledge and desired knowledge and how technology as enabler facilitate knowledge management practices.

Irrigation co-operatives may lose knowledge due to retirement, sease of membership, severe or long-lasting sickness and death. When these irrigation co-operatives experience these it creates loss on portion of its institutional memory. This is due to the fact that most of the knowledge is tacit and utilize solutions that depend on classical working practices as well as possessing negative attitude on technology, thus making explicit knowledge is found to offer solution thus, this Ontology Knowledge Organization Model is suggested.

6.3 Knowledge retrieval base ontology

The drive of the knowledge management is to offer suitable knowledge to the accurate persons so that they can be capacitated to make the best decisions. Furthermore, the knowledge retrieval is a main challenge of knowledge management which is the center within linking among people and knowledge. Knowledge if is to help organization and water user networks achieve goals for which it was established for must be retrieved at the suitable time and to the suitable people. Unfortunately, this is missing in most business organization and water user networks in Tanzania and as a result they fail to make informed decision on issues related to customers as well as product design. Knowledge recovery should focus on knowledge organization because recovery pattern is fixed by association design, and it is the differing procedures of the knowledge organization. Thus, the chapter apply the domain ontology-based firm design founded on the investigation of the ontology and the knowledge depiction to design the recovery path as shown in Fig. 6.

This recovery mode is alienated into quatern parts; knowledge interlinkage, ontology, knowledge resources, and matching recovery. Knowledge interconnectedness key role is going through the corresponding recovery mechanism by the use of recovery passages, selecting the suitable entering (self-defines recovery and autorecovery) that explore the knowledge bulges and ideas in the associated grounds, gaining acceptable similar consequences and again taking them
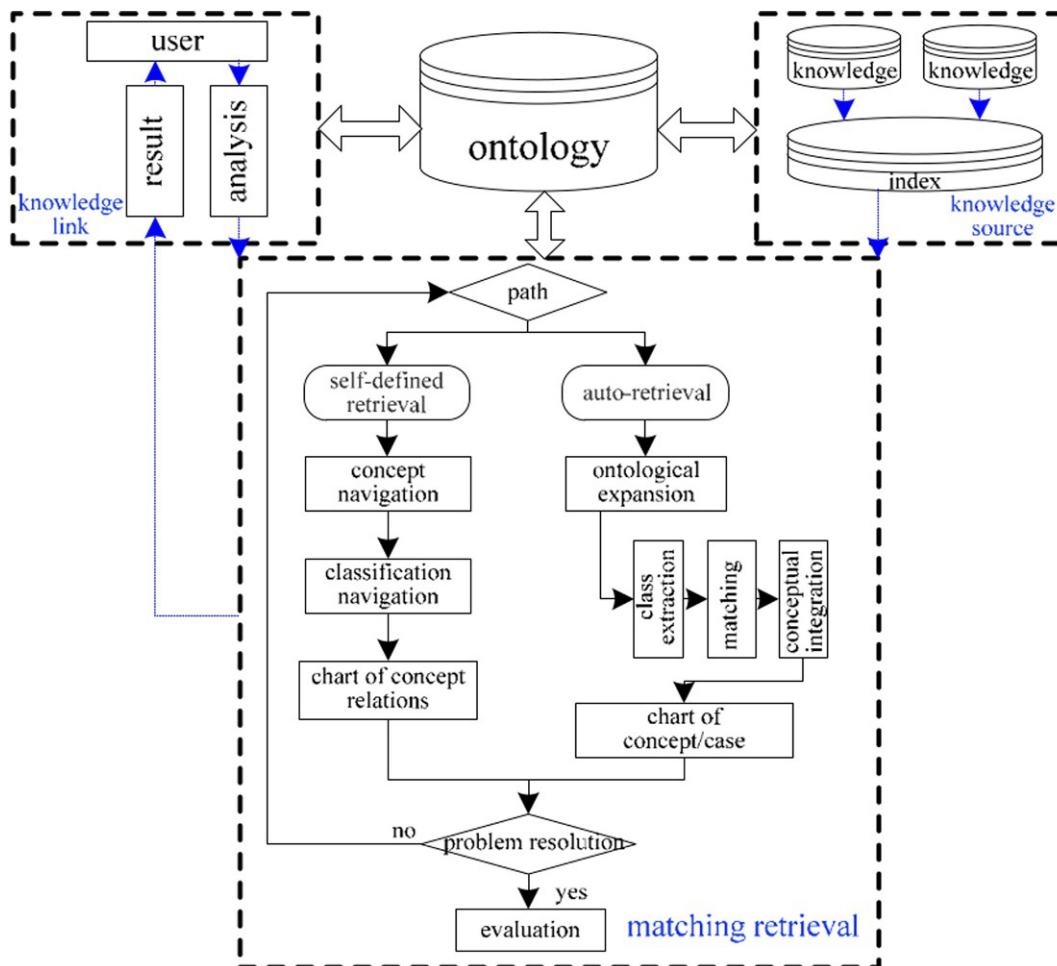

FIG. 6   Model of knowledge retrieval base on ontology. *(Modified from Zhang, J., Zhao, W., Xie, G., Chen, H., 2011. Ontology-based knowledge management system and application. Procedia Eng. 15, 1021–1029.)*

back to the operator. Knowledge reserve is the basis of the knowledge retrieval founded on the ontology, it is the main point to form the knowledge recovery arrangement dissimilar from well-known information recovery frameworks. Furthermore, it is the central tenet of the system model. From the recovery examination and the findings, management to the knowledge connotation recovery procedure, to the knowledge assets design to the index base are all founded on the correlated knowledge in the ontology.

High effectual knowledge repossession rests on in a higher quality recovery tactic and technique. This chapter present two recovery path self-defined retrieval and autoretrieval (Zheng et al., 2012). Which permits water users networks and business organizations in diverse stratum to opt the suitable retrieval means conferring to unlike needs. The procedure of self-described recovery user may describe the facet of knowledge all by themselves using the notion navigation, clarification navigation as well as graph of notion relations. As long as the network will explore the classes therefore, it can demonstrate the variation relatives of the ontology to the operator in the human computer integration level as well as can choose the sight of the itemized ontology. Since the ontology is quantified by operator in a definite selecting assortment, specifically the range for searching are tapering extra or fewer in similar extent thus, cognate the essential knowledge for the operator. This type of search method with some adjustment may principally satisfy majority of operators aspirations and offer operators with extra maneuvering direction.

Added form of recovery path is mechanical retrieval (extended type retrieval) that is truly the growing of the thoughts. It is implemented contingent to the relatives amid notions and connotation of the ontology. It comprises dual facets as follows by means of the association articulated by the ranked construction in domain ontology to produce extra retrieval findings user-challenging notions substituted by "topclass" concepts or the precise qualities value substituted by qualities value, which all decrease the restraints of this recovery mode. Operator challenging thoughts swapped by subgroup ideas can obtain profound and extra connotation thought and representation formats. Using the multidisciplinary notion counting many additional domains of knowledge and additional domain of notion relative knowledge to enlarge the field which these multidisciplinary knowledges are belonging to.

In business organizations in Tanzania storing of knowledge contains soft or hard mechanism of capturing and storage of personal and enterprise knowledge in a manner that is simply retrieved. Storage of knowledge exploits mechanical set-up like informational hard and software and human competencies to recognize organizational knowledge, then to code and index retrieval purposes (Armstrong, 2006). This persons to document method. A repository as consents many to explore for, and retrieve codified knowledge without meeting a person who inverted it, thus ensure organizational continuity.

6.4 Knowledge application and implementation base on ontology

This system may be applied to the arena of hydro informatics, after examining the formation of structure of knowledge management arrangement founded on ontology. The knowledge organization and depiction as well as recovery, first, in an effort to mine, classify and establish the connected knowledge ground firm apply a diversity of equipment for knowledge gaining to assess on associated domain of knowledge (Zhang et al., 2011). A proper-structured ontology is significant to establish a knowledge management framework successful. This chapter evidently describes the ladder among terms which are equally acknowledged in business organizations and water users' networks and acquire the top-down technique, which imply itemizing highest-level notions and progressively purifying to create subgroups. For example, hydroinformatics can be categorized into numerous glades; enginery, power, driver, performance, etc. then slowly feast the subgroup, spreading by similarity. There might obtain a theoretical chart that possess domain knowledge with dependence. Lastly build a ontology model after describing the qualities of classes.

The worth of ontology knowledge ground is usability, thus, the connection among enquiries that ought to be answered and knowledge in foundation is prime for knowledge repossession (Zheng et al., 2012). If user opt for self-described retrieval, it will arrive into the interface presented in the ideal of knowledge retrieval described earlier, if users select self-described retrieval, it will get in the interface as presented in Fig. 7.

On the left of notion exploration part is the notion three presenting groups, the differing side present diagram of web correlation. Clacking the key "enter" it will appear as Fig. 5B. Picking a notion, the right will show the key association of subject notion, inclusive of supreme, lateral, thought and related concept that will be displayed in viewing a concept part. This offers a thin or extension exploration varieties in order to get conforming knowledge object. If operator select auto-retrieval, it will get into the interface as it is displayed in Fig. 8.

Primarily, by means of isolating into quatern features, carrier, action, object, and condition by means of ontology scale for inquisitive and altering ontology word, it shall result into problematic depiction. Snapping the key "ontological expression" operator shall obtain content knowledge subsequently class mining connate as well as theoretical amalgamation. The knowledge acquired will help organization attain competitive advantage.
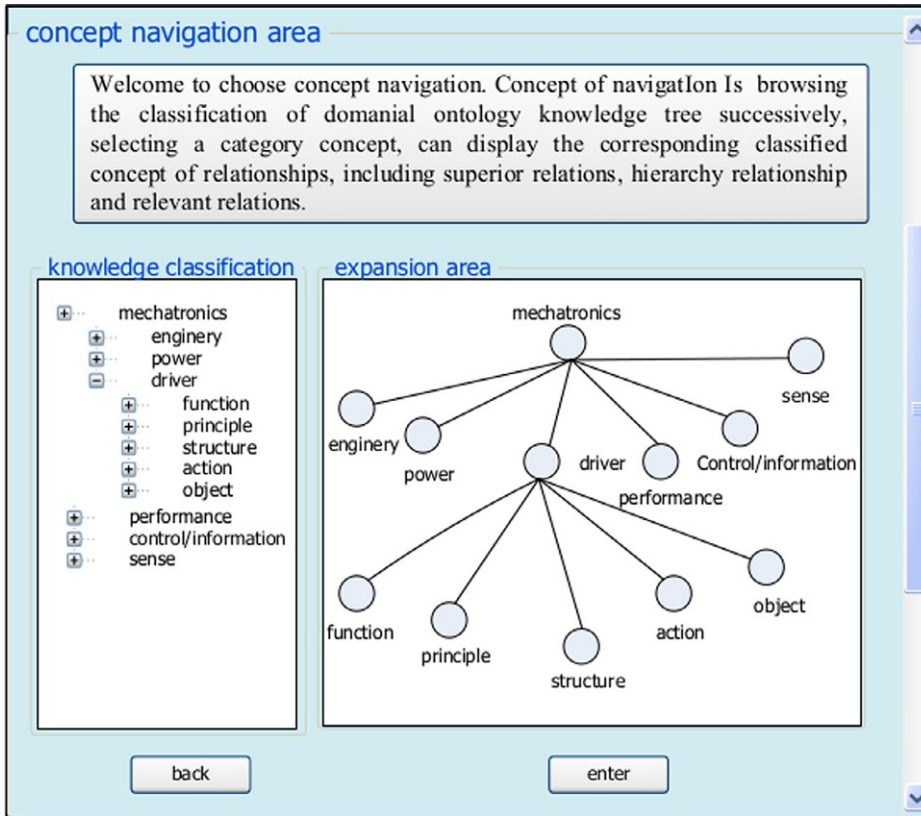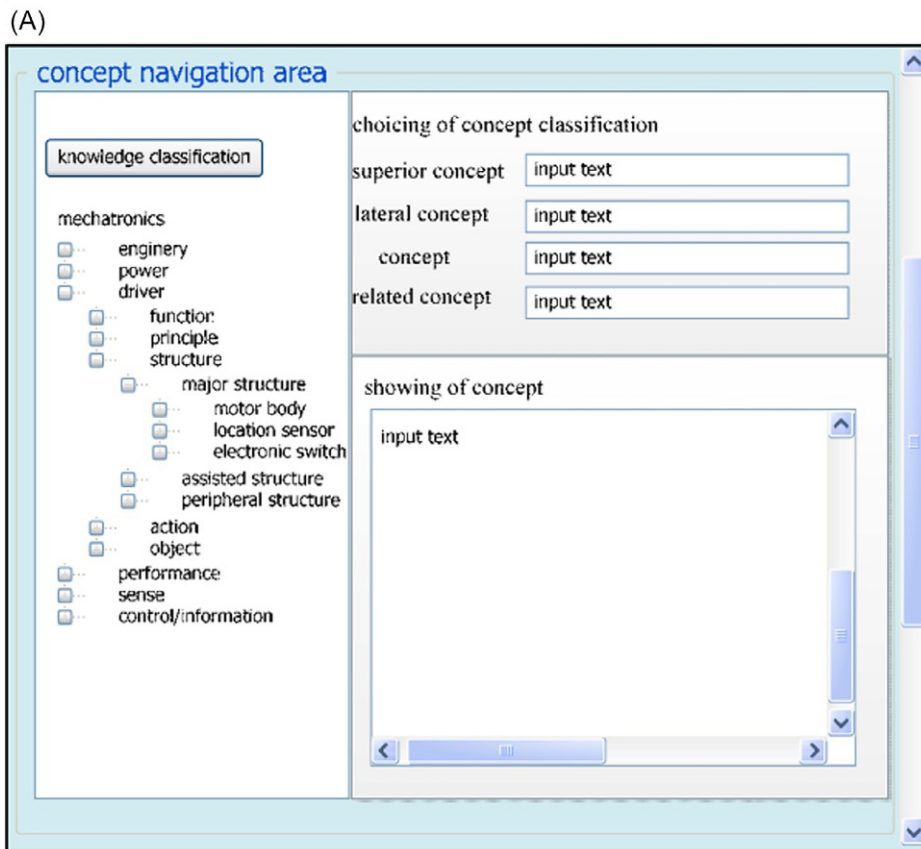
(A)

(B)

FIG. 8 (A) Autoretrieval module. (B) Autoretrieval model.

(A)

(B)

7. Conclusions

Granted that ongoing debate on performance of business organization and water user networks focus of various factors which affect performance, the contribution of ontology-based knowledge management framework has been given scant attention. In this chapter resource based and system theory are used to propose a framework of ontology-based knowledge management that can enhance performance of business organizations and water user networks. These frameworks can be employed to explain how ontology of knowledge management can facilitate competitiveness of these organization through knowledge acquisition, representation, retrieval and manning. The chapter also shows how culture, structure technology and people can facilitate knowledge sharing and ontology of knowledge management development in organizations. On the other hand, the chapter shows that most business organization and water user association in Tanzania lack framework of ontology-based knowledge management that creates challenges to the enterprise due to ambiguity and unstructured nature of knowledge management in business. Irrigation co-operatives and water users networks may lose knowledge due to retirement, sees of membership severe or long-lasting sickness and death. When these irrigation co-operatives experience these it creates loss on portion of its institutional memory. It is therefore recommended that in order to manage knowledge effectively management should invest enough capital in establishing structure and systems of knowledge management, educate employees and members on the various aspects of knowledge management ontology as well as fostering knowledge sharing culture based on trust.

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