Reflections on Knowledge Creation and Digital Asset Management Aspects of the Knowledge Centre

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Abstract

A knowledge centre is envisaged as the new or extended and transformed version of the library. It is expected to provide knowledge services to its patrons on the topic of their choice by value addition to the normal library and information services. Generation of quality knowledge by processing data and information will be its prime activity. However, knowledge comes in a number of categories and each with a wide spectrum. In this paper a lesser known category of knowledge namely, 'low' knowledge incorporating that produced by abduction process, tacit understanding and aura sensitivity tracing is focused. Further, the concept of negative knowledge is elaborated with implications in the digital technology mediated era. Select knowledge refining strategies, knowledge acceptance criteria and knowledge discovery tools are also discussed to design higher order services by the knowledge centres. Attention is drawn to the issue of digital asset management as it becomes extremely important to maintain the underlying digital infrastructure for knowledge creation, dissemination and preservation. Emerging challenges and opportunities to the library and information science profession in this context are highlighted at the end.

Keywords: Digital asset management, knowledge centre, knowledge refining, low knowledge, negative knowledge, sentiment analysis

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1 Introduction

To transform public libraries in knowledge centre and to establish new knowledge centres to address the emerging societal challenges was one of the ideas pursued relentlessly by the late Dr. H. K. Kaul who was the Founder Director of the DELNET (Developing Library Network). To that end the theoretical aspects of knowledge centre like classification of knowledge, characteristics of knowledge society, information and technical services, content variety and its creation, and the operational aspects like organisation, development and designs for infrastructure and services have been discussed by him in his numerous writings that form a large part of his book (Kaul 2017). To delve further on some facets of his designs would be a tribute in the true professional sense to him.

In the ongoing lockdown prohibition on the travel and need for maintaining physical distance in public places due to prevailing COVID-19 pandemics in India and the rest of the world the library is required to plan and implement its services in different ways. The digital libraries or the libraries having the stock in digital form are in a position to serve the users more satisfactorily than those deficient in it. Even in the expected 'new normal' scene after the pandemics, lot many things in the academics and societal transactions are bound to change. One immediate departure is the imposition on the number of library users present physically in the library at a given moment. The rearrangement of furniture to maintain distance between the library users is another thing. Handling of books and other material would require an elaborate procedure for which IFLA has come out with the guidelines "COVID-19 and the Global Library Field" (https://www.ifla.org/covid-19-and-libraries). Onus will be on providing bulk of the services remotely, digitally. So, a crash programme of digitisation of the select material in the library and designing new library services that also draws upon the available digital material from various sources both free and paid will need a priority.

On this background the library will have to work on different strategies to carve out a niche of its own. Rather than competing with other well entrenched digital information service providers, how to make the best use of those resources and subject them to verification, validation and packaging suitably for the concerned user is one appealing option. In other words, the library will have to graduate from the ordinary role of document and information services provider to a higher role of knowledge provider to the patrons to the extent possible. This naturally brings the concept of knowledge centre to the central stage of the library and information science (LIS) field.

We are generally under an impression that we now know many things and feel knowledgeable. However, this is far from the reality. Ample demonstrations of how much we take for granted without understanding are available and this phenomenon is termed as 'knowledge illusion' (Sloman and Fernbach 2017). It is argued that as an individual most of us are not as smart as the cave man who knew so many things for the survival and to face unexpected things in daily life. We think we know a lot, but individually we know very little is the fact. Since we assume the available knowledge generated by others as our own, we are under such deception. Due to this presumption it is imperative that the available knowledge must be complete and trustworthy. The situation is severely exaggerated by the misinformation and fake news rampantly spreading through various electronic media channels and platforms. This is where the knowledge centre is expected to the play a critical role.

In sum the knowledge centre can be viewed as an interaction of three main activities as depicted in Figure 1. They are: 1) policy and administration to guide collection development and functions, 2) processes and technology to direct operations and infrastructure development, and 3) knowledge management to facilitate knowledge creation, validation, dissemination, reuse and preservation. Though the structure envisaged is general in nature, we shall focus here on the digital knowledge centre that is essentially driven by digital technology.

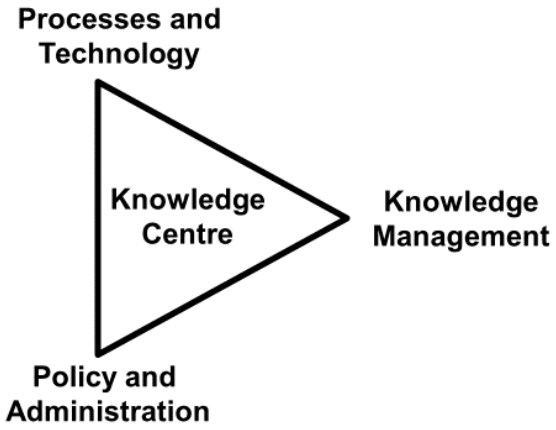

Figure 1: Three Pillars of a Knowledge Centre

To create a distinct digital infosphere will, therefore, be a major mission for such knowledge centres. Understanding the concept of knowledge in all its dimensions will be the critical element. Filtration or distillation of information to produce useful knowledge is a vital activity in that regard. Equally important will be the digital assessment management (DAM) activity that knowledge centre will have to undertake systematically.

In this paper a review of some important but lesser known categories of knowledge is presented first along with negative knowledge. Knowledge refining and knowledge acceptance criteria for establishing the credibility of a knowledge centre are discussed next. It is followed by an outline of sentiment analysis and a few other tools for knowledge discovery that would facilitate shaping the knowledge centre in the digital environment. The crucial role of digital asset management to support knowledge centre functions is described subsequently. The challenges and opportunities for the library and information science profession to contribute to knowledge centre development are also deliberated.

2 Knowledge Galore

Rather than one universal well defined entity the knowledge varies with the subject matter and time. It may deal with some specific local issue or with larger issues of wider societal concern. Knowledge is usually divided in the theoretical part and applied part. Theory part is an outcome of basic research or exploration, whereas, procedures, processes and technology development on that basis form the application part. Such a body of knowledge is explicit, well documented and can be shared freely or at a price. It is largely produced by the standard methods of deduction, induction and simulation on the raw data or information collected from various sources. Traditionally the library has played an important role in collection and organisation of

documents to assist the promotion and sustenance of scholarship, knowledge generation and dissemination process through reference desk-service, preparation and circulation of subject bibliographies, inter-library loan and so on.

However, equally important is the implicit or tacit knowledge part, which means the knowledge held say by an individual in the form of his or her experience and practice (Polanyi 1964, 1967). Fusion of explicit and tacit knowledge is recommended for the comprehensive treatment of any issue.

Besides these broad categories of knowledge there are several others as described below.

2.1 Knowledge Continuum

Data organised and processed forms information and that, in turn, on further analysis, supplementing and interpretation takes the form of knowledge is a general view. Of course, transformation from information to knowledge is not so simple because knowledge is a very rich concept and has many shades (Machlup 1980). Each of them forms a range with diametrically opposing ends. A sample of bi-polar knowledge categories is given in Figure 2 to illustrate the variety.

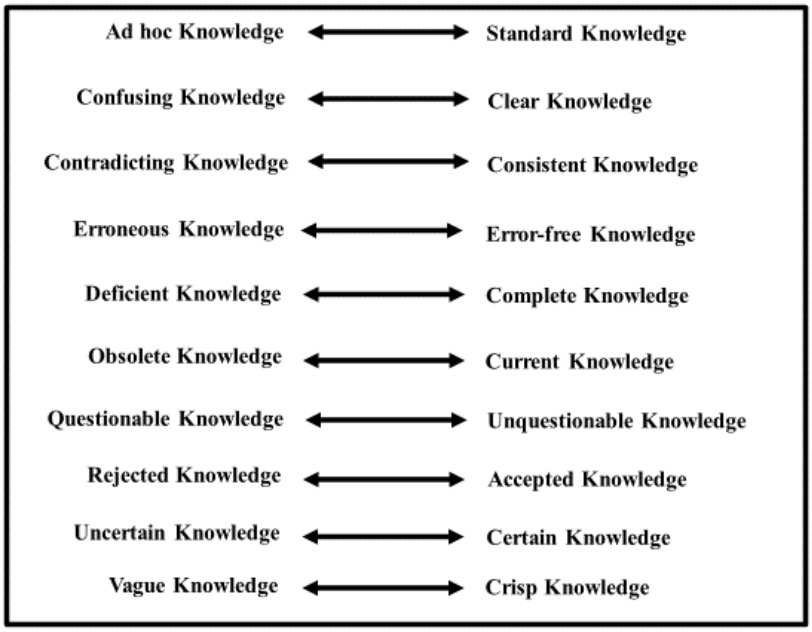

Figure 2: Select Categories and Ranges of Knowledge

A knowledge centre will have to ensure that the knowledge produced for the given patron should avoid falling in the left-hand side categories of Figure 2 as far as possible. In other words, negating unwanted knowledge should be the aim (Kaul 2017, p.192). Though these categories of knowledge are basically qualitative in nature, tools from fuzzy set theory can be used to assess the degree of created knowledge on that continuum (Zadeh 1965; Zadeh and Aiev 2018). This quantification can further be used to produce knowledge innovation matrix (KIM) and thus help the decision maker proficiently (Gregor and Hevner 2014). In particular an impact of knowledge contributions on the end result that is innovation could be assessed. It is surmised that more research in this area would offer useful guidelines to design knowledge outcome-based services by the knowledge centre.

Apart from the categories of the knowledge listed in Figure 1 a few more specific categories of knowledge are worth considering in the light of the characteristics of the cyberspace. They are produced by the following processes: 1) abduction, 2) tacit understanding, and 3) aura sensitivity tracing. An umbrella term, "Low knowledge" is used to denote them (Patokorpi 2006). Given below are their salient features. It is clarified that the adjective 'low' is not referring to the inferior quality but the subtle form of knowledge that has less visibility.

Abduction: This is akin to educated guess or simplification. Here knowledge is neither produced analytically nor deductively. However, it is ordinarily fashioned and used commonly. A 'principle of proximity' that is, mundane association rule is employed to construct it. For example, if we find an open page of a book on table with several printed lines marked by pencil and a pencil lying near the book, then it is concluded that the lines were marked by that very pencil. No other explanation is thought of. It is a form of subjective or intuitive knowledge that is produced by the abductive reasoning on the basis of the clues received by all or any of our five senses.

While dealing with the digital material the 'hypertext' facility in particular is found promoting production of such knowledge. It directs attention to limited source indicated by the links and often leads to ignoring other sources and viewpoints. One consequence of this tendency in the cyberworld is quite alarming namely, one perhaps jumps to a professional level or assumes that status without getting command over the basic ground rules, methods and testing.

Tacit Understanding: This in short is considered as street smartness or practical intelligence. It is quite difficult to explain and can only be demonstrated. For example, the knowledge of swimming or bicycle riding technique. No amount of reading the corresponding manuals or handbooks can help imparting the necessary skill.

This knowledge is difficult to bring under a physical or digital regime and can remain outside the purview of the knowledge centre unless special efforts are put in.

Aura Sensitivity: The concept of aura emanates from the field of aesthetics. It describes exclusive features of a given object like a mural (colour sensation), sculpture (fine curves) and even ordinary tennis ball (softness) and cricket ball (shine). That knowledge is unique for every person. No wonder this type of knowledge also eludes detailed description and codification in real life.

In the digital era, one deals mostly with the copies of the original and thus the underlying knowledge of aura category is lost. For example, a digitised book can help with the clean copy of contents and better navigation, but other pleasing aspects of the real physical book such as touch and smell are lost in the process. Current ICT is not adequate to handle these features. It may however be noted that in addition to the advances in the 3D printing and augmented reality quite a few new tools are under development to offer the sensation such as taste, touch and odour corresponding to object appearing on the computer screen. So, these elements will have to be added by the knowledge centre as and when those promised deeper awareness imparting haptic devices become the reality in practice. The knowledge thus produced will move from deficient to complete category, for instance.

It is seen from the above characteristics of the low knowledge that it is largely immobile and difficult to share. Attempts are no doubt made to make it portable. For example, in big multi-divisional organisations local, regional or global teams are formed to work together in real time employing cutting-edge ICT tools so that in the collaborative work process the tacit knowledge

possessed by an individual or group gets transferred to others without converting it to explicit form like elaborate documentation, which is a cumbersome process (Nonaka and Takeuchi 1995). Another approach in the commercial world is to involve the likely end users of the product in knowledge creation or product design process because they can provide inputs based on their experience and expectations that cannot not be captured satisfactorily say through ordinary surveys. Knowledge centre will have to plan its activities on these lines to acquire and process low knowledge gainfully.

2.2 Negative Knowledge

The concept of negative knowledge is also quite important in knowledge management and building knowledge centre services. Contrary to the notion that negative knowledge is bad or damaging it is found worthwhile in many disciplines. It needs to be approached in the manner similar to that prevailing in mathematics about the concept of negative numbers (Gartmeier et al. 2008). Negative knowledge deals with understanding the best practices employed by the professionals on the basis of their experience. Assertion of 'what is wrong', 'what can go wrong' and 'what not to do' in the given situation, are some of the manifestations of negative knowledge assimilated by the expert. It has a deep connection with the concept of knowledge constructivism and metacognition.

Negative knowledge is found quite beneficial in various applications because it lends decisive support to take efficient actions and contribute to advancing the knowledge in many instances. Its importance is vividly demonstrated in the field of artificial intelligence. Coding of what to avoid by the robot or automated machine in its functioning is critical for its success is underlined (Minsky 1994, 2006). Several data structures and rule-based knowledge-representation schemes have been developed with this concern. Learning from the paradoxes and inconsistencies is equally important from the perspective of negative knowledge accumulation.

However, negative knowledge is not simply drawing upon the errors or mistakes but involves incorporating certain elements of tacit knowledge too. What seems natural processing of emotions and expressions to the human being is to be built systematically in machines when employed for knowledge processing and management by a knowledge centre. Some promising approaches in this direction are reported on the basis of computer-aided design (CAD) education (Otto and Mandorli 2018). Empirical results about the assessment and usefulness of negative knowledge in the professional development of educational counsellors are also available for guidance (Gartmeier et al. 2017).

2.3 Knowledge Refining

The expansion of information sphere is expected to continue in the foreseeable future. The critical question however is how much of that information will really contribute to creation of the original knowledge? If one goes by the available results it is found that only about 10 percent of that adds to the *core* knowledge, about 15 to 20 percent to the *peripheral* knowledge, while rest of about 70 percent of the knowledge generated is *pseudo* knowledge (Jaenecke 1994). The core knowledge is usually universal and applicable almost all the time, whereas, a small part of the peripheral knowledge on further testing and validation may become the core knowledge. Unfortunately, the pseudo knowledge, which is nothing but reproduction of the existing knowledge by rewording, re-clothing and does not contribute to advancement of knowledge is generated in a huge volume to swarm the essential new knowledge. This can be well understood by our experience while searching the Internet for a specific query when we are deluged by sources that on examination are found duplicate and untrustworthy in large

volume. The time and other resources spent unnecessarily on this wild chase causes irritation and frustration.

That is where the knowledge centre will play a crucial role. Refining the knowledge to scrutinise and toss out the untenable knowledge and to supply the really authentic and significant results is its major task. Traditional techniques of the library and information science supplemented by the new digital technology and data science tools for example can help in this task.

To process tacit knowledge is another crucial dimension of this work. That means to build the network of experts and obtaining the benefit of their experience and understanding to weigh the outcome of the processed information is the action. In that context maintaining an updated database of specialists, their interviews and recordings, review articles and patents is recommended (Patkar 2006). A combination of standard information organisation processes, suitable technologies and inputs by subject specialists will form the knowledge refining or distillation activity in practice. A few demonstrative studies pertaining say a local issue through this process could be undertaken to establish the credibility of the knowledge centre.

2.4 Knowledge Acceptance

Knowledge can also be perceived from the second order cybernetics (Foerster 1996). The first order cybernetics dispenses with observed systems and functions mechanically to achieve the explicitly defined aim like the room temperature maintenance thermostat without human intervention. The second order cybernetics on the other hand deals with observing systems. That means the purpose and goal of human agent is also included. In its essence, the second order cybernetics depends on the observer exploring and interacting with the observed domain rather than depending solely on detached mechanistic feedback. Knowledge is thus produced by his/her active construction in the process. The value of knowledge is judged by testing its viability or success by real life experience (Glasserfield 2002).

Knowledge can accordingly be viewed as a mapping:

$$\mathbf{K_i : E \longrightarrow C}$$

where K_i is the i-th type of knowledge such as, effective action enabler, constantly produced, job oriented and so on, E is competitive environment and C is a set of actions to achieve the goal (Laise et al. 2005).

It thus follows that no best knowledge exists; it is considered satisfactory if the actions taken on that basis facilitate achieving the requisite end that can be at the level of individual or organisation. Criteria for treating the knowledge as satisfactory are like,

- **Distinctiveness** – one or more new distinguishing features about the subject matter are obtained.
- **Invariance** – stability over time, space and other parameters is provided.
- **Usefulness** – individual competence and collective good are achieved or enhanced.
- **Coherence** – old and new thinking is connected.
- **Formality** – understanding by all the stakeholders is ensured.
- **Conformity** – agreement by the majority is indicated.
- **Authority** – influence and spread are not challenged.

Generated knowledge satisfying quite a few of the above criteria would build the confidence in the utility of the knowledge centre.

3 Knowledge Discovery

With the proliferation of social media platforms, it is emerging that massive people-created content will dominate the information scene. Processing it to discover knowledge worth sharing and preserving will be a huge challenge to the knowledge centre. Creation of subject specific knowledge pool incorporating the behavioural pattern and data analytics and to design a new service model to disseminate useful knowledge will be the need (Peng 2018; Zhan and Widén 2018).

Knowledge discovery tools include machine learning, statistical techniques and visualisation techniques in general. Online analytical processing (OLAP), inductive learning algorithm, and decision tree approach, are prominent among them. They assist in describing the data on one hand and predict the results or offer estimates based on its in-depth analysis. To unearth the understandable patterns in data is the key objective. Further, computer systems endowed with ability to apply common-sense knowledge and interpret the data with the aid of robust logic is another tool. It is called 'knowledge infusion' and is considered quite promising for knowledge creation (Valiant 2008).

Sentiment Analysis:

One important tool to fathom social media material to construct knowledge is 'sentiment analysis' or 'opinion mining'. Though more popular in the commercial field to interpret and classify the expressed emotions by customers as positive, negative or neutral towards the product or service, it has a vast potential for general application too.

A plethora of software tools is now available to perform sentiment analysis. Rule-based approach, machine learning and combination of the two are some of the techniques form their foundation. They go to the minute granular level of the text, image or audio message to cull out a meaning by analysing intonation, subjective aspect, context, polarity, comparison, expressive symbols and so on. Efforts are on to improve the accuracy of sentiment analysis to help capturing subjective knowledge (Pang and Lee 2008; Liu, 2015; Lamba and Madhusudan 2018). Such knowledge is in great demand by security agencies, political scientists and communication experts among several others to assess the situation and decide the strategies. The following example will bring out the utility of such analysis. A sentiment analysis of the 5,500 tweets regarding the positive and negative aspects of the LIBER 47th Annual Conference held in Lille, France, 4-6 July 2018 provides many insights for assessing its conduct and organising such event in future (Papachristopoulos 2020).

A knowledge centre capable of offering sentiment analysis-based service would attract large patronage. It is a much more improvised version of the reference service of the gone by era. Combined with the text mining and subjected to the satisfaction criteria outlined in the subsection 2.4 above can result in a recommendary system customised to the needs of each user or a group of users.

4 Digital Asset Management

Adoption of digital media to create and disseminate information is now common both for formal and informal communication. A massive volume of academic and official documents is produced in the form of e-lectures, e-books and audio-visual presentation slides that are posted on the respective web site. Social media like Facebook, Twitter, Instagram, YouTube and so

on, have become popular for sharing different types of information items. Even the serious debates and discussions are happening through a variety of digital technology-based platforms like Google Meet and Zoom Meet and their recordings serve as an important reference document. The digital assets could be an assortment of still photos, videos, animations, music, podcasts and other multimedia content. Computer-aided designs (CAD), outputs of remote sensing devices like satellite cameras, RFID chips and roadside traffic sensors besides the data generated by the evolving Internet of Things (IoT) devices form another category. These files are usually very large in size needing special strategies for handling and sharing.

Managing and preserving the online digital asset therefore needs serious attention. They represent the footprints of the owner and form digital heritage that can serve the future generations. There are a number of privacy and legal issues related to them worthy of serious study, however. A guidance service can be designed in that respect by the knowledge centre for its users.

Digital technology changes rapidly and the most pervading technology media of today can become obsolete in near future. Our experience shows that newer developments in the information and communication technology on many occasions have been quite radical and obliterated past storage devices and recording formats completely. The classic example of NASA not being able to retrieve information from the older tapes having voluminous information provided in 1970s by two Viking space probes sent to the planet Mars is a grim reminder in this regard. This has happened because there does not exist a device that can read those tapes now! This phenomenon is akin to experiencing the "Digital dark age" in the modern time. And that can happen again, unless we plan systematically to address the issue by periodic migration to new technology.

Task of digital asset management (DAM) obviously becomes the key area of concern for the knowledge centre. It plays a foundational role. Unless the basic data and information is available for processing, one cannot think of their distillation to produce worthwhile knowledge.

Fortunately, the LIS profession has now the experience of more than two decades of curating and managing digital asset collections that draws upon the long tradition of document and information ordering principles. However, we have to remember that a fairly large section of digital information is not available in public domain. For instance, the e-mail and other digital correspondence between persons or within an organisation is often not preserved for analysis or not available in general. It is envisaged that study and research in certain areas like history, political science and psychology is bound to suffer in future as a result. Vanishing websites and blogs is another worry in this direction. Though the "Internet Archive" is available, it stores information available in the public domain alone (Fanslow 2015).

A DAM system has to deal with several aspects of an information architecture like developing metadata schemes, taxonomies with controlled vocabularies, search facilities and suitable user interfaces. Indexing and metadata tagging for accurate retrieval is vital. In addition, there are administrative tasks of maintaining and managing digital asset lifecycle, user accounts and their privileges and integration with new information systems. Digital preservation incorporating asset integrity, storage management and disaster planning is another important dimension. Protection from theft and unintentional distortion or destruction of the digital asset is also a part of the DAM.

Many sources exist to support the DAM tasks. Some user communities are active in this area. Special training courses are offered by a few LIS schools and professional associations. A number of DAM software packages are available to support running such a system. Tagging intelligently, cross-referencing and video recognition of digital asset using the utilities offered by artificial intelligence products is expected to facilitate DAM in near future.

Cloud-based storage that is scalable is one promising avenue for keeping the large digital files for DAM processing. Another is the hybrid of cloud and software-defined storage place for faster access. Already a few artificial intelligence-assisted DAM systems are offering several new utilities to increase the efficiency in acquiring, organising, and accessing digital assets. Moreover, they have the capability to produce new assets from existing ones by deploying the functions of intelligent cropping and resizing. One has to assess the cost, frequency & speed of access and other features to choose the option to assure smooth running of a knowledge centre.

5 Discussion

It is clear that knowledge production is a far more involved process. Managing the low knowledge for instance in the digital era is a daunting task. Understanding its limitations and benefits needs considerable analysis and reflection. Similarly, how to elicit, document, and develop negative knowledge to support higher education and professional needs is another challenge. It may be mentioned that a concern about loss of human element due to increasing role of digital technology-mediated transactions is voiced by some quarters. In particular they lament that the knowledge is no longer generated for finding the truth but for its economic value (Lytord 1984). But to blend real and virtual worlds is the need of the hour and producing knowledge with both use-value and exchange-value cannot take a backseat.

One of the adverse side effects of ICT-based social media on knowledge domain in general is the rise in ‘will to ignorance’ (Beer 2015). It means raising the barriers for critical thinking. Trusting the fake and doctored information as real knowledge, which is flashed constantly is the result. Independent thinking and use of standard methods and theory is given go by. Knowledge becomes myopic and one-sided. People become memorisers instead of dispassionate thinkers and inventors that we need significantly. Critical thinking or oppositional thinking that demands suitable filtration, analytic comparison and rejection of untenable knowledge on the basis of solid evidence is often found missing. In real life, however, one may need something in addition. New knowledge could be based on compositional thinking, which strives for obtaining something new, different and unexpected along with rejection of dubious knowledge. Comprehensive knowledge based on measurable and immeasurable inputs is expected to address the complex challenges. Developments of the tools like the internet of things (IoT), augmented reality (AR), ontology development organising the knowledge produced by web and other digital platforms and data science are to be tapped for this purpose (Patkar 2011, 2019).

LIS professionals will certainly have a role to play in this process. They should equip and upskill themselves to join the new workforce of knowledge hands to manage the knowledge centres. LIS schools and professional associations should identify the areas to augment the education and training courses to facilitate knowledge gathering and refining tasks. Case studies and practical projects employing knowledge refining processes will help the students in honing their abilities. Emphasis should be on achieving high competency index on numerous dovetailed facets of LIS, technology and management aspects to prepare for the knowledge centre occupations (WebJunction 2014). Focused research on production and utilising low

knowledge, negative knowledge and sentiment analysis can help expanding the services by the knowledge centre.

6 Concluding Remarks

A knowledge centre establishment whether afresh or by transforming the library is now imperative for every society. It would be a productive strategy to help reconfiguring local, district level and higher-level public libraries for addressing varying but precise knowledge needs of the users. Each centre can be assigned a task of knowledge creation in a given specific domain and a well-geared network should connect them to share the knowledge services across the institutions and individuals. Further, their collaboration with the academic libraries should be encouraged because it can give added advantage to both.

The LIS professional needs to be trained in the knowledge discovery tools like data mining and sentiment analysis and communication with experts and others to play a major role in the core knowledge refining task of the knowledge centre. Dedicated multidisciplinary research initiatives are to be promoted to explore various processes of knowledge generation and management. Rich dividends are expected on this investment both in the short and long run.

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