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Review Article

PRESENTING A MODEL BASED ON THE SEMANTIC WEB FOR KNOWLEDGE MANAGEMENT IN THE CLOUD COMPUTING COMPOUND SERVICES

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ABSTRACT
Recently, with the development of cloud architecture more need for the combination of services if felt in such a way that the user applying a particular service may move to another service performing a new action on it, thus, such an event is repeated in a series like manner leading to creation of the work flow. In addition to the problem of combining the services, it is necessary to obtain automation over the operations of combining the services for the better implementation of this work. Therefore, the cloud services should have the capability of meeting a user's complex needs, however, this affair becomes accomplished if we can combine the simple services of the cloud computations and create the applied ones. In this research, the identification of cloud computing services was dealt with, moreover, the researcher examined the extent of the relationship in cloud computing services in which the "saas" service, in comparison with services of the lower layers in the layered architecture was more outstanding. In addition to investigating the problem of combining the services and their weak points, the tools and ways of managing the combination of services in line with gaining the automation in the operation of combining the services, and submission of dynamicity of the compound services were examined. Then, a model based on the conceptual web for the knowledge management while considering its components and processes with the purpose of evaluating its effectiveness and performance, and creating more dynamic cloud computing compound services, was presented.

Keywords*: Cloud Computations, Compound Services, Semantic Web, Knowledge, metadata, Knowledge Management.*

INTRODUCTION
The cloud computing is an under network model which brings about easy access to a collection of such configureable computations as servers, networks, storage systems and services when needed. These computational sources are speedily available and usable in the case of users' demand. The cloud computing has become a very significant environment due to the capability of presenting flexible and dynamic infrastructure. The simple cloud computing services combine with each other and form diverse, complex and heavily applied ones. Of course, this topic includes the services of the lower layers in addition to having the "saas" layer or software services in such a way that the user, with due attention to his own different needs, can demand appropriate services and exchange the required data among the services. In combining the services with each other, some problemes and shortages of various computing sources such as the automation operations of combining the services appear, moreover, protecting the dynamic binding in compound services has been disregarded. In this research, a solution to automatically facilitate the discovery and resource sharing of the services was presented. However, having been of an applied type, the research uses a descriptive-analytical method using a comparative approach to obtain a model based on the semantic web for the knowledge management in the cloud computing compound services.

The Main Purpose of the Research
The main purpose is to present a model based on the semantic web with due attention to components and processes of knowledge management in the cloud computing compound services.

The Secondary Purpose of the Research

- Recognizing and investigating the semantic web
- Recognizing and investigating the semantic web
- Recognizing and investigating the cloud computing compound services

THE RESEARCH METHOD

In this article, the research method is descriptive-analytical in which a comparative method has been used to obtain a model based on the semantic web for the knowledge management in cloud computing compound services. This research is an applied one.

The Theoretical Framework of the Research

The Definition and Concept of the Semantic Web

So far, no precise definition of the semantic web has been given, in addition, there are countless disagreements on how to define it. However, the semantic web aims at organizing and storing the information in such a way that the computer's marketing and searching of it can be possible to process and interpret. In other words, the semantic web is a kind of method of coding and also retrieving the information which is intelligible to the computers (Keshavarz, 2007). Moreover, the semantic web is a network of information on the global scale in such a way that its processing is simply possible for the machines. The semantic web was first defined by Berners Lee in 1998, but its formal definition which covers a seven layer architecture, was given in 2001(Khatami, Ale-sheikh, Hamrah, 2007). In other words, the semantic web is an expanse of common web to which the information is given as defined meanings and concepts (Guhu, R. Rob McCool, 2003). Two significant issues are propounded in the semantic web: one deals with the formats of exchanging information as in the main web only documents are exchanged, and the other is the language of how to register the information in relation to the elements of the real world (Ning, xiaomin, Haj Jin; & Hao Wu, 2008).

The Purpose of the Semantic Web

The under web resources should not only include textual integrated strings, but also they must be able to make the text's existing meaning clear. Of course, by the term meaning we mean that kind of meaning which can be processed by machine. The obtain the above-mentioned objective, the semantic web should establish an interaction between the imageries and the existing realities in the web resources (Kubel, 2008).

Of other objectives of the semantic web is that it provides a better system of the knowledge management so that the knowledge is organized in the conceptual space based on its meaning, according which automatic tools of keeping the information are supported with their investigation of incompatibility and extraction of the new knowledge, also, searching based on the key words is replaced with the semantic searching, and finally, accomplishment of question on several documents becomes possible (Khatami et al, 2007). In other words, it deals with a method by which presentation of information is done in such a way that it is understandable, sharable and exchangeable. The semantic web has been propounded as a completing part in the information is desirably defined in order for the computers and users to appropriately interact with each other, thus, it is the aim of the semantic web (Tho, Q. T, A. C.M.Fong, S.C, 2007). The semantic web is in the preparatory stages and with attention to the increase in the existing pages for the semantic webs, more facilities are imaginable for its development (Fillies, Christian, Gay Wood-Albrecht, Frauke Weichhardt, 2003).

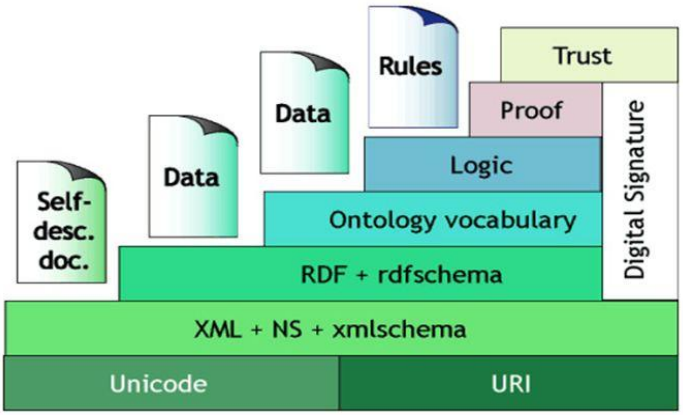
The Merits of the Semantic Web

Contrary to searching through the semantic web, the traditional techniques of searching concentrate on finding documents and articles as the key words while the semantic relations among the resources have been disregarded, though relations play a significant role in the semantic web. An isolated object never attracts the attention, therefore, it is necessary to familiarize the users with the conclusions which are

semantically identical to the demands of the users' object, even if the searching results, do not cover the key words of the searching (Ning, Xiaomin, Haj Jin; & Hao Wum, 2008).

The Components of the Semantic Web:

For a better understanding of the semantic web components in picture 1, the layers of the semantic web have been clearly displayed, the quality of their classification has been also made clear. The infrastructure of this picture is based on the Unicode , URI, and URI signifies unified concepts in the semantic web. In the next layer is XML. As you know it is quite possible to define the tag and structure of a datum. It is, in fact, taken into consideration as the first step for the semantic web. But XML is intelligible only to man, of course, it can be made possible through being changed into HTML format, therefore, we should move to a higher layer in order for the data to become intelligible to the agents. For example, RDF is the higher layer of this architecture allowing us to define a word. We must search for a thing that can establish relationships among these concepts. So, it seems necessary to move to a higher layer, called "ontology" in which language OWL is applied to bring about such a relationship. However, there are other programing languages for this layer, nevertheless, W3C identifies and introduces this language as a standard one. The logical layer or logic is the higher layer of this architecture which tries to identify the authenticity of the ontology. The next layer is called Proof which is also known as the Rule layer. In this architecture, the trust layer is the highest one in which we should trust in data, allowing the software agents to give access to them so that they can interpret the data based on the definite algorithms in such a way that we, human beings, interpret them. Of course, it does not mean that we have made the web as intelligent in this step, since the web's becoming intelligent is an idea which in the web 4.0, the web os, will be accomplished within the next years.



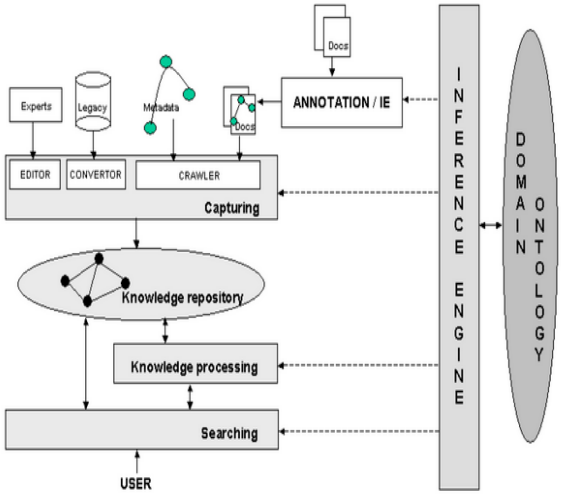
Picture 1: The Components of the Semantic Web

Knowledge Management

So far, many definitions on the concept of knowledge management have been given each of which examines the different dimensions of this subject. Knowledge management is a process of creating value of the organization's intangible assets. In other words, knowledge management consists of creating the knowledge, acquisition of knowledge, storing the knowledge, in addition, it is the publication, sharing and finally application of the knowledge (Jaafari & Akhavan, Mostafa & Peyman, 2011).

The Framework of Knowledge Management for the Semantic Web

Each knowledge management needs components and processes so as to present the framework, design, and implementation, however, it is true about the semantic web. In picture 2, components of the semantic web based on the knowledge management can be classified as users, searching, knowledge processing, knowledge reservoir, and storage. (Nenad Stojanovic, Siegfried Handschuh,2012).



Picture 2: components of the semantic web based on knowledge management

The Cloud computing

The cloud computing is a model for providing the easy access, based on the user's demand via network, to a collection of configurable and changeable computing resources like networks, servers, storage spaces, applied programs and services, in such a way that this access can be speedily brought about with the lowest need for the the resource management or, the service provider's direct interference.

The Forms of Presenting the Cloud Computing:

The Cloud Software as Service (SAAS)

It is a type of model of presenting the software in such a way that the software and its related information have been fully set on the cloud, however, the users' access to software is made possible through a web browser.

The Cloud Bed as Service (PAAS)

The user may establish his/her self-made applied program on the cloud infrastructure. This program has been made of the programming languages and tools (Java, Pyton, and Dotnet) which are supported by the provider. The user does not manage or control the cloud infrastructure, network, servers, or the underside storage space, but he is invested with a control program on the estblished applied program, and possibly on the configuration of the host environment.

The Cloud Infrastructure as Service (IAAS)

The user's provided possibility include the ability to process, storage space, networks, and other basic computing resources, however, the customer can establish and implement his favorite software which holds operating systems and applied programs. The customer does not manage or control the underside cloud infrastructure, however, he has the established programs and the selection of networking components (fire walls) on operating systems and storage space.

The Forms of Cloud Computing Preparation

The Private Cloud

The cloud infrastructure only functions for an organization and maybe managed by the organization itself or another company, placed either inside or outside of the organization.

The Community Cloud

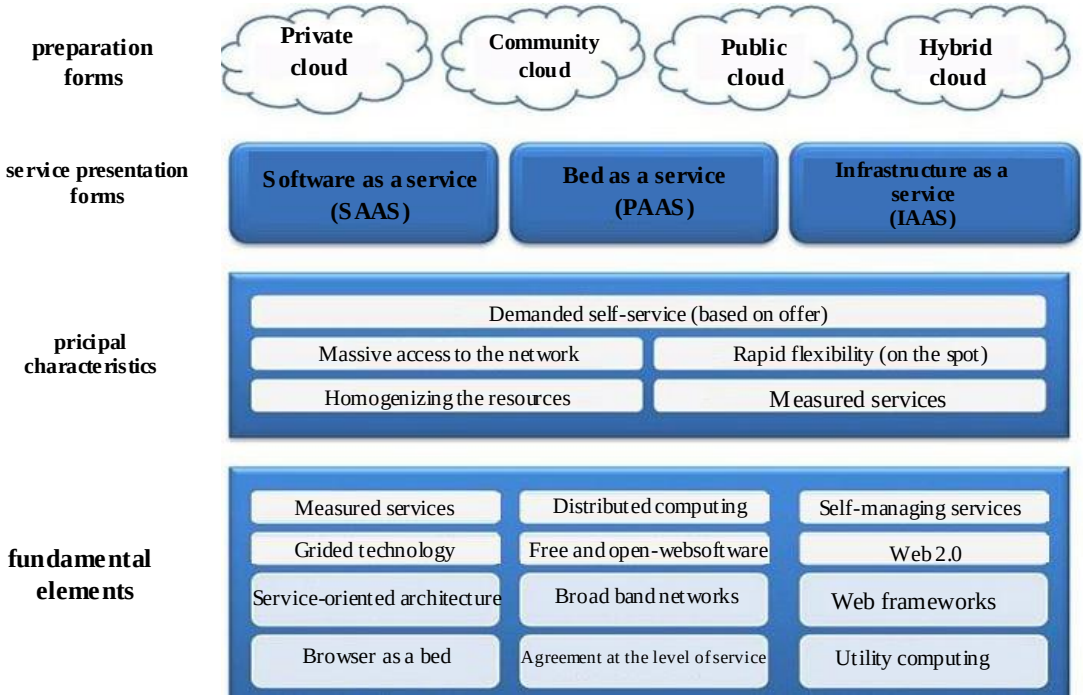
The cloud infrastructure has been shared with couple of organizations, supporting a definite group with a common responsibility (mission, security needs, policy making, and legal considerations). This cloud can be directed by these organizations or another company, having the capability of being laid in inside or outside of the organization.

The Public Cloud

The cloud infrastructure is accessible to the public or to a massive group of customers, moreover, it is owned by the organization that sells such cloud services.

The Hybrid Cloud

It is composed of two or more public, private, or community clouds each of which having its own special characteristics, but, connected to each other by the standardized and exclusive technologies which make the applied data and programs portable. In picture 3, a complete face of a simple cloud computing architecture is illustrated.



picture 3, a complete face of a simple cloud computing architecture

In fact, the purpose of cloud computing is flexible cooperation on the global scale with a high grade of automation and its facile application (B. P. Rimal, E. Choi, and I.Lumb, 2009).

The web Ontology

Ontology is taken into account as one of the layers, in addition, as its backboneof the semantic web (Berners-Lee, T, J, 2001). Moreover, ontology has been defined as a tool of organizing the web resources that helps retrieve the texts with an easy language. But, it should be noted that the main problem does not stem from the organization of information, however, this is the reform collection which has become problematic, resulting in the appearance of the ontologies as complete dictionaries and thesauruses (Sanatjoo, 2005). The new environment of information needs a more flexible system for the intelligent

representation of knowledge. Ontology, due to having unique abilities to clearly define the meanings and their meanings, and explaining them, as intelligible to the machines, has become the focus of attention as a solution to this problem. In addition, it plays a significant role in the creation of semantic and knowledge-based, and acts as the backbone of the future generation of the semantic web (Safari, 2004).

Cloud Computing Architecture

The cloud computing architecture consists of two general sections as: a) frontal section, and b) dorsal section.

The frontal section which is related to the user and the user connector through which gains access to the cloud services, however, it itself includes user network, hardware and the software that he uses to exploit services. But, the dorsal part, as related to the cloud itself, is, in fact, a collection of stored information in the servers to which the service recipients tend to gain access. These two sections of architecture are connected to each other via a network bed, generally Internet (Ghafari, 2010).

Motivations in Cloud Computing Architecture

As mentioned in the introduction, cloud computing, due to its ability to present very flexible and dynamic infrastructure of the computing environments and also configurable software services, has become a significant topic. In the combination of the services from a couple of different clouds, because of incompatibility, lack of contract among these companies, also, lack of suitable infrastructure for automation and dynamic binding, we have faced obstacles on the way of the clouds' development and participation with each other in this technology.

We should first develop the services in such a way that management of the compound services is possible. In other words, they should be defined and created so that their data be later interpretable via explorer tools or reasoning engine, and the action of discovery and sharing of resources and services is performed automatically, in addition, the automation becomes facilitated. As you know, the cloud programs are knowledge-based, and such a knowledge includes information on the time and quality of using the resources and services. To combine these services and resources, this knowledge should be changed into the explicit knowledge, therefore, one of the duties of knowledge management is to change the tacit knowledge into the implicit knowledge. Here, we have presented a solution according which metadata, meaning, and knowledge are used so that the discovery and sharing of the resources and services can be automatically accomplished. But, there are challenges as follows:

Challenge in the Architecture of Cloud Computing

The key subjects in relation to the use of metadata, meanings, and knowledge, are quality of obtaining a formal model to clearly represent, store, and maintain them, and the quality of using them to support the sharing and combining the services so as to obtain a high degree of automaticity (Goble, 2007). However, there are some challenges on the way of achieving the goals:

- Knowledge and metadata of the resources and services are implicit and unstructured whose scope is massive and appears in a natural language so as to be intelligible to machines, and become model, in other word, they should be retrievable and stored.
- Knowledge and metadata of the resources and services are only intelligible to the providers and other users are in need of being aware of this knowledge to combine them with each other.
- We expect this event to take place automatically, thus, it seems necessary for the software and machines to understand the knowledge of resources and services, in addition, the cycle model of knowledge and its representation should be mixed with the capability of inferring and arguing so that the best and the most approapriate services can be selected, but, its requisite is that the knowledge of services be implemented within the framework of the Semantics (S. Schreiber, H. Akkermans, 1999).

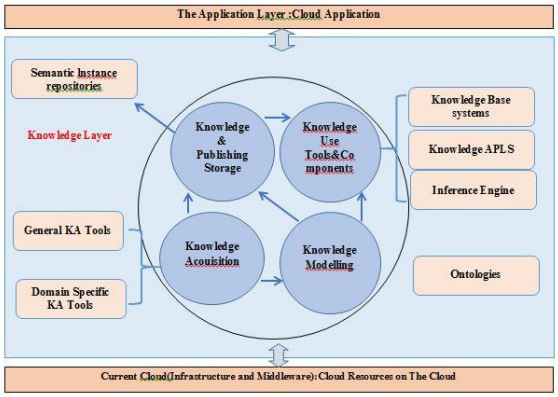
The Research's Background on Cloud Computing

In conducted studies on the formation of a cloud compound services, it is possible to combine the services within a cloud with each other as recently some software engineers from the Amazon company decided to represent the quality of making the under web programs via combining the Amazon services, also, it was

likely to combine services from many different clouds, as done in the combination of the AppEnggine and Salesforce services, in fact, the salesforce company has presented a library for the AppEnggine. However, despite accomplished works in the field of combining the services, the topic of automation of the operations on combining the services and supporting the dynamic binding in services has been disregarded.
The topic of grid provides massive facilities for the users. Moreover, the automation issue in applying the provided resources, as introduced by grid, is of high significance. "Chen et al" presented a model for this problem and implemented it on the flight simulator system in England. The system was a straight-off one, leading to desirable results such as ease of application, rapidity, and higher efficiency.
Considering the conducted studies, we tried to cope with the existing weakness and problem in the automation of operations on combining the services and supporting the dynamic binding in the compound services, and give a solution to solving such problems.

A Model Based on the Semantic Web for Managing the Combination of Services

In this section, a method based on the semantic web for managing and engineering the knowledge of services and compound resources will be introduced. The nature of this method is in such a way that a basic layer of knowledge has been added to the resources, in addition, to cloud services and programs. Moreover, in this layer, a technology based on the semantic web has been applied so as to implement the knowledge acquisition, modeling, representation, publishing, storage and reuse. In such a method, ontology plays a significant role. Ontology is an explicit characteristic of diverse concepts within this domain of problem used for the knowledge acquisition, also, it provides conceptual structures through modeling the concept so as to keep the knowledge. It, thus, receives the meaning interpretation of metadata and produces the semantic instances as knowledge bases, and finally stores it in the knowledge base. Both semantic instances and ontology are displayed by the web ontology. The web ontology has been established based on the language of the former ontology and descriptive logic. Reusing the knowledge is made possible with the analysis of the semantic instances via a semantic annotation. (V. Haarslev and R. Moller, 2003). For instance, to be able to decide on the combination of services based on knowledge, such ontological operations as inference, investigating the examination, concept classification, navigation, and retrieval can be used. In addition, this layer provides a collection of ASPs so that the users can accomplish different actions. We, for example, can cause demand of services, by changing the characteristics and methods of an ontology with the instrumentality of ontological services based on our application. At last, the system is capable of managing the services and resources taken from various tools, moreover, it can select the best and most appropriate methods and combine them with each other. Picture 4 illustrates a model based on the semantic web for managing the combination of services.

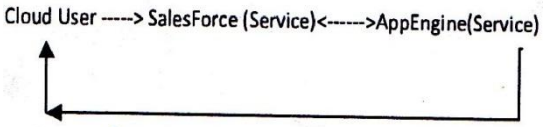


Picture 4: a model of based on the semantic web for managing the combination of services

The Implementation Method

For the implementation of this system, at the beginning of the combination of cloud services, we form the work flow which is the result of accomplishing a set of activities, that is, for the combination of various

services with each other, the needed activities to perform an action should be made clear so that a simple flow of work, as illustrated in picture 5, can be created.



Picture 5: an instance of a simple flow of work

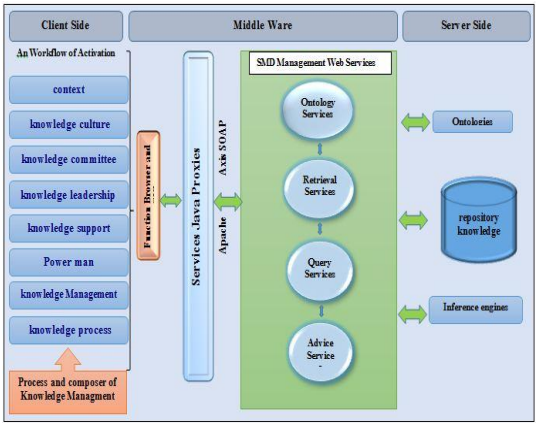
After such an order is made clear, we need a tool for knowledge acquisition to catch and model the knowledge of services. This tool, named as the service interpreter, provides an intelligent support to acquire and model the knowledge including automatic extraction of information, and its classification and completion for the purpose creating the semantic samples. The service interpreter uses the representation and OWL application for the creation of ontology and instances in which produced instances are archived in the knowledge reservoirs. More details on service interpreter can be found in (L. Chen, S. J. Cox, 2006). To be able to collect knowledge of the cloud services, the providers of services must have their tools for publishing and establishing the knowledge for themselves. The knowledge reservoirs are distributed knowledge bases that store the semantic description of services. A semantic description of service means an instance of the ontology concept together with its analyzed information which is stored in its group of similar services via the reasoning service.

Presenting the Architecture Establishing Modelof Semantic Web System Based on Knowledge Management in Cloud Computing

A brief explanation of the performance of architecture establishing model appears as follows:

The Query System: according to it, we create a query system based on the meaning in order to receive the user's demand and then performs the semantic comparison action on the reservoirs with the help of the reasoning engine, and finds the preferred service. The term "query" is first represented as XML on the user's side, and is then transferred to the server by HTTP, however, it, then, changes into the OWL's format, finally, the reasoning engine performs the reasoning action and produces the result via comparing the particular criteria on the existence of knowledge reservoir.

In the next stage, the offering service may present many clouds of a similar service after the action of searching for the services. The existing problem is that which cloud should the individual use in order to select the best and most appropriate service, in this respect, it is the offering service which is able to choose a service with an attention to the structure of the work flow coupled with the semantic comparison of the input. Picture 6 shows an offering system architecture as follows:



Picture 6: An offering system architecture of the semantic web for knowledge management in cloud computing

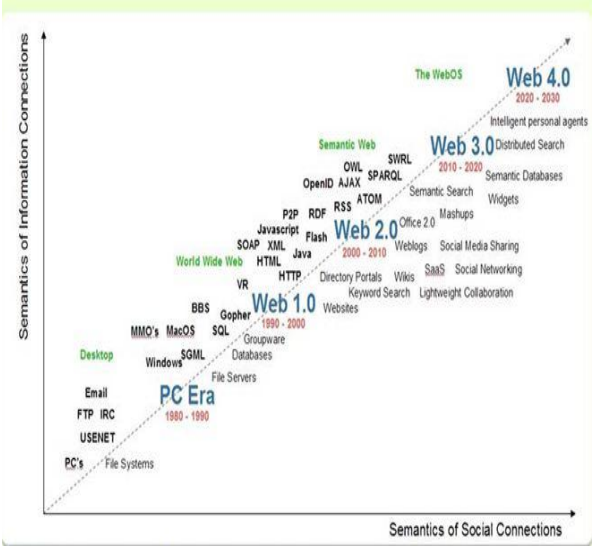
CONCLUSION

In summary, in the semantic web, the web of confidence is used for listing the reliable sites, however, this affair can enable the software programmers to influence each other's work and determine which semantic site is reliable. In this article, we tried to automatically obtain the information and metadata related to the resources and services from different clouds by using the semantic web technology while interacting with machines, and then store their meaning and concept via modeling the ontology in the knowledge base, moreover, the best and most appropriate choices are applied and combined with each other so as to automatically accomplish the bound services in accordance with individuals' favor and interest. In addition, managing the knowledge of resources has brought about their ease, speed, comfort and efficiency.

In future, we plan to investigate a methodology for the development of clouds and knowledge servers, and implement it within the framework of a case study and within the data processing techniques.

Suggestions

Undoubtedly, the future of the web 4 is heavily dependent on the knowledge management, however, with the advent of cloud computing, and considerable development of the Big Data, no other thing can dominate the created, acquired, stored, retrieved, applied, expert, and returned to get up to date system. Advanced knowledge comes into vogue even much faster than the expected time, and as we see in the picture 7, its growth has been invested with an amazingly ascending trend.



Picture 7: Logical searching and intelligent human factors in 2020-2030 (Radar Network&Nova,2007-www.radarnetworks.com)

According to predictions, the web 4.0will considerably increase the speed of the knowledge transfer by the year 2020 to 2030. One of the most powerful factors for controlling such a speed and hurry deals with the components and processes of the knowledge management some of which are as follows: 1) ground 2) management 3) knowledge-based users 4) infrastructure 5) information technology 6) culture 7) organizational memory and knowledge management processes 8) the process of knowledge identification, knowledge production, knowledge acquisition, knowledge storage, knowledge evaluation, knowledge sharing, upgrading and knowledge application. In fact, the main characteristic of the web 4.0 is the logical searching and intelligent human factors which are navigable and controllable only within the domain of knowledge management.

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