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Knowledge Preservation: Need for a Multi-pronged Approach – Lessons from Ancient Indians

Vijay Srinath Kanchi
Moolji Jaitha Autonomous College
Knowledge Resource Center, Jalgaon, India
email: drvskanchi@mail.com

Abstract
The leaps and bounds with which the knowledge domain of our modern civilization is growing pose a formidable challenge as to how this wealth of knowledge is to be preserved for posterity. Are we sufficiently prepared should there be any cataclysm of gigantic proportions or a major catastrophe such as a nuclear war? What if the whole world is thrown awry and crippled by such major events? How do we ensure that future generations of humans who would have inherited a substantially destroyed world can rebuild it back to its glory? How to safely supply the wealth of knowledge we amassed from modern advancements in science and technology to those generations who have to rebuild everything from scratch? This paper examines the techniques espoused by our wise ancient Indian sages to transmit knowledge to posterity across many millennia, the wisdom and philosophy behind such adopted measures and whether there are lessons for us to learn from them.

Keywords: knowledge preservation, knowledge transmission, stone carvings, symbolism, story format, reliance on memory, oral transmission

Introduction

The last two hundred years of human history have been extraordinary judging by advancements in science and technology. We have been able to make our world and our living very sophisticated and amassed a large body of knowledge. We have made so many advancements in every field that human civilization, to our knowledge, has never come closer to where we are today. Now, we have greater clarity on the workings of our universe and are better equipped to handle and control nature than ever before. All our advancements have made our lives a lot easier and the world a better place to live. We have strongly fought against poverty, disease and ignorance and have been able to alleviate these maladies that plagued humanity since time immemorial. Thanks to the advancements in science and the technological interventions that followed them, the majority of the human world is now better placed in terms of access to knowledge, better economic conditions and better healthcare facilities.

There are attempts to make this mustered wealth of knowledge available to every nook and corner of the world, thanks to the advancements in digital technologies that are enabling information storage, retrieval and dissemination to become borderless. Recently, we have built a surreal world of information maze which is now the modern repository for all the accumulated knowledge of our present civilization. It is incumbent upon this present civilization to ensure that this precious wealth of knowledge that has enabled our modern society to have a better quality of life is safeguarded and transmitted to future generations unhindered, even in the eventuality of any major calamity. Conserving the knowledge and transmitting it to future generations is a big challenge for knowledge managers, especially if they take into consideration any catastrophic events that may destroy the existing knowledge structures. But,

our over-reliance on the digital storage of knowledge may prove catastrophic should there be some cataclysm of gigantic proportions or a major catastrophe such as a nuclear war that may wipe out the very structures of our present-day knowledge repositories. Human civilization has faced several such events in the past but our ancestors, particularly in India, had devised some ingenious techniques to ensure that the knowledge they considered important was preserved and handed over to posterity effectively. The present paper attempts to bring forth some techniques adopted by the ancient Indian civilization that can prove very insightful to present-day knowledge managers.

In this technological era, we are increasingly banking on digital technologies and formats to preserve the knowledge we created and accumulated. However, access to such digitally stored knowledge is contingent upon the availability of four necessary things: electricity supply, suitable hardware, currency of data storing format, and the technical know-how to run the whole system. Another requirement would be a prevalence of the language and the script in which the knowledge is stored at the time of access to such a wealth of information. Several challenges can crop up from any of these necessary conditions. For example, unlike solar energy, electricity is an energy source that needs to be generated to make use of it and that requires technology. If the electricity-generating mechanisms are destroyed for any reason, all the equipment that is electricity-dependent becomes infructuous, and the information contained therein is inaccessible. Similarly, the hardware we currently use to store, retrieve and access information and knowledge is highly complex and is continuously evolving. What is used as the medium at a given time gets altogether replaced with newer devices within a span of just a couple of years. The hardware and the equipment we currently use, if they are reduced to dust in a war or other such situation, would be very hard to rebuild by a civilization unfamiliar with this technology. Even the software formats that we use to store our body of knowledge are also changing at a mind-boggling pace. Unless the whole body of knowledge stored in one format is migrated to the latest formats, that knowledge becomes inaccessible and useless. At a time when all our technological installations would have been completely levelled to the ground, how would the generations that subsequently arrive on the planet access the digitally preserved knowledge and rebuild the world? Are we really prepared for such a possible contingency, whose possibility of occurrence is alarmingly increasing as instances of terrorism and political instability across the globe are perilously growing day by day? Is it not sensible that we consider alternative approaches to the digital preservation of knowledge as backup mechanisms which are not dependent on electricity and technology? Did any previous civilizations face such en masse destruction yet managed to transmit what they considered necessary to future generations? A peep into the past gives some astounding techniques evolved and adopted by the ancient civilizations in preserving and transmitting their body of knowledge for thousands of years, particularly the ancient Indians who have used remarkable media to transmit their knowledge and wisdom to future generations. Present political and environmental conditions are warning us to rework our strategies of knowledge storage and transmission to be more resilient, more human-mind dependent and less technology-dependent.

The Ancient Indian Civilization

India is known the world over as one of the most ancient civilizations of the world[1]. In the ancient past, it registered some of the greatest achievements in science, art, literature, architecture, philosophy, astronomy, metallurgy and other subjects. It was the world capital of

[1] For the unversed, the Vedas, (literally, 'knowledge'), which originated in the ancient India, are the oldest known religious works in the world. – Joshua J. Mark, "The Vedas", published on 9 June 2020, https://www.worldhistory.org/The_Vedas/.

knowledge with over a dozen world-acclaimed universities, Takshashila, Vikramashila, Nālanda, Oddantapuri, etc[2], to name a few, where scholars from across the globe visited to gain scholarship and wisdom. This oldest known human civilization has produced appreciably well-developed knowledge in myriad fields[3]. The people belonging to this Vedic civilization conceived *kāla* (time) as being divisible into *yugas* and *kalpas*[4] and believed that at the end of each *yuga* and *kalpa*, the world would witness destruction of gigantic proportions. Rightly so. This ancient Indian civilization that thrived in the Saraswati – Ganga River basins also had to face the vagaries of time, such as natural calamities, war and destruction and eventually bow down to the all-powerful *kāla*. The perennial Saraswati River that was highly eulogized in the Rigveda eventually dried up owing to severe changes in the environmental conditions, and the civilization that thrived along its banks had to retreat into obliviousness. Further, at the end of the previous *yuga* called *Dwāpara Yuga*, a great war ensued and curtains were drawn onto this great civilization[5]. That civilization also faced the very challenge of transmitting their hard-accumulated knowledge and wisdom to posterity in an enduring way. They were successful in preserving and transmitting their body of knowledge for well over five thousand years. How did they manage to hand over their culture and knowledge to the posterity? What did they rely on as the dependable media? A peep into the simple yet ingenious techniques they employed reveals to us their sagacity and wisdom in choosing the media for the transmission of knowledge.

The Challenge of Knowledge Transmission over Millennia

The ancient Indian sages were very wise. They were aware of the impending disaster that was about to gulp up their civilization. They also knew that the transmission of knowledge, values and wisdom for many generations is a horrendously challenging task. Any technology-enabled method will be ineffective and unsustainable. And so, they devised some ingeniously simple methods for the preservation and transmission of their wealth of knowledge. This ancient civilization reached its pinnacle in various fields that were preserved and transmitted for centuries in the form of monuments, artefacts, oral tradition and manuscripts. A brief evaluation of those techniques is carried out here.

Reliance on Long Enduring Material: Stone

All the ancient civilizations across the globe have created grand structures of stones that survived many millennia. The pyramids of the Pharos of Egypt, the grand temples of Mayas and the Incas in the Andes, and the stone henges of the United Kingdom stand testimony to this remarkable feat. The ancient Indians have also used the stone dexterously not just to erect standing

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[2] Takshashila (aka Taxila), whose ruins are found near present day Islamabad in Pakistan was at its pinnacle at least before 7th century BCE. Many accounts call Taxila as one of the earliest (or the earliest) universities in the world. – Joseph Needham, Within the Four Seas: The Dialogue of East and West (London: Routledge, 2004).
Nālanda University was highly eulogized by the Chinese traveller Hwen Thsang in the 7th century AD as attracting the best scholars from all directions.

[3] The Sulba sutras, appendices to the Vedas, which predate Pythagoras, describe complex trigonometric formulae. The Rudra path, composed in archaic Sanskrit enlists several complex mathematical number series, metals, a variety of millets, cereals and other crops, apart from chariots, weaponry, etc., pointing to a reasonably advanced civilization. Rigveda 1.35.9, 1.164.13, 10.22.14, 10.149.1, Yajurveda 33.43, etc., propound heliocentric model and describe how the earth is pulled around the sun by its power. Jyotisha (literally science of Illuminous celestial bodies), an ancillary subject to the Vedas, describes the complex calculations to estimate eclipses, transition of planets into various constellations, etc., with astounding accuracy.

[4] The ancient Indians divided the time ranging from microseconds to trillions of years, with the smallest paramāṇu being equivalent to 26.3 μs and the cycle of Brahma being 3,110,400,000,000 human years. – Wikipedia, the free encyclopedia, "Hindu Units of Time", last edited on 7 October 2023, https://en.wikipedia.org/wiki/Hindu_units_of_time.

[5] This Great War is described in the Indian epic Mahā Bhārata by Sage Veda Vyāsa.

masterpieces of architecture but also to convey historical events, beliefs and knowledge. This is the only geographical entity in the world where its landscape was heavily dotted with the most elaborately carved temples[6], standing testimony to the acme of perfection it had reached in various fields. Even though over thirty thousand temples have been razed to the ground by those fanatical invaders who could not tolerate the grandeur of the mesmerizing temple architecture and sculptures, the temples that still survive today, such as the *Chennakeshava*, *Atmanadhar* and *Jambukeshwara* temples in Tamil Nadu, Beluru and Halebidu temple complexes in Karnataka, Dilwara temples in Rajasthan, Ajanta Kailaśa temple in Maharashtra, etc., stand as living testimony to the mastery in craftsmanship and acme of perfection attained by our ancestors. Indian temples, unlike the ones in other parts of the globe, were not mere places of worship; they were the centres of learning and dissemination of knowledge, culture and tradition. They were the forbearers of our modern-day universities and fulcrum of economy that centred on the *dharma*, *artha*, *kāma* and *moksha* - the four *purushārthas*[7] that brought meaning to human life. The stone carvings of every Indian temple depict tales of the past grandly and exquisitely. They are like a history books carved on stone. The use of granite, the hardest stone for many temples enabled them to survive through the vagaries of time.[8]

Pictorial Representations Carved on Stones

The sagacity of ancient Indians is evident not only in choosing the toughest medium but also in the thoughtful measure of using pictorial depictions to convey the message, as a message carved in stone is language-independent. The extinction of one civilization also invariably results in the disappearance of the language used by those people. And so, unless the script is deciphered the rock edicts fail to convey the message. Contrary to this, the carvings on the temple walls can be understood without the need for knowledge of the script and language. Thus, the Indian landscape is replete with temples with stone carvings rather than rock edicts. The European historians, unable to appreciate this wisdom, often complain that the ancient Indians lacked the sense of documentation. We may however also remember that the vast *Itihāsa-Purāṇa* literature of India was meant to enumerate the historical records of kings and their dynasties, which the European Indologists of the 18th and 19th centuries found convenient to discard as mere mythologies.

Reliance on Human Memory and Intellect

The Indian ancestors have identified human intellect as the best medium for preservation of knowledge and oral transmission, as the ideal mode.

They have employed the human intellect as the perfect tool to store the four Vedas, whose ancestry dates back to at least five thousand years, and transmit them verbatim for hundreds of generations. It will be awe-evoking to note that the corpus of the Vedas, is about 20,000 *mantras* (verses) with Rigveda having 10552 *mantras*, Yajurveda and Samaveda 1875 verses each and

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[6] Around the 4th and 5th century CE, during the Gupta Era, considered the golden age, India witnessed a deluge of intricately carved temple architecture all across its landscape. The entire geography – every nook and corner of the land – was elaborately described in various Purāṇas (18 in all), particularly the Skānda Purāṇa. Each of these places had an intricately carved temple erected, dedicated to the deity of the region. Sitaram Goel, a renowned historian listed with historical pieces of evidence, over 38000 ancient temples that were destroyed by the fanatical forces during the Islamic conquest. For the appalling architectural marvels of ancient Indian temples that still survive today, one may visit Pravin Mohan's YouTube channel.

[7] The four values that make a satisfied human life and for which every individual must strive, according to the ancient wise men are: righteousness, prosperity, fulfilment of desires and salvation.

[8] Vijay Srinath Kanchi, Manuscript Conservation in Maharashtra (New Delhi: Kaveri Books, 2022).

Atharvaveda containing about 5800 verses. It was prohibited in the orthodox system to write down the Vedas on any medium, even though Sanskrit was a highly evolved language system and Brahmi, Magadhi, Kharoshti, and Devanagari as scripts were very much extant for at least over two millennia. The teaching class *brahmans* were expected to memorize the whole text verbatim and transmit them through a long chain of preceptors-disciples to the posterity.

No other works in any other part of the world are comparable to the length, depth and extent of the works of the bards, poets, saints and philosophers of this land. Just to illustrate the point, the Mahābhārata, one of the two major Sanskrit epics of India, is about 100,000 stanzas long! It is 15 times longer than the Bible (Old and New Testaments combined) and eight times as long the Iliad and the Odyssey of Homer put together! Skānda Purāṇā that describes geography of the Indian subcontinent in detail apart from many other fields of knowledge is stated to be 400,000 verses long!

Defying the common perception that oral transmission suffers from the inherent limitations of speech and that memory is not a fool proof method of transmission, the oral system has withstood the ravages of time when all the ancient libraries of the world and their entire collection of books, manuscripts, tablets, palm leaves etc have all been burnt down by the hordes of invaders. It is recorded in the annals of the Indian history that when Bhaktiyar Khalji[9] set fire to the Nalanda University in 1198 AD – the world's very first residential University, so as to incinerate the knowledge and wisdom of the 'infidels', the nine storied library mansion is said to have burnt for three months turning into ashes over nine million texts! Such was its manuscript wealth! Khalji is also remembered for the destruction of other famed universities of that time including Odantapuri in Bihar and Vikramashila apart from the destruction he meted out to the Nālanda University.[10] Despite such repeated plunder and destruction meted out year after year by the invading forces, the knowledge of this civilization survived till date thanks to the sagacity of our ancestors that relied on the human mind as the ideal medium for knowledge preservation. This powerful oral tradition of the Vedic culture is supplanted by several supporting mechanisms to ensure error-free sustained transmission.

The Pāṭha Technique

To ensure that the sound of each word remains unaltered, practitioners are taught from childhood complex recitation techniques that are based on tonal accents, a unique manner of pronouncing each letter and specific speech combinations. Pāṭhas are the styles of hymnal recitation. There are eleven such ways of recitation - *Samhita*, *Pada*, *Krama*, *Jaṭā*, *Mālā*, *Śikha*, *Rekha*, *Dhwaja*, *Danda*, *Rathā* and *Ghana*.

The first, *Samhita pātha*, is the simplest form of continuous recitation that approaches the mantra as it is. *Pada*, on the other hand is recited in a way where each sentence is broken down into constituent words. Krama, the third technique, adds the first real level of difficulty into the recitation through a pattern of repetition. It involves recitation of words in pairs — 1 2 / 2 3 / 3 4 / 5 6 / 7 8, etc. *Jatā pāṭ**ha***, the first of the more challenging *pāṭhas*, alternates between

[9] Khalji was the military general of the Ghurid ruler Muhammad of Ghor, who led the Muslim conquests of the eastern Indian regions of Bengal and Bihar and founded the Khalji dynasty of Bengal. His invasions of the Indian subcontinent between 1197 and 1206 CE led to mass flight and massacres of Buddhist monks and caused grave damage to the traditional Buddhist institutions of higher learning in Northern India. His rule also resulted in the displacement of Buddhism from India. – Wikipedia, the free encyclopedia, "Muhammad Bakhtiyar Khalji", last edited on 5 November 2023, https://en.wikipedia.org/wiki/Muhammad_Bakhtiyar_Khalji.

[10] Nalanda is considered by the historians as the world's first residential university and among the greatest centers of learning in the ancient world that ran during 427 to 1197 CE. It was at the acme of arts and academics during the 5th and 6th century CE, a period that has since been described as the „Golden Age of India" by scholars. – Wikipedia, the free encyclopedia, "Nalanda Mahavihara", last edited on 3 October 2023, https://en.wikipedia.org/w/index.php?title=Nalanda_mahavihara&oldid=1178439089.

a repetitious interposing and transposing of words. Between *Jatā pāṭha* and the last technique *Ghana* are six other techniques (called *Mālā*, *Śikha*, *Rekha*, *Dhwaja*, *Danda* and *Ratha*[11]) that again are built-in combinations and permutations that have ensured that the order and words of the Vedas remain unchanged throughout the chant[12]. Thus the ancient Indian sages have ensured error free transmission of what they considered the utmost knowledge wealth of mankind to their posterity.

Creation of Aphorisms

Sūtras or aphorisms are simple nuggets that sum up big ideas. They are easy to memorize as they are set to meter and contain in their womb immense knowledge in capsule form. When elaborated and expanded, these nuggets of wisdom can reveal the knowledge contained in a voluminous book. These pithy observations contain general truth that are time-space independent and are universal in nature. There are definite rules governing the formulation of such *sutras*. The *Vāyu Purāña* succinctly describes those rules in a Sanskrit verse:

> *alpāksharam* (brief), *asandigdham* (unambiguous or incontravertible), *sāravat* (complete in essence), *vishwato mukham* (covering all facets), astobham (devoid of 'stobha' (kind of fillers in Vedic chanting like hā, ca, tu, hi, vy, hū, etc.) anavadyam (irrefutable) cha sūtrah sūtravido viduh (the learned who know aphorisms know so) [13].

The wisdom of the ancient Indians is evident in the abundant use of these *sūtras* as the effective means for easy memorizing and efficient conveying of large mass of information in the least possible format. In fact, every system of knowledge of the ancient India had their own *sūtras* such as the Patanjali *yoga sūtra*, Nyaya *sutras* (logical system), Sulba *sutras* (mathematical formulae for Vedic rituals.) These are then expanded in *bhāshya* or commentary texts, which are further elaborated in *vārtika* texts. They are then critically evaluated in the *tīka* texts by the later scholars. Thus, the nuggets of wisdom contained in the succinct *sutras* can roll out into a very long treatise, when unfolded by the later scholars.

Choosing Story Format and Symbolism for Conveying Knowledge

Ancient Indian seers were adepts in storytelling. They knew that a fable is remembered and transmitted easily than a scientific truth or a theorem. Hence, they converted many philosophical ideas, theories and tenets in the form of symbolic fables and anecdotes and ensured that the underlying idea is effectively conveyed to the laity, generation after generation. Sage Veda Vyasa is credited with authoring the eighteen *purāñas* that contain many allegorical stories and fables. The stories are more easily remembered as they contain emotions, human relations and contexts that are closer to our heart. While seeing scientific principles behind every art and

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[11] There are 8 traditional vikriti permutations and combinations of recitation of words in a mantra or verse which are as follows: (The numbers here depict the sequence of words that are repeated in each style of rendition.)
jaṭā: 1 2 2 1 1 2 / 2 3 3 2 2 3 / 3 4 4 3 3 4 / 4 5 5 4 4 5 / .....
mālā: 1 2 / 2 1 / 1 2 / 2 3 / 3 2 / 2 3 / 3 4 / 4 3 / 3 4 / .....
śikhā: 1 2 2 1 1 2 3 / 2 3 3 2 2 3 4 / 3 4 4 3 3 4 5 / 4 5 5 4 4 5 6 / .....
rekhā: 1 2 / 2 1 / 1 2 / 2 3 4 / 4 3 2 / 2 3 / 3 4 5 6 / 6 5 3 4 / 3 4 / 4 5 6 7 8 / 8 7 6 5 4 / 4 5 / 5 6 7 8 9 10 / 10 9 8 7 6 5 / 5 6 / .....
dhwaja: 1 2 / 99 100 / 2 3 / 98 99 / 3 4 / 97 98 / 4 5 / 97 98 / 5 6 / 96 97 / ..... 97 98 / 3 4 / 98 99 / 2 3 / 99 100 / 1 2 .
daṇḍa: 1 2 / 2 1 / 1 2 / 2 3 / 3 2 1 / 1 2 / 2 3 / 3 4 / 4 3 2 1 / 1 2 / 2 3 / 3 4 / 4 5 / 5 4 3 2 1 .....
ratha: / 7 8 1 2 / 5 6 / 2 1 / 6 5 / 1 2 / 5 6 / 2 3 / 6 7 / 3 2 1 / 7 6 5 / 1 2 / 5 6 / 2 3 / 6 7 / 3 4 / 4 3 2 1 / 8 7 6 5 /.....
ghana: 1 2 2 1 1 2 3 3 2 1 1 2 3 / 2 3 3 2 2 3 4 4 3 2 2 3 4 / 3 4 4 3 3 4 5 5 4 3 3 4 5 / .....

[12] Indian culture, "Tradition of Vedic Chanting", Government of India, accessed March 10, 2023, http://www.indianculture.gov.in/unesco/intangible-cultural-heritage/tradition-vedic chanting.

[13] vasya10. "A Sutra for Naming Conventions", edited October 28 2009, https://vagartham.wordpress.com/2009/10/28/a-sutra-for-naming-conventions/.

natural events is a mark of high intellect, greater intellect is of those who can narrate scientific truths in the artistic form that are easily assimilable. Only master craftsmen can see art in scientific truths and express artistically.

Manuscripts on Palm-leaves, Birch-bark and Copper-plates

Even though India endured repeated arson and looting for well over 800 years by the invaders, several millions of manuscripts managed to survive in the temples and mutts and also protected by the individuals. The choosing of the medium for manuscripts by our forefathers is also very insightful. Palm leaves and birch bark the most frequently used media for manuscript writing in India. Palm leaves and birch bark, though are organic in origin are yet some of the most enduring materials that can withstand the climatic conditions and are least prone to insect infestations. The earliest known palm leaf Indian manuscript belonged to the sixth century A.D in Sanskrit language. Even Hwen Thsang, the famed Chinese pilgrim, who documented his visits to several parts of India in seventh century A.D., mentioned in his travelogue the use of palm leaf as the medium for manuscript writing all over India. Hwen Thsang also took to China hundreds of palm leaf manuscripts from India. Palm leaves are generally more UV tolerant and fire resistant [14] and so were one of the preferred media for manuscript writing. Copper plates are another frequently found medium that easily survive several hundred years.

Paper Was Only a Second Choice

Handmade paper as an alternative to palm leaves, copper plates and birch bark was also in vogue for hundreds of years. Conventionally the Chinese are credited with the invention of paper, even though the word 'paper' is a derivative of the Egyptian *papyrus*. Paper is said to have been invented in China in 105 CE by Tsai Louen[15]. It may, however, be pointed out here that there are reasonable pieces of evidence to show that the art of preparing paper was known to Indians much before the Chinese and the rest of the world came to know about it. The famed German Indologist of the 19th century, Max Muller in his book 'History of Ancient Sanskrit Literature' points to the documented evidence by Niarchos, one of the chieftains of Sikander (Alexander), who wrote: 'The people in India know the art of preparing paper by using the cotton and rags of clothes, on which forecasts, Almanacs and '*janma kundali*' (natal horoscope) were written down'[16]. The main problem with papyrus manuscripts is that it decays in damp climate as it is made of plant material.[17] Though Indians knew the art of papermaking, it is believed that the use of paper was not in vogue during that time (Alexander's invasion of India in 326 BCE). It may be because of the felt need to keep the message long-lasting and retained for generations that the rock was chosen as the preferred medium.18

The above discussion shows us how, despite not being equipped with the advantages of our modern-day technological means, the ancient Indians devised ways and means that proved effective in transmitting a large mass of knowledge for thousands of years with appalling accuracy.

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[14] Kelly McPherson and Kimberlyn Williams, "Fire Resistance of Cabbage Palms (Sabal Palmetto) in the Southeastern USA", Forest Ecology and Management 109, no. 1 (1998): 197–207. https://doi.org/10.1016/S0378-1127(98)00243-6.

[15] Edouard Chavannes, "Inscriptions et pieces de chancellerie chinoises de 1e'poque mongole", Journal Asiatique Vol. 6, no. 1 (1905): 1–42.

[16] Friedrich Max Müller, A History of Ancient Sanskrit Literature (London: Williams and Norgate, 1859).

[17] Anita Bagchi, "A Glimpse of Scientific Knowledge in Ancient India: Evidence of Manuscript", in Manuscript and Manuscriptology in India, edited by Subodh Gopal Nandi and Projit Kumar Palit (New Delhi: Kaveri Books, 2010).

[18] Kanchi, Manuscript Conservation in Maharashtra.

Modern Day Knowledge Storage and Transmission Media

With the advent of the paper-making machine, after its invention by Louis-Nicolas Robert in France in 179919, modern civilization began to heavily rely on paper as the chief medium of information storage. However, the acidic content used to make the paper look brighter and whiter remained with the paper, making it turn yellow and brittle over time. Even the cellulose within the paper and the wheat paste in the binding material contained gluten and often attracted bookworms, termites, silverfish, etc., causing heavy damage. Hence, the books published in the 19th and the first half of the 20th centuries are often found irreparably damaged in libraries. As a remedial measure, modern papers began to be created as non-acidic and much more insect-resistant. However, they faced a challenge from an unexpected corner. Access to knowledge embedded in a paper has several limitations such as time and space constraints, limitations in the number of copies, inability to store audio and motion pictures, linear mode of information transmission (one can only gain information in a linear way as the book intends to provide and cannot hop from one topic to other which the digital environment offers), etc. Later, analogue storage media emerged that enabled the recording of information in audio and video formats. In the early 60s of the last century, microfilming was considered the best solution for deteriorating books and manuscripts. The analogous storage media, such as tapes, film strips, etc., had a very limited life span - much lower than the paper. The tapes and films were vulnerable to climatic variations in temperatures and also used to spoil due to disuse over a period of time. They also suffered from time and space constraints of the paper, and their ability to mass transmission of knowledge was also limited to the availability of a copy of that medium at a particular time and place. And then emerged the digital technologies as a panacea to all these challenges. The revolution in Information and Communication Technologies (ICT) that swept the modern world in the last five decades or so, promised to be the most dependable choice for knowledge storage and dissemination. The mechanisms for the preservation of knowledge for posterity have also changed considerably. The seemingly unlimited cloud storage coupled with nanotechnology-based highly shrinking storage media, the fifth-generation signal transmission capabilities, the ever-improving ultra-resolution imagery and the power of artificial intelligence appear to be the perfect combination for our hunt for an ideal storage and communication medium. This hitherto unimagined capabilities of a storage and communication medium are so compelling that it seems everybody is hurrying hard to embark on the digital platform. The global e-book industry, valued at USD 16.66 billion in 2020 is expected to witness exponential growth to expand at a compound annual growth (CAGR) of 3.0% from 2021 to 202820. Generation Alpha also become heavily dependent on digital platforms for their knowledge needs and is averse to books and other knowledge sources in physical format. Many experts believe that printed books are soon going to become obsolete, replaced by digital media in no time.21

Is Digital Preservation the Right Choice?

With the rapid progress made in Information and Communication Technologies in the second half of the twentieth century and the addition of emerging technologies each new day, it seems the world is transitioning into a digital world, and there is no comeback. Digitization of past and

[19] Robert Henderson Clapperton, The Paper-Making Machine: Its Invention, Evolution, and Development (Elsevier Science, 2014), https://books.google.co.in/books?id=C3E-AwAAQBAJ.

[20] Millioninsights, "Global eBooks Market Size, Share & Growth Report, 2028", February 2022, https://www.millioninsights.com/snapshots/e-books-market-report.

[21] Paul Bates, "The Future of the Printed Books in the Digital Age", Baltimore Post-Examiner (blog), July 23, 2018, https://baltimorepostexaminer.com/the-future-of-the-printed-books-in-the-digital-age/2018/07/23.

current knowledge sources such as manuscripts and books is now acclaimed as the one-stop solution for preserving knowledge for future generations. Digital preservation, even though offers several advantages also has its own inherent limitations. For example, digital technologies have such a short span of life that any equipment, format, or storage device used becomes obsolete and unusable in less than a decade.

At the outset, we must remember that the digital image can never replace the physical object. Further, we must remind ourselves that access to digital content entirely depends on the availability of electricity, suitable wherewithal, currency of the particular file format etc. summarizes the advantages and disadvantages of digitizing culturally significant materials in his report titled '*Why digitize?*'. The report is based on the assessment of the impact of digitization on large libraries such as the Library of Congress, the National Archives, and major research libraries in the Digital Library Federation, and on smaller institutions such as the Huntington and Denver Public Libraries. The author says expectations of benefits, cost reductions, and efficiencies that digitization often is associated with can be illusory and, if not viewed realistically, might put at risk the collections and services libraries have provided for decades. He completely downplays the view that digital conversion has already or will shortly replace microfilming as the preferred medium for preservation reformatting and warns that such a hurried judgment could result in irreversible losses of information. He says 'librarians everywhere hear the voices of people urging the conversion of text and visual materials into digital form as if conversion per se were a self-evident good'. But, he argues, 'because we tend to imagine the future in terms of the present, such projections of the present onto the future may, at best, be misleading'. One significant disadvantage of digital data, he points out is that 'digital information is not eye-legible: it depends on a machine to decode and re-present the bit streams in images on a computer screen. Without that machine and active human intervention, those data will not last'.

He argues that though digital format offers easy change of plasticity and without a trace of erasures or emendations, the question of which version of the file, or how many versions, should be archived becomes problematic from the perspective of a library or archives that strives to collect a text that is final and definitive. He also points to the formidable technical obstacles to ensuring the persistence of digital information.

Pointing out that digitization is not preservation yet, he underscores the value of all recorded information by stating that all that is recorded, from paintings on the walls of caves and drawings in the sand, to clay tablets and videotaped speeches, has value, even if temporary, or it would not have been recorded, to begin with. That which the creator or transcriber deems to be of enduring value is written on a more or less durable medium and entrusted to the care of responsible custodians. Other bits of recorded information, like laundry lists and tax returns, are created to serve a temporary purpose and are allowed to vanish. Thus, he argues that it is important to choose the right medium for storing information that is long-lasting, less technology-dependent and language-independent.

Truly so. What would happen to the wealth of knowledge that we are amassing on digital platforms without bothering about the consequences of disasters – natural or manmade – that could wipe out the electric substations, cloud servers, etc., and throw our civilization back to the Stone Age? How will we ever ensure our children who survive such calamity rebuild their world with all the advantages of technologies we are enjoying now? How do we make sure the present-day knowledge we take pride in is secured and handed over to future generations? The world we now live in is precariously perched on the World War III scenario owing to the clash of civilizations. What if another Bhaktiyar Khalji rampages on a destruction spree, setting on fire and destroying every icon of modernity and technological advancements? Will our overreliance on digital storage and our apathy towards cultivating and honing our memory as a powerful storage and transmission tool prove a costly mistake? The knowledge managers of the present day must seriously ponder over this imminent challenge.

Conclusion

The Vedic oral tradition of India is reckoned as an astounding feat that preserved the vast ancient wisdom intact for at least well over five thousand years. The dedicated efforts of some of the great ancient scholars in medieval India also created a vast swathe of written records which were enshrined in intelligently chosen durable media. Though at first sight, the methods of preservation and cultural transmission adopted by the ancient Indian civilization and the like may seem unsophisticated, it certainly is a good bet for us to take a relook at these strategies and consider whether they have some lessons for us as well. Our overreliance on technological interventions to preserve the existing body of knowledge may prove greatly detrimental to the very idea of transmitting the knowledge to future generations.

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Очување знања: потреба за комбинованим приступом и поуке древних Индијаца

Сажетак

Брзина којом се у модерној цивилизацији увећава област знања праћена је великом бригом у вези са начином очувања тог богатства за будућа поколења. Да ли смо довољно припремљени ако би дошло до неке катаклизме гигантских размера или светске катастрофе, као што је нуклеарни рат? Шта ако се свет постави наглавце или значајно оштети у таквом светском догађају? Како да осигурамо да ће будуће генерације људи, које би наследиле озбиљно разрушен свет, моћи да га изграде поново, у његовом пуном сјају? Како безбедно похранити богатство знања које смо сакупили захваљујући модерном развитку науке и технологије за генерације које би морале све да граде поново из рушевина? У раду се даје преглед техника које су током више миленијума користили древни индијски мудраци да би пренели знање будућим поколењима, као и мудрости и филозофије из којих потичу изабрани поступци. Такође се дискутује да ли су њихове поуке намењене нама.

Кључне речи: очување знања, преношење знања, камени рељефи, симболизам, облик приче, ослањање на памћење, усмено предање

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