Centralization and Universalization of Knowledge: Problems, Solution and Challenges

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Abstract—Knowledge in academies is expressed in a decentralized and non-standard form that we encounter everyday and is expanding at an alarming rate at many places and is ultimately consumed by us to teach and make others to understand. There has been tremendous increase in knowledge in various areas and competition among many academies to understand and explain it in its most innate form. Due to this act, we have made so many different, duplicate and somewhere ineffective versions of explanation of knowledge entities that has always put us in a doubtful question like – "Am I teaching or learning the ultimate manuscript about the fact?" Inadvertently the knowledge is in devastating state in most of the academic institutions of the world. This paper proposes a solution that provides a platform to centralize and universalize the academic knowledge quality by using internet as pathway and sharing as an act.

Index Terms - Hierarchical Knowledge Sharing Model (HKSM), Knowledge Processing System (KPS),Text Processing Subsystem (TPS), Multimedia Processing Subsystem (MPS), Triple-A System (AAA-System). Authentication-Authorization-Accounting (AAA).

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1 INTRODUCTION

Knowledge universalization [1] in the context of this paper means to authenticate and standardize it into its unique form and centralization is to concentrate it at physically multiple but logically one location to control its duplicity and reach among aspirant mass. We all are connected to various sources of knowledge like books, Internet, Television, newspapers, people etc to get updated and use it in various aspects of life and ultimately enhance standards of living. The advent of many goods of daily use and new ways to make them more useful and efficient has only been possible due to in-depth knowledge and understanding of the matter around us. With passage of time we have become knowledgeable from Stone Age to Iron Age, from industrial revolution to today's Information Technology (IT) Age. Knowledge is continuous and never ending act of human creativity. Knowledge has always played a major role in the growth of human civilization and economy of the world. People with good academic knowledge are always in demand in industrial sector to provide best solutions and services to make our lives simpler, smarter and prosperous [1]. Academies play a vital role in imparting the major portion of the knowledge that we find around us. The Knowledge shared and learnt has been authentically classified into scalar and/or non scalar physical, chemical, biological sections and many

more. The knowledge acquisition and delivery process follows a hierarchical approach to reach to its intended learner which is as follow:

(a) Production of Knowledge
The classified knowledge been provided by discoverers, inventors, physicists, chemists, biologists, researchers, scientists, doctors and scholars in their own field as authentic documents e.g. Laws of Mathematics, Physics, chemistry and facts of biology to name a few i.e., most important subjects of knowledge in their respective domains.

(b) Processing of Knowledge
In order to generalize and make more elaborative explanation of knowledge produced in (a), people of academia and non-academia understand, follow, categorize, document and make it available to its intended users or followers in more explanatory and broader form as found in text books, Internet, magazines, articles, notes, etc.

(c) Delivery of Knowledge
The Academic institutions of the world deliver the processed knowledge attained from (b) in different classes/grades of Primary, Secondary, and Post Secondary level etc in an organized manner.

(d) Addition of Knowledge
The knowledge seekers in academia and non-academia later on with their depth of understanding and experience from knowledge delivered in (c) become knowledge producers and add or fine tune the

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knowledge of (a) in (b).

From aforesaid it is understood that, Part (a) is where the knowledge originates and is well kept with what is known and what else to know. (b) and (c) are the most dominating and fluctuating part of the knowledge acquisition and delivery. Here the knowledge about any entity of (a) is found in different explanations (clear and unclear), in different places (same content inside many Books, at multiple places on the Internet etc with good ,better, best type quality) and in
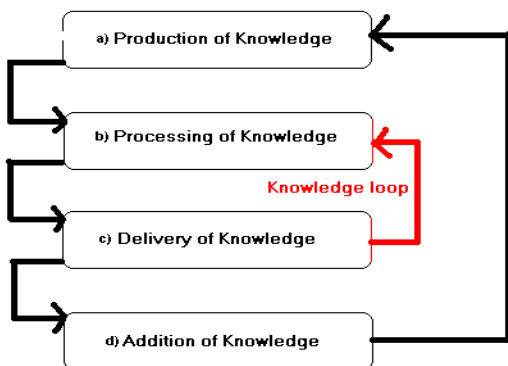

Figure 1. Journey of Knowledge

duplicate form. Most of the problems related to quality and quantity of knowledge arise from an endless knowledge loop that virtually seems to exist between (b) and (c) as in Figure 1. Due to this, every time the academic knowledge is poorly understood and explained by most of the individuals of academia which is making knowledge of (a) inefficient and ineffective for imparting in academies, where well known facts are written understood and repositioned again and again in different sources thus everyone finds it differently. The academies have their own methods and code of teaching/deliverance of knowledge that can be controlled by the people serving in the academic institutions but there are monitory, regional, economical, political hindrances which hamper the quality of knowledge being accumulated and delivered. The current knowledge system has data which is unfiltered and unorganized, conceptual view of the same is indicated in Figure 2, where knowledge from different sources is divided into various fields/subjects/domains as f1, f2, f3…fn for further explanation and understanding the facts. In this process it is again found as untreated and unaltered for authenticity and reliability of the same.
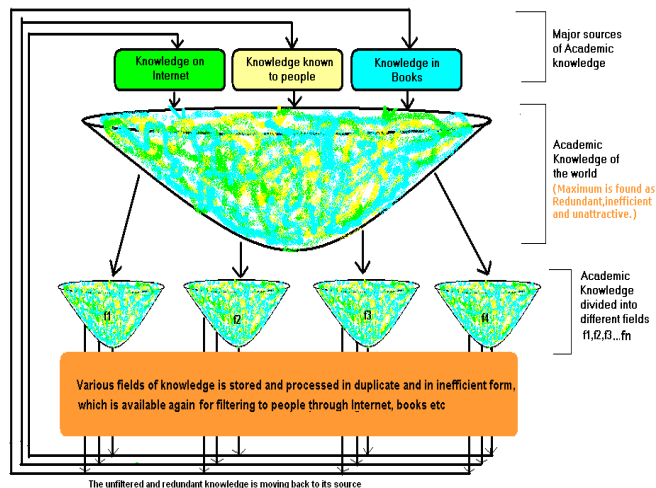

Figure 2. Conceptual view of current knowledge system

The quality and authenticity of academic knowledge can be improved, enhanced and preserved by establishing a platform for sharing [1] and summarizing multiple instances of knowledge explanations into one place by further enhancing and providing it on a large scale [2] as in Figure 3.
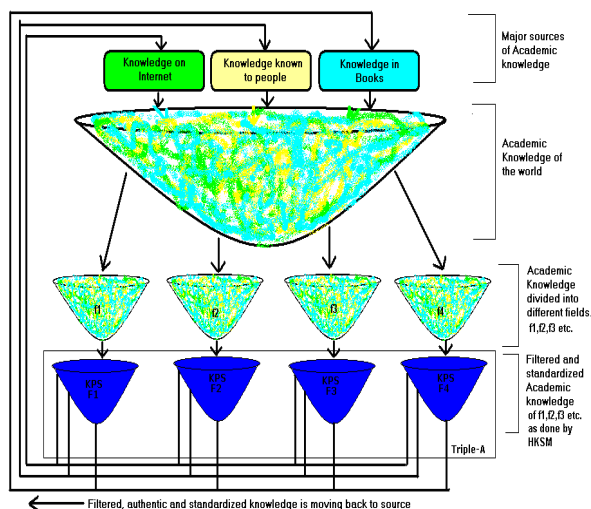

Figure 3. Current Knowledge system with filtering

In this paper an attempt has been made to introduce a model for filtering and enhancing the academic knowledge in hierarchical way. In this model every knowledge entity of a known classified knowledge domain (physics, chemistry etc) is divided into two forms-text and multimedia. The textual information is processed into three levels. Every level has different class of scrutinizers and participators. The finalized knowledge of third level is changed to various multimedia formats. Both text and multimedia knowledge is created, viewed, edited, commented and rated by users and hence the most authentic and referenced resultant knowledge is provided to public through reliable sources.

The complete paper is divided into seven sections, the section two reveals the problem domains of current system of knowledge and its solution. Section three proposes the design of knowledge model where as section four explains the implementation of the same. The section five gives phase-wise implementation of proposed system. The sixth section compares the model with existing system and finally section seven throws light on its challenges and conclusion.

2 PROBLEMS AND SOLUTION RELATED TO KNOWLEDGE REVISITED

Partial or Ineffective Knowledge Acquisition
Most of the learners do not know the actual implementation of knowledge taught in academia even though they qualify for higher grade of academia e.g. real world implementation of laws of mathematics, physics, chemistry etc. Reason for that is knowledge from the sources has been explained in an ineffective manner which leads to failure of understanding the knowledge of academia, which has to be robust, documented and well explained.

Eradicating Partial or Ineffective Knowledge Acquisition
Accumulating, storing and presenting single instance of any knowledge entity in a highly scrutinized form and providing it only from central repository, can drastically help in addressing the partial or ineffective form of it.

Problem of Redundant Knowledge from Sources
Ineffective explanation of knowledge leads to its redundancy. The sources of a knowledge topic (knowledge points) are books, internet, academia and people. However, books and internet being the major sources have most of the redundant copies of the same. Due to this redundancy learner is always in a clamor to search and find the most authentic piece of information that fulfils his need. For instance there are so many books or explanation on the internet that explain laws of motion and gravitation.

Eradicating Redundant Knowledge from Sources
The academic knowledge is provided through a system which is logically one but located at physically multiple locations, where knowledge of various fields (subjects) of academia will be shared by aspirant mass, highly analyzed by experienced personalities of related fields and finally stored as single instance. This will help in removing the redundant knowledge as found in various sources.

Problem of Un-attractive Information Acquisition and Presentation
The text is static, non-interactive and unattractive media of information exchange and understanding. It is the prevalent mode of expression for knowledge. The problem is that different users have different approaches in going through the text, understanding the manuscript and applying the same practically.

Eradicating Un-attractive information acquisition and presentation
The most authentic single instance of knowledge in the form of text is converted to its multimedia format as animation (3D), lecture videos, real world demonstration videos and voice of the same. The software used for conversion is based on 'Open-source' model. [7] E.g. Open-source projects similar to Blender can be introduced for 3D animation and modeling part [8].

3 PROPOSED KNOWLEDGE MODEL

3.1 Hierarchical Knowledge Sharing Model (HKSM)

Internet and communication technology (ICT) has played a vital role in changing the way people communicate and share their ideas [1] [3]. In this digital age there is no other power or tool other ICT that can help to solve the problem related to knowledge delivery and its acquisition. Reason being, that we all are connected to one another through networks. Internet is the network of networks where we can reach from distant places with the click of a mouse for sharing information, and which connects us to information processors or servers that take inputs from our machines, processes it and stores the result at appropriate places within a fraction of time. Hence, ICT provides a wider scope in designing and implementing such a model. For making authentic and effective Knowledge explanation, there has to be a platform where aspirants (academic or non-academic people) have right to participate for creating, sharing ideas, editing and confirming for its authenticity which ultimately leads it to its innateness. The proposed knowledge model filters the knowledge of various fields of academia. The model has knowledge processors (KPS) and AAA Systems (Triple-A), which are connected in clustered fashion for redundancy and failover that stores, manages and provides every atomic knowledge of a particular domain/field/subject. However, Triple-A System handles authentication, authorization and accounting for various types of users (student and mentor) of KPS along with delegation and appliance of access, control and policies on user and the content being shared.
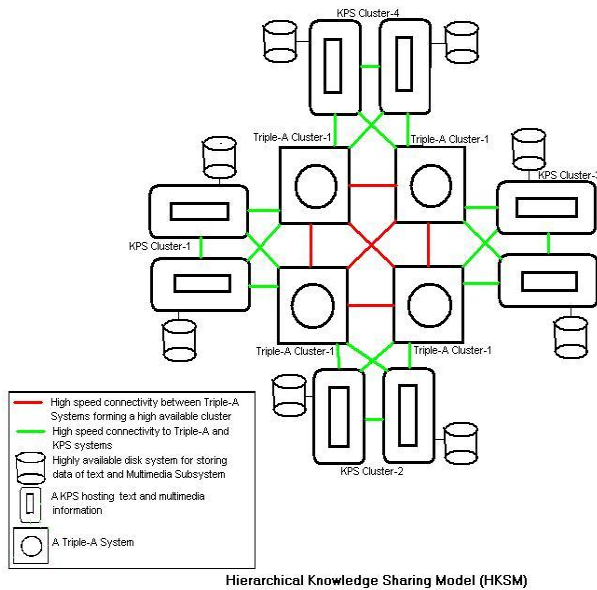
Figure 4. Hierarchical Knowledge Sharing Model

3.2 Design

The Generalized view of knowledge system has input, output, processing and storage parts in the form of Client (Input/Output), Internet (pathway for information exchange), processing machines (KPS and Triple-A), and storage for the same.

The proposed model is based on Client-Server Architecture for software and hardware design. The software deployed for implementing the system would be strictly based on 'Open-source' model. The Knowledge system has two core components:
a) KPS, and
b) Triple-A System.

3.2.1 KPS

KPS is the most important part of HKSM model which centralizes the shared knowledge of a particular domain/subject/field. It is analogous to a server takes inputs, processing it and storing the results. A KPS runs a single instance of operating system under which there exist two separate instances of PHP or like software for server-side logic and database for text and multimedia subsystem [9] Figure 5. The participant logs in to the Knowledge processing engine of a subject that interests him, creates a topic and submit it for approval. The Triple-A system assigns an appropriate mentors/scrutinizer for its final acceptance. KPS hosts the knowledge of a particular field in two sub-systems called as TPS and MPS as shown in Figure 5.
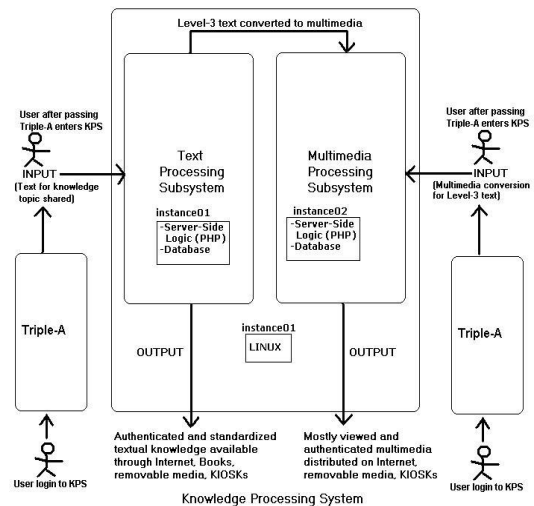

Figure 5. Knowledge Processing System

The key entities of KPS

- Participants/students: Participants are people from academic or non-academic background and are assigned defined set of rules and policies within a knowledge level by Triple-A Subsystem. Participants form groups for sharing ideas, create and maintain the topic they are interested in. They are registered with the Triple-A System which places them in a level of Text or MPS and are under strong scrutiny of the scrutinizers of that level.

- Scrutinizers/mentors: Scrutinizers are the most experienced responsible and highly qualified participants in their domain, who resolve the issues of levels related to knowledge authenticity and approval of topic. A scrutinizer is carefully assigned to participant/students by the Triple-A System, at the time of creation of knowledge topic of a particular field. They may or may not be interested in sharing knowledge but their core responsibility is to judge and maintain the topic they are appointed for by the Triple-A System. A scrutinizer form group of a particular domain who mutually agree upon the gravity of content (topic of participants/students) they are responsible for. These groups of scrutinizer in turn recommend a topic for next higher level scrutiny and authentication, where the topic meets a different class of participants / students and scrutinizers for finalization.

- Level: The KPS has three levels for TPS to view, edit,

rate and comment the contents. These are analogous to primary, secondary and tertiary i.e., Levels 1, 2 and 3 respectively as part of education system. These levels have been framed to enable different class of people to participate, contribute, scrutinize and authenticate the knowledge they possess in hierarchical manner.

3.2.1.1 TPS

Text processing subsystem filters textual knowledge in three levels. Every level has different rules and policies for the users. The user and the shared knowledge in each level are under strong scrutiny of the scrutinizers. Level-1, Level-2 and Level-3 have class of participators/students and scrutinizers/mentors taken differently. The subsystem is strongly dependent on scrutinizers and references that support for the authenticity and uniqueness of knowledge inputs from participators/students. The user in each level creates, maintains, modifies and ultimately submits the knowledge he/she are interested in to share. However, after a topic reaches a certain maturity within a level it is sent for approval for higher level auditing as shown in Figure 6. The knowledge of first level (lowest) needs to be recommended for second level by the concerned scrutinizer, so it is true for second to third which is a final stage. Each level has different policies and access rules defined for the participator and scrutinizer. These policies and rules strictly govern the knowledge inputs and any modifications therein.
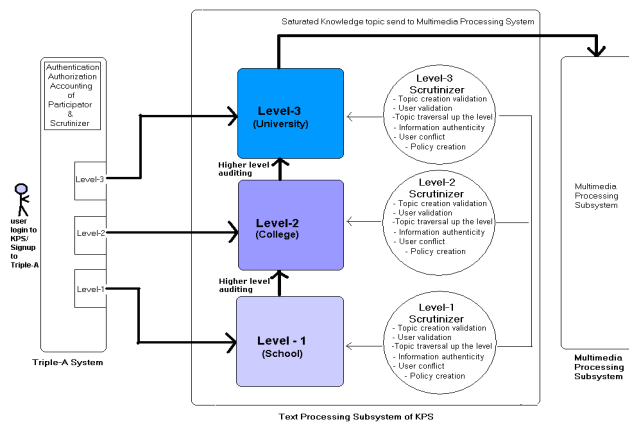

Figure 6. TPS

3.2.1.2 MPS

In this subsystem the most authentic and referenced textual knowledge of third level is converted to multimedia part of it. In addition to users of this subsystem the user from any textual level may login and take part in it. The Multimedia Processing Subsystem provides two separate workspaces for users unlike Text Processing Subsystem. In first, different multimedia explanation

of any finalized textual knowledge topic is accessed, added and deleted in the form of a web portal where user view, comment or rate it. The second workspace presents the finalized multimedia part of knowledge topic where it is put along with its finalized textual version presented by the system which is again in the form of web portal as in Figure 7.

Multimedia Processing Subsystem contains the following formats of a knowledge point of a particular domain/subject to be shared and made authentic (the conversion must clearly reflect finalized version of the text)

a) 3D view in video form with its source code for remake or design,

b) Video lectures in various video formats,

c) Real world examples through video,

d) Audio of the knowledge point and many more

It is then searchable, downloadable from portal or updatable in user terminal as application from reliable repositories (i.e., Nearest KPS). Both textual and multimedia processing of knowledge is followed by intense questionnaire and FAQ and their answers for expedite maturity of knowledge topic.
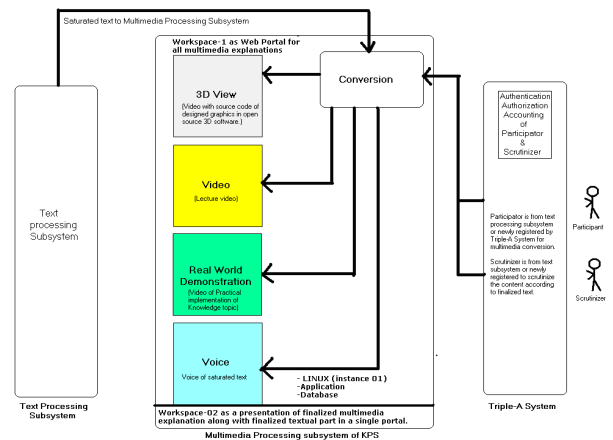

Figure 7. MPS

3.2.2 AAA-System

It is the central part of model which *authenticates* the user for participating to Knowledge system. Further to this it *authorizes* the user as to what to be accessed in respect of addition, deletion or creation of knowledge topic of interest. In addition to authentication and authorization it also provides the *accounting* of various knowledge transactions (Addition, deletion, creation) in and out of the system. This way the present and previous state of participants in terms of any transaction related to knowledge can be viewed and analyzed later on for their performance and level of participation, the conceptual view of Triple-A is shown in Figure 8. The Triple-A System may be kept in geographically separate locations depend-

ing on the density and location of KPS. Apart from providing the service of AAA it also has a core duty to delegate/appoint an appropriate scrutinizer to a topic as created by a user in any KPS.
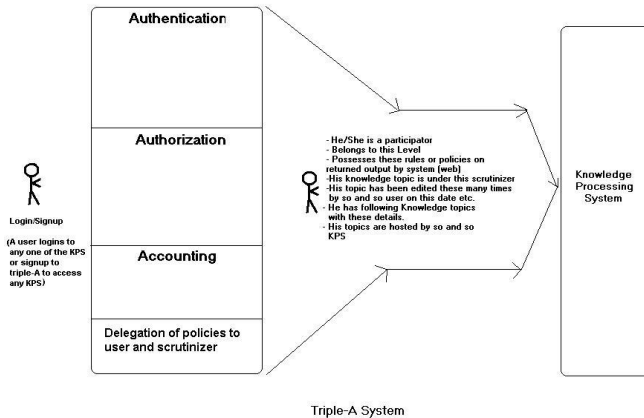

Figure 8 Triple A System

4 IMPLEMENTATION OF HKSM

The HKSM is designed, configured and maintained as highly available and fault tolerant network, hardware, software systems and storage platform for maximum uptime and reliability. It follows open standards and 'Open-source' software model in terms of its independence, zero cost, modularity and regenerative capacity of the Web 2.0 [4][5][7]. Initially it is setup on the basis of web technology, in parallel it can be made as multiplatform application based, where users can update their application with topics of knowledge with the KPS they are interested in, for offline editing and use.

4.1 Knowledge Processing System

- System Software: Linux Operating System (any one distribution with support of clustering).
- Application Software: PHP for server-side logic processing.
- Database: Open source database management system which is compatible with system software and application software.

4.2 Triple-A System

A Triple-A System utilizes following components:
-System Software: Linux operating system (any one distribution with support of clustering).
-Application and Database Software: Application is written in open source language and is integrated with high availability open source data store for storing user credentials, rights and their logs.

5. PHASE WISE IMPLEMENTATION OF HKSM

One of the vital parts of the HKSM is scrutinizer which maintains knowledge to the system and authenticates it in different levels. The phase wise implementation of HKSM will help to identify quality scrutinizers and participators for System. The implementation of HKSM is divided into two phases, these are:

Phase-I
In first phase general enrolment and participation to KPS is allowed for a period of x years as a slow-start process of implementing the system. In this way system will come into existence and continue to function with assessment of quality scrutinizer for next second phase. During this period the scrutinizers for phase-II would be selected and assigned the roles accordingly for different levels. The scrutinizers will be chosen depending upon participation and their interest level by mutual votes or any other suitable way within the aforesaid phase.

Phase-II
The Phase-II has scrutinizers from phase-I along with additional insertion provision into the system. Here the general scrutiny is now changed to scrutinizing for Level-1, Level-2 and Level-3 i.e., categorized the general one into various levels depending upon the knowledge they possess and learn as registered by Triple-A System.
After such phases, participation and control of HKSM can be made mandatory for different levels of academies (Level 1-Primary, Level 2- Secondary and Level 3-Post secondary).

6 COMPARISON WITH EXISTING SYSTEMS

6.1 Textual Knowledge Expression and Acquisition

Major sources of textual knowledge are books and internet.
Books: Books have always been a great source of getting knowledge which in addition to learning and teaching enhances mental power and memory.
Internet: Some of the most visited web sources of the internet provide knowledge in an elaborated form e.g. all Wiki sites [6] and lot many could be seen by punching a keyword of any knowledge topic in the web search engine.

Problems of these sources
Books: There have been so many books for explaining a single knowledge topic which has created confusion and redundancy of information among the mass. Everyone is explaining the knowledge in their

own way through this source i.e., books.

Internet: Web sources have problem of authenticity and scattered information which cannot be consulted for academic knowledge.

6.2 Multimedia Knowledge Expression and Acquisition

Major sources of multimedia information are:

Organizations: There are organizations/institutions that are using multimedia as a tool for delivering the academic knowledge

Internet: Youtube.com and several such sites offer sharing of educational and instructional videos over the web, often solving technical or size-related problems. Some websites, specifically offering educational materials, are Teachertube, Sclipo, Expertvillage, etc [4].

Problems of these sources

Organizations: Most of the institutions or like bodies are using multimedia within their reach. Also they are using limited power of multimedia i.e. video to explain the topic. There is always an issue of authenticity of knowledge explained in both of the above sources of multimedia form of knowledge.

Internet: The problem with the internet as a source is, that most of the multimedia information are unorganized and ineffective.

7 CHALLENGES AND CONCLUSION

7.1 Challenges

Few of them are as under:
The initial potential implementers and stake holders of such a system of sharing knowledge on global basis.
- Creation of policy and edit rules for different levels of KPS in open source software model.
- A Technical view and role of KPS and Triple-A System both as individual and as mutually working systems.
- The delivery format and look and feel of final/saturated textual and multimedia content to public.

7.2 Conclusion

Technology is a never ending amalgamation of human creativity and there is no limit as to how deep and how far we can materialize the things and make our life simpler and smarter. Today, we have abundance of knowledge found around us which is spread unevenly and understood in a lethargic way, which is why we find problems as far as reliability and authenticity of the knowledge is concerned. For this we need to authenticate and make most reliable and best sources of knowledge where every piece of information is centrally stored controlled and accessed. We need to start accumulating the knowledge from the basics first that we have to learn, share and teach phases wise and make it authentic by the experienced ones out of us. Academies are the only responsible bodies where billions of people learn and experience from it. They attain the same knowledge throughout the world as it always remain same even though taught and learn in different languages, location and among different class across the world. We simply need to enhance the chalk and talk way of teaching by modern teaching aids. People across the globe are using Internet and telephony to interact. It can be set as a medium of information exchange among all for all which is to be accessed centrally free of cost. By setting up of such systems we can decrease and tackle the constraints that beset the knowledge universalization. Global advertisement through various mass communication media will play an important role to attract more and more academic and non-academic aspirants to participate in it.

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