

RESEARCH ARTICLE

DIGITALIZATION OF INDIGENOUS KNOWLEDGE IN NEPAL – REVIEW ARTICLE

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ARTICLE DETAILS

Article History:

Received 05 August 2021
Accepted 09 September 2021
Available online 29 September 2021

ABSTRACT

This article strives to explore the need of digitalization of indigenous knowledge for socio economic development and its effective management. The best use of natural resources is aided by the indigenous practices providing invaluable knowledge. In these modern days of technological advancement, it is seen that this knowledge is often being ignored. Naturally rich countries like Nepal, which holds innumerable counts of Indigenous practices, no any considerable efforts have been seen to understand the scientific basis of this knowledge. Studies have shown that most of the world's natural resources, along with digitally born resources have been vanished and due to neglectism, some cannot even be recovered. So, in order to provide long term preservation and global access to Indigenous Knowledge, digitalization can be viewed as a remarkable tool. The introduction of new technology and communication channels are changing the way how we gain knowledge. Many of us are considered to be living in a digital age, this era however is having an effect on cultural/traditional/indigenous knowledge and create new challenges for indigenous communities. Documentation and digitalization of Indigenous knowledge should be included in the curricula of environment and sustainable development as a cross-cutting issue.

KEYWORDS

Indigenous knowledge, Traditional practices, Digitalization, Sustainable development.

1. INTRODUCTION

Indigenous knowledge (IK) refers to the knowledge belonging to a specific ethnic group that is unique to that ethnic group, society or culture. It is knowledge based on the social, physical and spiritual understandings which have informed the people's survival and contributed to their sense of being in the world. According to World Intellectual Property Organization (WIPO), IK is often referred to as Traditional Knowledge (TK) and 'encompasses the content or substance of traditional know how, innovations, information, practices, skills and learning of traditional knowledge systems such as traditional agricultural, environmental or medicinal knowledge'. Such knowledge, developed from experience acquired over time and adapted to the local culture and environment, has always played – and still plays – an important role in the everyday lives of the majority of people universally and is considered to be an essential part of cultural identities (Maden et al., 2011). Indigenous Knowledge is important for Indigenous communities across the globe and for the advancement of our general scientific knowledge (Nakata et al., 2014). It is the basis for decision-making of communities in food, security, human and animal health, education and natural resource management (Hunter, 2005). All over the world, indigenous knowledge is increasingly becoming part of the development agenda (Version, 2018).

Digitalization refers to the growth in human- computer or human-information and communication technologies (ICT) interaction (Fielke et al., 2020). Digitalization is also known as the "ability to turn existing

products or services into digital variants, and thus offer advantages over tangible product" (Henriette, Feki, and Boughzala 2015). According to Brennen and Kreiss digitalization refers to "the adoption or increase in use of digital or computer technology by an organization, industry, country, etc." (Greeven et al., 2017). It is said to be one of the most significant technological trend faced globally at present (Levi, 2016). Digitalization, or digital transformation, is "the changes associated with the application of digital technology in all aspects of human society" (Greeven et al., 2017). It has come to refer to the structuring of many and diverse domains of social life around digital communication and media infrastructures. Digital transformation has the potential to deliver significant economic, social and environmental benefits (FAO 2019). Digitalisation involves the introduction of digital technological innovations into existing (organisational, industrial, societal) systems in such a way that changes how those systems operate (Fielke et al., 2020).



Figure 1: Characteristics of Traditional knowledge

Quick Response Code



Access this article online

Website:
www.actainformaticamalaysia.com

DOI:
10.26480/aim.02.2021.42.47

2. LITERATURE REVIEW

2.1 Indigenous Knowledge in Nepal

Nepal, in terms of indigenous traditional knowledge is considered as one of the richest, due to its geographical diversities and many ethnic communities (Subodh et al., 2009a). All of these communities have some kind of traditional knowledge associated with their life from time immemorial. Indigenous peoples have shared their knowledge of sustainable natural resource management, conservation, and restoration (Subodh et al., 2009b). In particular, when it comes to understanding ecological relationships and natural resource management, indigenous knowledge has played a huge role in providing cumulative wisdom passed on from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, local language, and agricultural practices, including the development of plant species and animal breeds (Langton and Rhea 2005).

Since indigenous knowledge is so essential to most rural communities' natural resource management, agricultural and pastoral lifestyles, medicinal, and other social and economic needs, recording indigenous knowledge and practices is unachievable in the short term. Nonetheless, documentation is critical to the ability of Indigenous peoples and local communities to promote, protect and facilitate the proper use of their knowledge (Langton and Rhea 2005). However, none of Nepal's governmental policies have prioritized the documentation and study of indigenous knowledge and challenges. There are several indigenous practices which are practiced in Nepal. Indigenous knowledge in irrigation management: some lessons for farmer-managed irrigation systems in Nepal and peoples' Indigenous Technology Knowledge (ITK) for watershed management in Nepal including ITK on water conservation, irrigation canal management, and fishing are some of the common indigenous practices in Nepal.

2.1.1 Indigenous water resource management practices

Indigenous system of irrigation, indigenous water mills, indigenous water conservation methods, five major farmers' managed systems of water resources management, and a system of water delivery have also been documented (Kandel et al., 1999; Subodh et al., 2009a). Indigenous water resource management methods from different countries in the Hindu Kush-Himalaya have also been described (Sharma and Moog 2005). The art of rainwater collection as a principal source of water has been in practice in Nepal since ancient times. This practice was most common among Brahmin community. Planting Tulsi plant in a specially built structure called, Maeri was considered an essential religious practice in every house and a small pond would always be built close to this for storing water. The soil excavated while constructing such pond would be used in building Maeri and every morning all the members of the family would use this place for bathing.

The water wasted during bathing was stored in this pond and used for a kitchen garden close by or else used for cattle watering. Evidence of traditional water collection ponds, especially in the hilly region, dates back to the historic period when Nepal was divided into several kingdoms. Many water collection ponds were built during that era. Where more flat plains were possible, bigger ponds were built with higher storage capacity and in steep places smaller ponds were built and during the dry season were used as a place to perform community religious activities. Water stored in the ponds during the rainy season was used in dry periods for many domestic needs including washing, bathing, and drinking. Using roof catchments mostly made of slate and storing run off from the hillsides for both domestic and agricultural purposes has been a practice, which came later in different parts of the country.

The technology of rainwater collection from rooftops in ferro-cement jars for domestic purposes is becoming more and more popular in the water scarce districts of Nepal, after its successful introduction in Daugha Village Development Committee (VDC) of Gulmi district- introduced as a pilot project by the Rural Water Supply and Sanitation Support Programme

(Subodh et al., 2009a). Thereafter, the project has replicated this technology to many other areas like Baletaksaar and Thanapati in Gulmi district and Chahara, and Madanpokhara in Palpa district. System of water conservation for growing vegetables during winter in Nepal has been documented. Water from swampy land is harvested, stored and used in irrigation. Utilizing rainwater is also becoming popular in Nepal, where people can afford to bring metal sheet to collect and divert the water into a tank through a gutter. Parallel water diversion from the same stream at different elevations along the slope is a popular method of water delivery in the hills of Nepal.

Farmers in Nepal design and construct channel head diversion for water abstraction using simple and indigenous technologies and locally available materials preferably shrubs and bamboos. In most cases, the intake is found located in a narrow section that makes diversion reasonably stable and cost effective (Kandel et al., 1999). A system of water delivery through bamboo-made bridges, where there are gullies, cliffs or landslides enroute canals has also been documented (Piya et al., 2019). People in the midhills of Nepal have to go long distance for collecting water for consumption. However, where sources of water are available, a bamboo split and a drain locally called kulo is used to carry water by gravity as indigenous method of water abstraction. Use of loose boulders for reducing the cutting effect of streams locally called as bhakari is used by farmers to protect their paddy fields in the hills of Nepal and India. Four pillars are used at four corners, which are mostly made of wood.

Drip irrigation is not common in Nepal. In most of the farmer-managed irrigation systems in Nepal, temporary and semi-permanent type overflow weirs are found to be performing satisfactorily. Brushwood temporary weir is the most common diversion structure built with locally available materials. The practice of irrigation by continuous flowing spring water in paddy is common in Nepal (Gautam et al., 2018). In the mountains, this practice helps in increasing the soil temperature and in lowland to lower the soil temperature. Practice of tapping flash flood in the beginning of rainy season is also reported in Nepal. This brings fertile silt that helps in adding nutrients to soil. In many farmer-managed irrigation systems in Nepal, for proportionate division of water share, device called Sancho or Jhyal, which is made of wooden blocks with rectangular notches is popular¹⁹. Where such devices are not in use, water allocations is dependent on Kulara meaning delivery through each branch canal ensured by the size of inlet opening (Subodh et al., 2009a).

2.1.2 Indigenous soil fertility management practices

The role of indigenous knowledge in soil fertility management in the hill farming of Nepal has been documented. This study was conducted in Gulmi and Arghakhanchi districts to identify the types of soils in the ban land using PRA and RRA techniques. Farmers have developed indigenous soil classification systems mainly based on features which can be sensed such as colour, texture, soil fertility and other physical properties. Soil fertility is related to the aspect of the land. Northern aspect is reported to perform better for mandarin orchards. Researchers documented indigenous Tjyapoo method of soil management and some 12 methods of indigenous soil fertility management¹. Use of farm yard manure, green manuring, in-situ manuring such as by keeping animals in sheds or in open fields and also by using migratory flocks of sheep and goats, mulching, use of nitrogen fixing plants, crop rotation, fallowing, terrace riser slicing, trapping flood water for fertigation, burning of trash, use of forest soils and black soils, and burying of dead animals and mobile toilets are recognised as indigenous soil fertility management practices common in Nepal (Subodh et al., 2009a).

2.1.3 Indigenous Knowledge on biodiversity and forest management

Indigenous forest management systems in Nepal are of diverse nature and community specific. Forest resources in the hills and mountains have been protected for years through local people's age-old technical knowledge (Pandey 2017; Puri 2020). Indigenous communal forest management system and the distinctive rules and regulations associated are documented, and are believed to be many generations old knowledge (Subodh et al., 2009c). Sing! Nawa- this is one of the important community

level traditional knowledge of the Himalayan people, living in the highest part of the world to conserve the forest and wildlife. Singi, in Sherpa language, means wood or trees and Nawa means to ask. So Singi Nawa means to ask someone before cutting any trees or woods. This is a custom the Sherpas have been practicing for many years. People choose a leader, old but an intellectual person, among them who can adeptly handle the community.

The leader prepares a calendar, where it is mentioned that people are allowed to cut trees on that date only otherwise some dreadful things may happen in the community. The people of the community ask the leader when they are allowed to cut trees. Because of him, the people maintain their discipline and do not cut trees anytime. This, in the long run, conserves the forest. Nowadays, because of the system of Wildlife Reserve introduced by the government, this tradition has been endangered (Rita et al., 2016). People are not allowed to go to the forest and so it is difficult to follow the tradition. Natural bamboo resources management is one of the most common indigenous knowledge possessed by farmers in Nepal. Bamboo is one of the most useful plants in Nepal and is used extensively as a source of income generation. Fodder tree plantation in the ban land is a very common practice in Nepal (Thapa et al., 1995). Farmers learn from their ancestors about appropriate tree species and its management (Khanal and Subba 2001).

There is wealth of knowledge available in Nepal about farmers' practicing Agroforestry in their private lands. Researchers have described some 19 wild plants and their uses as medicine in Nepal². In a field survey, conducted in the villages of Ramdi, firlalunga, Balam, Beltari, Mirmi, Burgha and Ridi in the KaliGandaki watershed, Nepal, 48 medicinal plants belonging to 31 families, each with local names, traditional uses, methods of preparation and route of administration have been documented (Joshi et al., 2020; Subodh et al., 2009c). Yarsagumba literally means summer plant and winter insect in Himalayan community. Before the rainy season begins, spores of this herb settle on the heads of caterpillars that lives underground. The fungus gets transfixed into the body of the caterpillar and grows out through its head, draining all the energy from the insect, which ultimately dies.

Yarshagumba is a rare and unique herb that grows in the meadows above 3,500 meters in the Himalayan region of Nepal. There are various types of famous medicinal plants found in Nepal but the popularity of yarsagumba is simply overwhelming. For the last couple of years, the trade of yarsagumba is increasing and it has been regarded as an expensive life-saving tonic. And not only that, it is also believed to be a cure for sexual impotency— a Himalayan herbal Viagra (Sherpa 2005). Titepati is plant meaning bitter leaves in Nepali language. It is also an effective TK at a regional level. The plant is used as herb in most of the communities of the South Asian region. It is a small green plant found in mostly hilly areas. Titepati is used as herb for many kinds of diseases. It is also used a cleansing agent. So this herb has a very important value in the communities (Sherpa 2005).

2.1.4 Indigenous knowledge on pest management

The firlawahang Rai's have indigenous methods of pest management that are heavily relied on in areas where external inputs (e.g. chemical pesticides) are in short supply. In remote areas, common pests, such as stem borer (*Chillozonellis*), attack wheat and maize stocks. The grounded pulp of the Khira leaf is spread on the wheat crop and the scent of the pulp is sufficient to kill the pests. In the case of paddy, the pulp is introduced into the paddy field through the irrigation channel. In the case of specific pest attacks, like the rice moth which creates clusters of rice on paddy, they are combed out with sticks and the moths deposited in the water; to ensure decomposition, the operation is carried out in sunlight. In maize, the dried disease infected stalks are manually removed. Originally, the traditional practice was that the maize cobs were kept dried by keeping them on the top floor where kitchen heat would facilitate drying of the seeds. Due to electrification of houses, no more heat being generated from kitchen, seeds have started to germinate in cobs. To prevent this, as an alternative, farmers have started drying the cobs in verandas facing the

sun to facilitate the drying process. Other practices like grain storage with ash or neem is common (Subodh et al., 2009a).

2.2 Indigenous Knowledge and Digitization

Because indigenous knowledge is the accumulated knowledge of an indigenous group over generations of living in a particular environment, it is important for researchers to pay attention to its preservation for posterity. This becomes more significant when one considers the fact that this knowledge encompasses all kinds of scientific, agricultural, technical and ecological knowledge, including cultigens, medicines and the rational use of flora and fauna (Sraku-Lartey et al., 2017). Indigenous knowledge has become recognized worldwide not only because of its intrinsic value but also because it has a potential instrumental value to science and conservation (Kunwar and Bussmann, 2008). The most critical component for unlocking the possibilities of digital technologies use is access to the internet (FAO 2019). The role of indigenous knowledge (IK) cannot be overemphasized. The range of current and possible protective measures for indigenous information and practice systems, then, is reliant on good documentation in order to identify and catalog the elements of local systems for sui generis and other protective measures, as well as for their preservation and protection for members of the communities in which they originated. Such protective measures, sui generis and otherwise, have particular consequences for digital libraries and registers (Langton and Rhea 2005).

Digitalization offers incremental economic growth; countries at the most advanced stage of digitalization derive 20 % more in economic benefits than those at the initial stage (Sabbagh et al., 2012). Many museums, archives, libraries and cultural institutions throughout the world hold large collections of objects that are of cultural or historical importance to Indigenous communities. Since many of these objects were collected without the permission of the traditional owners, the custodial organisations are now facing the challenges of determining ownership, obtaining guidance from the traditional owners on the future of such objects and either repatriating them, preserving them or exhibiting them appropriately as requested. New, innovative high quality 2D and 3D scanners, collaborative interactive software tools, high-speed networks and emerging grid technologies that promote communication and the sharing of resources and knowledge between geographically distributed groups, are providing an infrastructure that is ideally suited to the implementation of such digital and physical repatriation programs (Hunter, 2005). Many indigenous communities wish to maintain control over the circulation of certain types of knowledge and cultural materials based on their own cultural structures (Christen et al., 2009). Digital technologies and the Internet have combined to produce both the possibility for greater indigenous access to material collections held in collecting institutions, as well as a new set of tensions for communities who wish to monitor these materials and thereby limit their access and circulation (Bell et al., 2013).

Two aspects of the assessment that are relevant to the digitisation of Indigenous materials i.e. intellectual property, access and ownership; and technology issues – deserve further attention (Academic 2013):

2.2.1 Intellectual Property, Access and Ownership

Although in recent times research ethics protocols and guidelines have been produced both by institutions and communities to determine access and ownership conditions, issues of ownership are now a contested matter. Apart from the work required to negotiate issues of ownership and access with collecting institutions to repatriate materials to communities, the collection and storage of returned and contemporary materials in local communities also require considerable ongoing intellectual property management at that end. At the Indigenous end, a whole range of intellectual property issues are associated with managing the different kinds of cultural and group rights that attach to Indigenous knowledge management systems.

As well, there are a range of rights that are vested in different kinds of materials, such as photographs, film, and audio-recordings, collected over

different periods, by individuals, institutions and governments. These are being made available for possible viewing, reproduction, or wider use within the community, so the relevant rights must be managed as Indigenous users make copies of materials, or use materials, or permit downloads by external parties. Thus, access and ownership rights have to be managed by the relinquishing institutions at the repatriation stage and then managed onwards by communities themselves as they make decisions regarding access within their community, and between networked databases that may connect communities.

2.2.2 Information Technology Issues

Information technology issues associated with digitisation still loom as a problem that needs to be addressed. Much of the documentation work in Indigenous communities, including the data-basing of repatriated digital copies is often project-based and within time limits. The sustainability of digital content stored in different systems and platforms, in varying formats and media is in need of urgent review. Preservation of materials and data will not be achieved if digital content is not organised to be migratory and not standardised enough to be accessible beyond a particular space or time. Interoperability is a major concern in a context where many small projects are occurring in music, language documentation, in documenting contemporary performances of traditional ceremonies to aid with knowledge preservation and generational transfer.

2.3 The Indigenous Knowledge Management (IKM) Software System

The IKM (Indigenous Knowledge Management) system was designed as a low cost, simple robust system to enable Indigenous communities to manage their own digital collections within local Indigenous knowledge bases (Lindvall and Rus 2001). It comprises two major components:

2.3.1 The XMEG tool

This enables users to describe digital objects (based on an underlying, customisable metadata schema) attach annotations to the objects and define access rights and traditional care constraints. It also enables user profiles to be defined. A Schema Editor allows the underlying metadata schema to be edited – this is reflected in the user interface. Descriptive and rights metadata and annotations can either be saved to a MySQL relational database or flat XML 116 Australian Indigenous Knowledge and Libraries files which can be indexed using an XML database such as Tamino or Xindice or parsed and uploaded to any relational database. In addition to the metadata that is explicitly saved to the database through the user interface, meta-metadata is also recorded – all changes to the metadata, who was responsible and the date/ time of the changes are recorded within the database. This represents an important component of the system's built-in security framework.

2.3.2 The Search interface

This uses standard web browser technologies (Internet Explorer, Netscape) to enable users to search, browse and retrieve objects from the collection. The advantages of using a standard web browser interface are their familiarity and widespread availability and the lack of re-engineering necessary should collections eventually be disseminated over wider networks. To access the collection, users must have been allocated a login ID and password and a user profile. The user profile includes information such as tribal names, native/ non-native heritage, tribal/ clan membership, gender, status, role, etc. After a user performs a search, the system compares the matching objects' rights constraints with the user's profile to determine whether or not the user is permitted to access this object. If they are, then the object will be retrieved and displayed, along with any rights constraints, which appear as icons. Users can click on individual objects to view/play the high resolution object and to view the metadata details and any annotations. The system also includes software that can automatically aggregate selected mixed-media objects (images, audio clips, video clips, text), and dynamically generate a SMIL (Synchronised Multimedia Integration Language) presentation which is presented to the user.

2.4 Impact of Digitalization of Indigenous Knowledge

Digitalization offers incremental economic growth; countries at the most advanced stage of digitalization derive 20 percent more in economic benefits than those at the initial stage (Sabbagh et al., 2012). However, the digitalization of indigenous knowledge is limited in least developed countries like Nepal. With the passage of time, digitization has become an integral part of enforcing a country's economic activity. Digitalization has a proven impact on reducing unemployment, improving quality of life, and boosting citizen access to public services (Greeven et al., 2017). Access to digital technology can offer significant advantages to smallholder farmers and other rural business by providing links to suppliers and information and allowing users to tap into workforce talent, build strategic partnership, access support services such as training, finance and legal services and, critically, reach markets and customers (FAO 2019).

Exciting advancements are being made with digital cartography, which can provide multisensory, interactive maps of various types of knowledge, including subjects previously unable to be mapped (Steeves, 2015). More importantly, digital cartography is able to link multiple subjects using location as the main organizational thread. As much of Indigenous knowledge is based on location, this is an innovative way to combine the two world views (Engler et al., 2013). Digital applications and platforms have the potential to dramatically change the way knowledge is processed, communicated, accessed and utilized (Ingram and Maye 2020). These digital technology changes are having an effect on cultural knowledge and communication and create new challenges for Indigenous communities. Consideration should be given to how these technologies are used to maximise the benefits and lessen then negative side effects.

The importance of digitalization is becoming understood, but the question now is how to do it in practice in order to best benefit from it (Greeven et al., 2017). Digital transformation has the potential to deliver significant economic, social and environmental benefits. For example, agricultural robots ('agrobots') are seen as a key trend that will deeply influence agriculture in the future (FAO 2019). Furthermore, knowledge documentation that relates to genealogy, traditional sites, customary practices, and biodiversity knowledge, is sometimes the only way Indigenous groups can prove traditional connections to land for Native Title claims or prior Indigenous invention in biodiversity-related knowledge and practice from which scientists or others insist (Academic 2013). Digitalization of Indigenous knowledge extends strategies and thinking that consider what, how, and when the approach is adequately applied (Handayani, et al., 2018). One key benefit of documenting, digitizing and preserving the indigenous knowledge is that it ensures a greater diffusion of the knowledge through digitization (Sraku-Lartey et al., 2017). Digitalization allows governments to operate with greater transparency and efficiency.

2.5 Challenges of Digitalization of Indigenous Knowledge

'Digital literacy' is critical for using digital technologies. Unlike in many developed countries, where students regularly use advanced technologies and digital skills in their education and day-to-day lives, ICT knowledge and skills lag behind in least developed countries (LDCs) like Nepal (FAO 2019). For example, in some regions, countries and demographic groups, when individuals have access to equipment, such as mobile telephones, there is a prevalence of older models that may not interface with the latest applications. While digital technologies enable materials to be easily repatriated, widely distributed, and annotated indefinitely, these same technologies present challenges to indigenous communities who wish to preserve traditional cultural protocols for the display, dissemination, and reproduction of these new cultural materials (Bell, et al., 2013). Challenges identified by the research team in the collection and management of IK include language barriers, funding, technological challenges, and intellectual property rights (Sraku-Lartey et al., 2017).

Challenges that could hinder the elaboration of indigenous knowledge in the science curricula are that educators have been schooled in Western science and are more familiar with that general worldview than that of indigenous knowledge (Handayani, et al., 2018). Literacy and digital skills

and the availability of technologies all affect the use of digital innovations. However, the introduction of digital technologies in LDCs can be a challenge. Around the world, rural populations are declining and education and employment opportunities are limited. There is often a lack of infrastructure, including basic IT infrastructure, particularly in very remote rural communities and those with large indigenous populations. The costs associated with IT infrastructure present a major challenge in rural areas where rates of poverty are often high, especially in developing countries and least-developed countries (LDCs) (FAO 2019). A lack of basic literacy and numeracy presents a significant barrier to using digital technologies.

Government policies and frameworks are one of the driving forces behind digitalization which create an enabling environment for competitive digital markets and e-services. However, designing and managing a digital government program requires a high degree of administrative capacity and as a result some countries like Nepal have had limited success (Fakhoury 2018). None of Nepal's governmental policies have prioritized the documentation and study of indigenous knowledge and challenges. The use of digital technologies may also challenge traditional thoughts on ownership of knowledge, and this can result in a loss of stewardship by indigenous communities who are publishing content on the Internet (Steeves 2015).

Determining the optimum and most culturally appropriate approach in selecting, eliciting, recording, describing and disseminating the indigenous knowledge without insensitivity, intrusion, constraints, degradation or misrepresentation of the content is a challenge that is often underestimated. Similarly, collection of indigenous information is found laborious, time consuming and costly. Thus, proper storage and management must be ensured if the information is to be made available and accessible for the benefit of humankind. Digitalization creates demand for digital skills and for people who are competent in using digital devices, understanding outputs and developing programmes and applications. This requires not only basic literacy and numeracy but also data handling and communication skills (FAO 2019). Digital skills and e-literacy remain a significant constraint to the use of new technologies and are particularly lacking in rural areas, especially in developing countries. The diversity of available digital technologies and a lack of standardisation also present a barrier to adoption.

3. CONCLUSION

The overall conclusion is that the digitisation of indigenous knowledge are limited in least developed countries (LDCs) like Nepal. This is due to the fact that Nepal is not sufficiently capacitated for collecting and preserving Indigenous knowledge. The restoration and maintenance of Indigenous knowledge is recognised as a vital ingredient for restoring and maintaining the health and wellbeing of Indigenous communities worldwide. Digitalization offers incremental economic growth; countries at the most advanced stage of digitalization derive 20 percent more in economic benefits than those at the initial stage. Documenting, digitizing and preserving the indigenous knowledge ensures a greater diffusion of the knowledge through digitization. Digitalization allows governments to operate with greater transparency and efficiency. The importance of digitalization is becoming understood, but the question now is how to do it in practice in order to best benefit from it. These digital technology changes are having an effect on cultural knowledge and communication and create new challenges for Indigenous communities. However, consideration should be given to how these technologies are used to maximise the benefits and lessen then negative side effects.

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