

# Analysis of ICT Infrastructure and Tourism Informational Needs: A Case Study of Nepal

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**ABSTRACT-** Tourism finds enormous application of ICT in the development of strategic and operational goals. ICT promises long-term benefits and is a leading force in the tourism industry to enhance development and economic growth. The tourism industry in the western world and some developed countries of Asia have applied ICT for more than 30 years, and have gained tremendous benefits. Nepal which is also growing as one of the favorite tourist destinations lacks proper implementation of ICT in this sector. In our study, we examined how ICT can play a vital role in developing the tourism industry of Nepal. This study is exploratory research based on primary data collected from tourists visiting Nepal, supported by information from tour operators, government agencies, NGOs, and INGOs. A framework is devised based on data and information collected and finally, discussions elaborate on the informational needs, technological architecture, and challenges for the implementation of ICT in the tourism industry of Nepal.

**KEYWORDS-** ICT, Tourism governance, Tourism business, Technology development, Nepal.

## I. INTRODUCTION

Tourism has grown as a leading industry in the last few years overcoming the traditional industries in both development and economic growth [1]. It is predicted that tourism will be a highly promising and job-providing industry in the coming days for both developed and underdeveloped economies [1]. Tourism studies is a topic of curiosity and it has attracted many scholars around the world to research it. Studies have covered different aspects of tourism consisting of economic, growth, development, transition, the impact of different development, etc. A majority of studies done in developed and developing economies have found that there is a huge transition in tourism due to the development of Internet Technologies and Information and Communication Technology (ICT) [2] in this industry. The promising developments of ICT in terms of faster broadband, Web 3.0, intelligent applications, mobile systems, digital payment systems, geo Informatics,

wireless technologies, IoT, social networks, virtual systems, and integration of all business and information systems into one backbone has changed the traditional model of tourism business drastically [2]. There are new value chains and tourists nowadays have found a new way of communicating, planning a tour, booking a flight, exploring a new destination, reserving a room in a hotel, etc. These developments are not only benefitting the tourist but even the other players of this business including government agencies [3]. ICT is an indispensable tool to collect data and information about tourists, plan strategies, promote business and expand tourism as an industry [4]. The application of ICT is the most important aspect for a successful tourism economy [5][6] as the whole industry relies on correct and timely information. It can be seen that in the initial stage a tourist starts their planning by looking into information about a destination, then he makes a contact with a tour operator or collects as much information as possible to make contact with the local tour operator of the visiting destination and then arrange for his/her visit. Booking of tickets, hotels, and other supporting activities rely heavily on internet technologies these days [7][8]. In case, if the itinerary is taken care of by a tour operator, he will also use a lot of ICT tools and technologies to arrange for a visit of a particular group or individual [9]. Thus ICT serves as a backbone for the tourism industry, the beneficiaries, the service providers and product selling sectors [8][9] making a solid and prominent contribution to the economy.

The promising application and role of ICT cannot be ignored for a tourism economy that is fast developing. In this regard, the current study explores the ICT and informational needs of the tourism industry of Nepal. The study brings out the current state of ICT development of Nepal, identifies the information needs from a tourism perspective, and traces the lapses that occur in the implementation of ICT and Internet technologies in the case of Nepal. The study is divided into four important parts which include the literature review, survey designs, and analysis, construction of an ICT model for tourism, and the discussions on the prospect and challenges of ICT in the Tourism Industry of Nepal.

## II. METHODOLOGY OF STUDY

The study employs a review of documents of the related sector from the government agencies, private and public sector combined with a pilot study consisting of primary data collection based on semi-structured interviews of tourists in Lakeside, Pokhara. The components of the study include:

- Literature review of ICT technologies, development plans, project reports, published and unpublished work related to the tourism sector of Nepal. Study of technological drivers, technological development phases, and the technological perspective for the tourism industry.
- A review of available documentation relating to the Tourism sector development from government, private sector, civil society, and international agencies.
- Semi-structured interview and survey based on for a random sample of 45 Tourist, in Lakeside, Pokhara in August 2019. Interviews with some selected tour operators and government officers of Nepal related to ICT and Tourism.
- Development of a tourism model based on ICT tools and Internet Technologies and new governance structure of Nepal. The discussions related to the findings and proposals in the context of tourism and ICT in Nepal.

## III. LITERATURE REVIEW

Tourism research is a prominent area for scholars around the world. To date, many researchers have studied extensively concerning the application of ICT in the tourism industry. The adoption of Computer Reservation System (CRS) in airlines in the 1950s and the transformation to Global Distribution Systems (GDSs) in the 1980s, Hotel property management systems, and hotel CRS systems later, are some of the oldest applications of ICT in tourism [7]. The birth of the Internet brought a revolutionary change to the structure of this industry by letting the service providers sell directly [5]. There were new models in practice that threatened the intermediaries worrying them of being cut off and replaced [9]. The work of (Poon 1993) analyzed the rapid shift-taking place between the traditional tourism sector and the new tourism industry [8]. He studied the strategic role of ICT in reshaping the value chain in the industry and the process in which the consumers gradually adapt to the new values, lifestyles, and new tourism products, [10] which are re-engineered by the new technologies.[10] Deepti Shakher revisited the work of Poon and Sheldon and talked about ICT applications in different sectors like airlines, hotels, tour operators, road and rail transport, etc. [4]. She analyzed the impact of information and telecommunication technologies on the hospitality sector, entertainment sector, transport sector, management sector, and other intermediaries [4]. This work of Bhupati revealed that it is essential that the current information and communications technologies should be updated, upgraded, and seamless integration both internally and externally should be done to improve the tourism business operations.[9] He further stated that integration of ICT in tourism would benefit both, service providers and customers bringing together other stakeholders as well, on a common platform. [9] Various scholars in Nepal also have studied time and again

tourism and ICT. Some of the recently carried out work on Tourism and ICT is mentioned in table 1 below.

Table 1. ICT Studies related to tourism in Nepal

| Publisher   | Area of Study   | Ref  |
|---|---|------|
| IEEE Digital Explore, 2018                          | Distribution of Geotagged Tweets in Nepal                               | [10] |
| IEEE Digital Explore, 2019                          | Digital Tourism Sustainability Model for Nepal                          | [11] |
| Journal of Internet Comp. and Ser. 2016             | An ICT Framework for Nepal Tourism                                      | [12] |
| Springer Nature, 2020                               | An exploratory study for ICT tools and Technologies for Nepal tourism   | [13] |
| IEEE Digital Explore, 2020                          | Analysis and Design of Tourism Web Portal                               | [14] |
| Inf Technol Tourism, 2020                           | Factors affecting e-tourism adoption in developing countries            | [15] |
| Springer Nature 2021                                | Design recommendation for tourism website based on the user perspective | [16] |
| IEEE Digital Explore, 2020                          | Digital reference model system for religious tourism                    | [17] |
| Journal of Innovative Research in Comp. Sc. & Tech. | Digital Tourism Business Ecosystem Model for Nepal                      | [18] |
| IEEE Digital Explore, 2019                          | Utilizing User Generated Contents to describe Tourism Areas of Interest | [19] |
| Journal of Internet Comp. and Ser. 2021             | Evaluation of Tourism Websites based on User Perspective                | [20] |
| Springer Nature, 2019                               | e-Tourism Adoption Model & Its Implications                             | [21] |
| KSII Transactions on Internet and IS, 2020          | Digital Tourism Security System for Nepal                               | [22] |
| Govt. Of Nepal, 2028                                | Digital Framework   | [23] |

### A. Tourism Studies in Nepal

Tourism in Nepal started with camping accommodation at the very beginning of the 1950s when Maurice Herzog and his team scaled Mt Annapurna on June 3, 1950, and Tenzing N Sherpa and Edmund Hillary first ascended Mt Everest in 1953 [24]. The formal growth of accommodation facilities in Nepal started with the establishment of the 'Royal Hotel' by a Russian national, Mr. Boris Lissanevitch, in February 1955 [24]. However, the planned development of tourism in Nepal started after 1956 with the starting of the first five-year plan (1956-1961 AD) and the subsequent establishment of the Tourist Development Board in 1957 under the Department of Industry [25]. Nepal has always promoted tourism from 1956 onwards and Nepal Tourism Board has taken initiatives from time and again to organize collaborative ventures with government, private and regional forums [26]. It has continued its efforts to help attract major events to Nepal to assist the growth of business tourism, to increase the use of customer databases to engage in customer relationships marketing, and finally to create confidence and desire among the trade and the final consumers [27]. There were different plans initiated with a different approach towards tourism but none of the plans talked about technological development till 1992. In 1992 the eighth five-year plan (1992 - 1997) was the first plan that put tourism as a center of all economic activity and talked about technology and its role in tourism but it failed without any outcome [25][26]. The ninth five-year development plan (1997-2002) was the first successful plan that brought the private sector into existence [26][27] and Information and Communication Technology took priority in the Plan. There were developments in the telecommunication industry with Digital Link with D.O.T.

India through Optical Fiber in Birgunj – Raxual (1999), Launching of GSM Mobile service (1998), Implementation of SDH Microwave Radio (2000), and Launching of Internet Service (1996) [28][29]. The visit Nepal year 1998 used IT and communication as an extensive tool for marketing and promotion in 49 national seminars and 29 international conferences [12]. The tenth five-year plan (2002 - 2007), marked major developments in tourism and used Information Communication Technology as one of the prominent tools to attract tourists. Though internet services started in 1995 (Private), [12] the use of it gained popularity in the ninth five-year plan and the tenth five-year plan saw extensive websites developments, and Nepal was known on the world web [30].

Tourism is generally acknowledged as being one of the few economic sectors that have more than significant growth prospects in recent times. According to monthly and quarterly data of UNWTO, it is estimated that destinations worldwide received around 1.1 billion international tourist arrivals in the first nine months of 2019, about 43 million more than in the same period of 2018 [31]. Tourism has made a substantial contribution to the economy of Nepal but besides such a vast contribution and with such a huge potential, the tourism industry is struggling. The problems are attributed to every sector of tourism and in ICT it is attributed mostly to poor infrastructure and quality [24]. Due to inadequate ICT implementations, there is a very poor and uneven information sharing and partnership collaboration among the government agencies, tourism offices, public and private stakeholders, and Nepal Tourism Board [24] [25]. The tourism Industry in Nepal lacks quality in-service human resources, touristic brochures are not of high quality and lack sufficient information not only on the touristic attractions but also about the ecological environment of Nepal [24][25]. Studies reveal that there are possible data gaps in the accommodation sector, hospitality industry, and other related sectors. Further, the Research Planning and Monitoring Department of NTB designed and carried out a research study on tourist accommodation enterprises entitled, ‘Inventory of formal accommodation facilities in the major selected tourist areas of Nepal’ from April to June 2010 (CEST Nepal) [24]. This research article highlighted the overall inventory scenario of accommodation facilities in Nepal and also highlighted how lack of information and gap in information is hitting Nepal Tourism sector.

Analyzing the literature further, it is found that several problems and gaps exist in Nepal Tourism Industry. Tourists complain about the poor management of tourist places, Less use of computer technologies and software programs, lack of inventory of tourism sites, lack of a good master plan, [13][22] lack of proper and timely information access, and lack of poor rescue operations in case of accidents and natural disasters. Nepal, to date, has no significant information system to address the needs and supplement information on the Tourism sector[22]. The available systems are fragmented and scattered. There is a lack of IT education and training for policymakers, managers, and other players in the industry which finds only a small implementation of ICT in tourism [15]. The Integration of tourism stakeholders (Transport, Lodges, Hospitality industry) is not existing. There is a lack of Technical Infrastructure, Legal Infrastructure, ICT

infrastructure (Electronic linkages) between different players of the industry. There is no envisioning to develop Human Infrastructure (skilled people) and establish linkages, coordination, and networking between the training institutes, government agencies and job providers [1][13][14]. The legal framework which includes regulation of telecommunication providers, Internet service providers, and electronic business industries is missing at large. There is a need to enforce ICT culture and educate people with ICT and Tourism literacy. Steps should be advanced for the sustainability of the ICT environment, including maintenance and update of information sites and web portals in real-time.

The changing environmental conditions, biodiversity, and natural hazards are posing a big challenge to the tourism industry in Nepal. People willing to visit Nepal do not have adequate updated information directly in their hands and have to rely on a third party for the information, which may be misleading and not an updated one [23][24][25]. There are cases where customers in foreign markets lacked adequate information about food hygiene and drinking water availability. Due to lack of such information, the negative advisory results on the general information of the touristic infrastructure were spread, leading to conclusions that even high-level hotels are not in a position to provide safe food and drinking water [23][24] in Nepal. There are no automated systems or tools that can guide or help tourists in Nepal to explore the country more efficiently. The problem is not only associated with access to information but also creation and distribution of information are at stake. There is a huge gap between local tourism, community-based tourism, private tourism industry, and the Government of Nepal [15][32]. Local people feel that many places have a very good potential as a tourist destination but they are still not depicted on Government web portals and Government records.

**B. Technological Developments in Nepal**

Technology plays a very important role in the development of a nation. The role of technology in Nepal has not been up to the global standard. This section describes the different technological development that has taken place in Nepal.

Table 2: ICT Development in Nepal [28] [29] [30] [33]

| STAGES OF ICT DEVELOPMENT IN NEPAL |   |
|------------------------------------|---|
| 1913                               | Nepal Doorsanchar Company                                   |
| 1971                               | Introduction of computer for the census IBM1401             |
| 1974                               | Establishment of the Electronic Data Processing Center      |
| 1980                               | Digital Exchange System                                     |
| 1985                               | Distribution of Personal Computers in Nepal                 |
| 1992                               | Establishment of Computer Association of Nepal              |
| 1996                               | Establishment of the Ministry of Science & Technology       |
| 1998                               | Establishment of Nepal Telecoms Authority (NTA)             |
| 2001                               | Establishment of the National Information Technology Center |
| 2002                               | e-Banking by Kumari Bank                                    |
| 2003                               | GSM and CDMA services. Formation of HLCIT                   |
| 2007                               | 3 G Network and Data Services                               |
| 2009                               | Mobile wallet by e-Sewa                                     |
| 2012                               | Mobile Banking  |
| 2012                               | QR code by F1 Soft through Fonepay                          |
| 2017                               | 4 G Mobile Network Service                                  |
| 2018                               | ICT Digital Frame Work                                      |
| 2018                               | ConnectIPS Banking Service                                  |

Table 3: Representing the ICT Policy and Technology Acts of Nepal [30][31][32][33] [34][35][36]

| Act and Policy Title                                  | Year    |
|---|---------|
| Telecommunication Regulation Act                      | 1997    |
| Information Technology Policy                         | 2000    |
| Nepal Wireless Networking Project in                  | 2002    |
| National Science and Technology Policy,               | 2005    |
| Electronic Transaction Act                            | 2006    |
| National Nuclear Policy came into force               | 2007    |
| e-Governance Master Plan (eGMP)                       | 2007    |
| ICT Development Project                               | 2008-14 |
| IT Policy 2067  | 2010    |
| 10 Year Master Plan initiated by NTA for telecom acts | 2011    |
| ICT in education Master Plan                          | 2013-17 |
| IT Umbrella Act                                       | 2014    |
| Broadband Policy                                      | 2014    |
| National IT Roadmap                                   | 2015    |
| eGMP-2  | 2015    |
| ICT Policy  | 2015    |
| Information Communication Policy                      | 2015    |
| Directives for Regulating Nuclear Elements            | 2015    |
| NepalQR Standardization Framework and Guidelines      | 2020    |

Nepal has realized that technological use is mandatory for the development of a nation. This realization has created pressure time and again and various initiatives were introduced to modernize the development through science and technology. To understand technological development and technological breakthroughs, the history of technology must be understood. Table 2 depicts the technological developments that have taken place in Nepal and it also represents the main initiatives that were enforced. To control the technological applications and avoid any conflicts and legal issues, policies and regulations must be framed. Table 3 shows all the different policies and regulations that were brought into practice with the application of ICT and other technological tools. Figure 1 shows the current status of Nepal in terms of e-governance implementation at the global level.

In recent years, the government of Nepal has realized that technology must be addressed as a specific component to harness the maximum benefit out of it, thus digital framework 2.0 was introduced in the year 2018. The Digital Framework has identified eight sectors – digital foundation, agriculture, health, education, energy, tourism, finance, and urban infrastructure that need immediate attention and priority of the government to develop the nation. Out of different identified sectors, tourism is prioritized with seven major components to be addressed that include, development of Welcome Nepal Website and Mobile App 2.0, Electronic Visas and Immigration Process Improvement, Multilingual Helpline, Augmented and Virtual Reality Tours, Electronic Tour Guides, Omnichannel Marketing and Tourist Security Infrastructure [23]. These initiatives are introduced to provide the basic informational infrastructure for the tourist visiting Nepal and also to advertise the tourism potential of Nepal on the tourism world map.

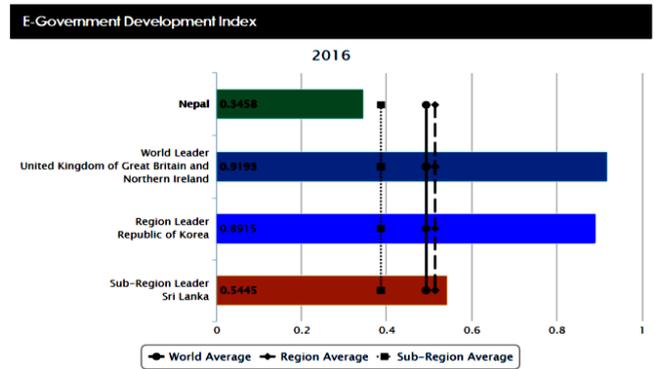


Fig. 1: Representing e-governance global position of Nepal. [27]

C. Pilot Survey of Tourism and ICT in Nepal

To gain deeper insight into our study, we conducted a pilot survey to trace the situation of tourism in Nepal. Our study focused to identify the ICT scenario in the Nepal tourism industry and also finding out the basic requirements of the tourism industry in terms of information needs. A semi-structured interview was conducted with a random sample of tourists in Lake Side Pokhara and the results of the survey are discussed below.

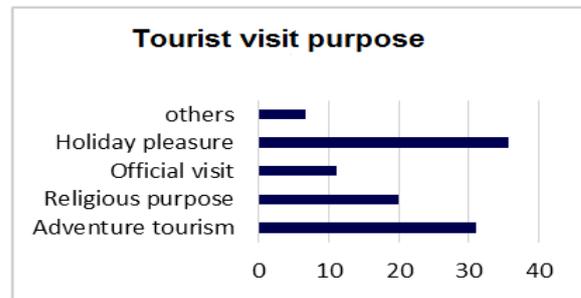


Fig. 2: Representing the purpose of the visit of tourists.

On surveying about the purpose of tourist visit in Nepal, it was found that almost 84% of the tourist visited Nepal for tourism purpose only, while 71 % for adventure tourism as shown in fig. 2. The next favorite category was religious and official visits. These tourists when inquired about the basic problems answered that transportation was the biggest problem (61%), uneven cost and poor infrastructure were reported by (50%) while (44%) complained about poor communication and other important aspects include food and water(33%) and rescue operations (32%) as shown in fig 3.

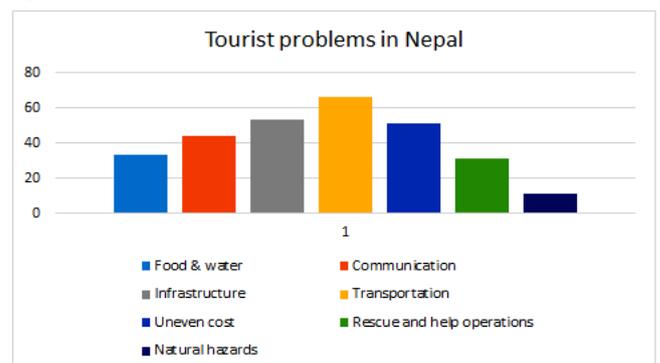


Fig. 3: Representing tourist problems in Nepal

Regarding the information availability of tourist destinations majority of the tourist reported that information is not complete (63%) while (27%) reported confusing information as depicted in fig. 4. It was interesting to observe that (46%) of the respondents found that the Government of Nepal has no active role in the tourism industry while (41%) were not aware of the government's role in tourism (fig 5). Figure 6 represented that 65% of the respondents felt that government rescue plans and operations were worst in case some accidents occur.

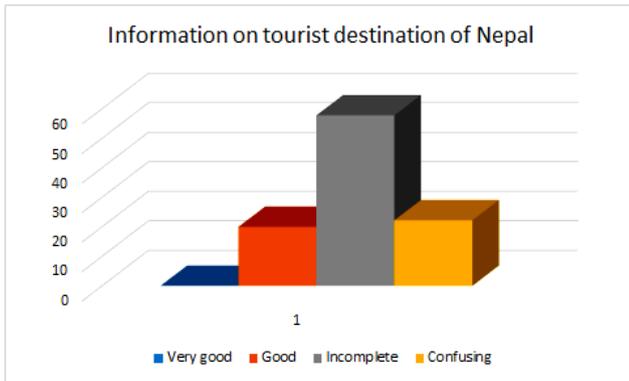


Fig. 4: Representing the status of information on destination

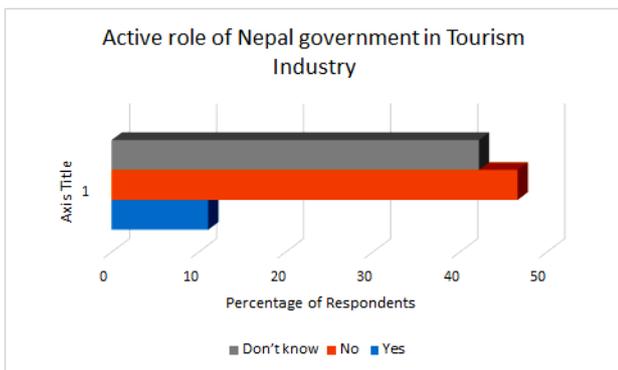


Fig. 5: Representing the role of government in the tourism sector

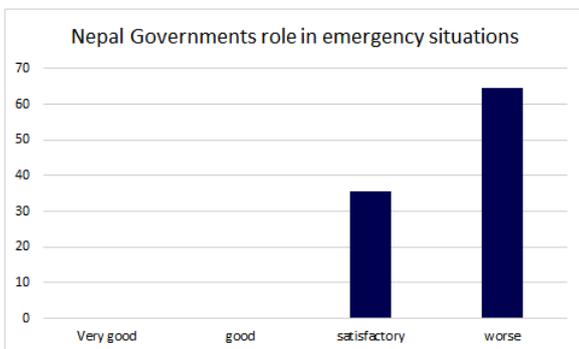


Fig. 6: Representing the role of the Nepal government in emergencies

Our study found that the growth of tourism in Nepal was accountable to the private sector (60%) and local can community sectors (54%). The government had a small

share of around (16%) in the growth of the tourism industry in Nepal as seen in figure 7.

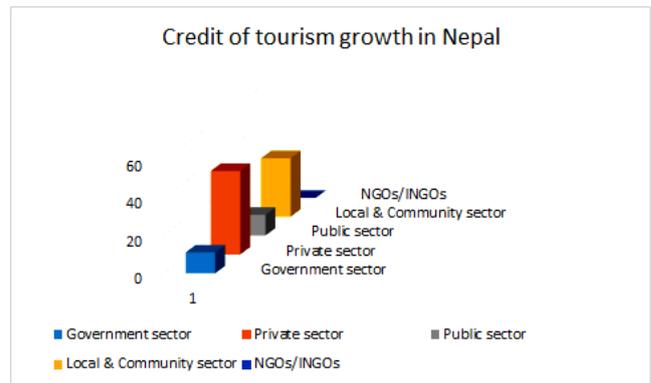


Fig. 7: Representing the participation of different sectors in the development of tourism in Nepal

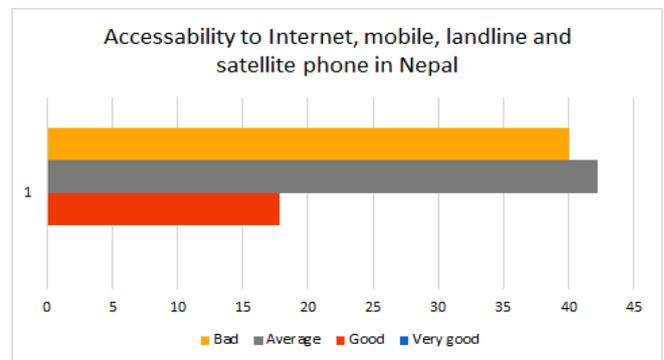


Fig. 8: Representing the statistics of communication technology availability and quality in Nepal

Regarding the major aspect of ICT development and initiatives in Nepal, it was observed that accessibility of communication technologies services was categorized poor (40%) to average (44%) by the respondents as seen in figure 8. They were of the view that it is acceptable in urban centers but gets poorer to worse in remote tourist destinations. On the aspect of the internet, they complained about slow speed, poor performance, high cost, and inadequate operational facility. They were of the same view for mobile and satellite phone communications. The major problems were in the connection and quality of sound reception. Almost everyone complained about the power cuts and the bad impact due to power cuts. Regarding the availability of information online and online assistance, respondents complained about incomplete information (47%), while a good number of respondents commented that the situation has improved in current times (28%, 24%) as shown in fig 9.

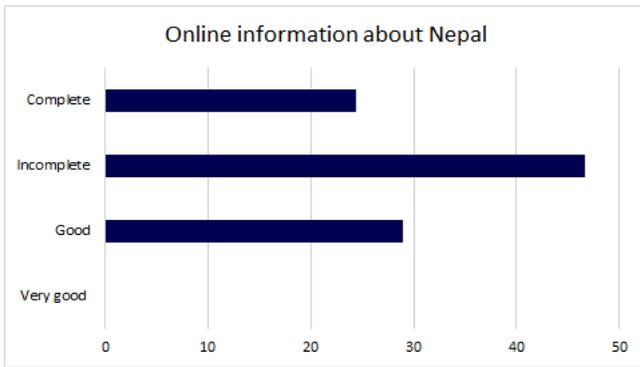


Fig. 9: Representing the availability of online information

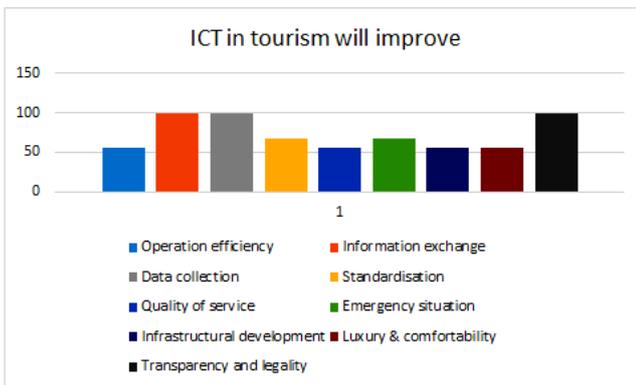


Fig. 10: Representing the role of ICT in tourism

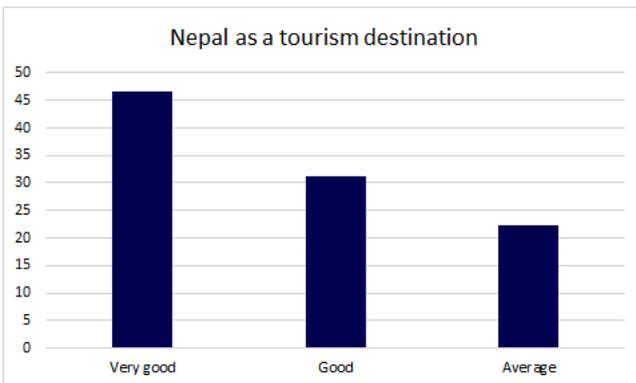


Fig. 11: Representing the popularity of Nepal as a tourism destination

The respondents were clear about the role of information technology in the tourism industry. Almost everyone (100%) agreed that ICT will enable better communication, data collection and improve transparency and legality in this industry (fig. 10). The other factors like operational efficiency, standardization, preparation for emergencies, and infrastructural development will also become better with the role of ICT in Nepal. The majority of the respondents considered Nepal as a very good tourism destination as depicted in the survey data shown in fig. 11. They only complained about the poor service sector, bandhs, syndicates, and high influence of local politics. Some of the respondents feared their security due to these aspects.

### C. Conclusions from literature and survey

The literature review and survey indicate that Nepal Tourism Industry is struggling with many problems. The problems range in all spheres that including from promotion agencies to service industries. The reviewed literature indicates that even the Government of Nepal and Tourism agencies have no aggressive strategic plans to uplift the Tourism sector besides so much diversity and potential. The very elementary requirements in terms of information requirements (update and access) are missing at large. There are very few and not up to the mark websites and web portals to provide correct and timely information. The availability of information and access to information is all scattered and fragmented which is not entertained in the current age of ICT. To summarize Nepal Tourism Industry has the undermentioned problems that include:

- Poor promotional plans and inadequate Information access
- Lack of Proper Management of Tourism Infrastructure and Services.
- Fragmented databases and information gaps in all sectors of Tourism.
- Lack of proper information access to International tourists on health, hygiene, and ecology.
- No proper channels and mechanisms for information update in terms of natural hazards, change in biodiversity, ecology.
- Very little data on websites /portals /books /brochures regarding tourist destinations in Nepal.
- Lack of strategic vision of Government officials in the implementation of technology.
- No proper integration and communication mechanism of the public sector, private sector, local and community tourism sectors.
- Lack of coverage of local/rural and community-based tourism industries.
- Lack of trained and skilled workforce in the tourist industry.
- No plans to mitigate emergencies and accidents occurring in tourist destinations.
- No legal frameworks and standards in the service industry to guarantee a quality tourism approach in Nepal.

These all problems indicate that one of the prominent requirements of the Tourism Industry in Nepal is to immediately plan and implement Information Communication Technology as a priority. The Ministry of Culture, Tourism, and Civil Aviation should focus on the identification of major players in the tourism industry which include the Nepal Tourism Board, District Tourism Offices, Village and Community Tourism Sectors. It should identify public and private partnership roles in the promotion of tourism, enforce the policies and plans, and regulate standardization in the tourism sector. The tourist should be provided information regarding every component of the tourism industry, starting from immigration, transportation, taxes and customs, service industry, products, language assistance, etc, to feedback and complaint cell.

#### IV. AN ICT FRAMEWORK FOR NEPAL TOURISM INDUSTRY

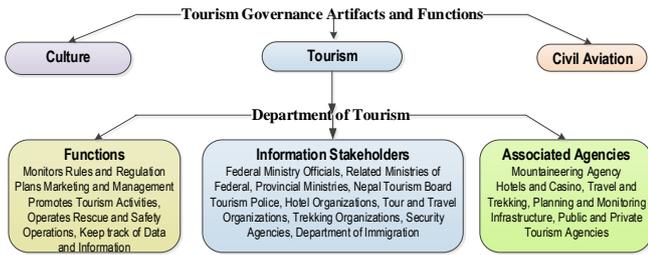


Fig. 12: Representing the tourism governance structure

To propose an integrated ICT framework for the tourism industry of Nepal, it is important to understand the tourism governance model. Figure 12 depicts the tourism governance model and it can be seen that tourism governance consists of three important components that include culture, tourism, and civil aviation. The tourism functions are controlled by the department of tourism under the Ministry of Culture, Tourism, and Civil Aviation. The department of tourism is the central entity that takes care of the whole tourism governance in Nepal and also coordinates between the federal and state government.

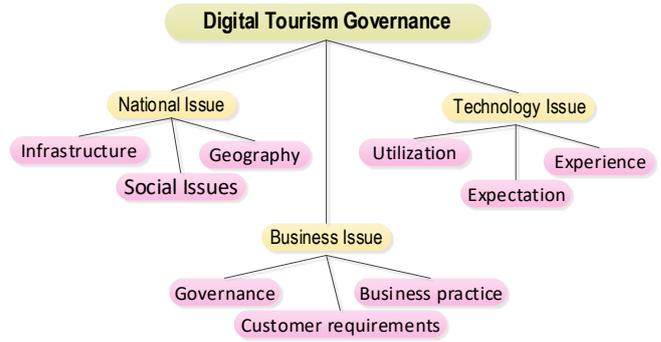


Fig. 13: Representing digital tourism governance issues

Further, to utilize the best results of the proposed model, it is mandatory to understand the different factors that impact the implementation of ICT and internet technologies in Nepal. The studies carried out by Tan and Shrestha in their paper [11] discussed various factors that must be taken care of while implementing the ICT system and solution in Nepal. The different factors that need to be considered are shown in figure 13. Considering the previous studies and the change in the structure of governance structure of Nepal after the new constitution in effect, an integrated model is proposed.

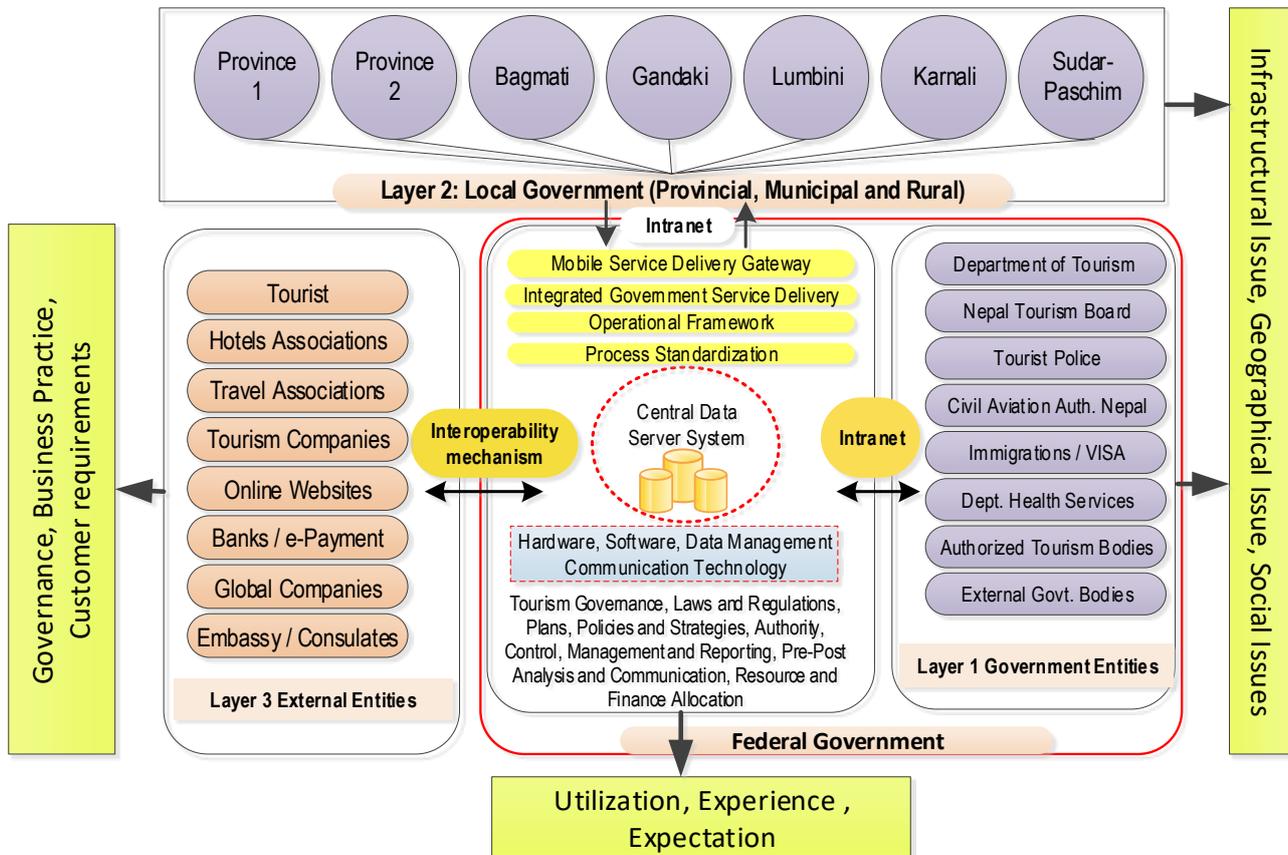


Fig. 14: ICT Framework for the tourism industry of Nepal

### ***A. Prospect of the proposed model***

The proposed model consists of three governance layers, the federal, state, and rural levels. The proposed ICT model of tourism integrates all three levels of government with the federal government taking care of all the tourism data at all levels. The system proposes a structure that is capable of keeping data integrity at all levels. The ICT framework shown in fig 14 represents three core layers designated as federal with (L1), provincial and local with (L2), and External entities (L3), which are connected through the internet and ICT technologies. A secured connection and controlled access mechanism are needed between the three layers to protect the information from unwanted access. This can be decided based on the right and privileges of sharing data between the government entities. The Federal Layer (L1) is proposed as the core layer as, visa allocation, entry to Nepal, and tracking the other relevant information is taken care of by the Federal government of Nepal. A centralized server with robust backup and a communication mechanism is required by the federal government to provide tourist and tourism information to the other entities. The latest technologies should be used to process data and share data among different entities. The core layer includes hardware, software, data management, and communication technology as the technical artifacts and mobile service delivery gateway, integrated government service delivery, operational framework, and process standardization as the services artifacts. To provide a smooth operation between entities, the roles, responsibilities, and rights of the entities must be drafted. Further, the provincial and local governance are proposed to have their technological architecture and defined service exchange mechanism with other cooperating entities. A software application must be designed at all levels with detailed analysis of tourist and tourism entity demands to enforce proper governance. The third layer L3 comprises entities that are external to the core system and serve as an important part of the system. These entities must be equipped with technology to properly communicate with the central tourism server at all three levels of governance. The layer 3 artifacts are business entities that are either the direct consumers or are in direct contact with the consumers of tourism products and services. The relationship between artifacts is bidirectional depending on the information type and requirement during form on either side. Besides this, the model proposes a concerned approach toward the issues of technological Government policies, Business practices, Customer requirements, and the national level and must take care that technology has maximum utilization, a pleasing experience, and fulfill the expectations of the tourist visiting Nepal. Further, the geography and landmass of Nepal are challenging and unfavorable for technological implementations so an extensive study of the infrastructural issue, geographical issue, and related social issues need to be considered as shown in the ICT framework.

### ***B. Opportunities and Challenges of the proposed model***

The development of technology and the usage of technological tools by tourists and Nepalese citizens have opened up a new horizon for the tourism business. The availability of smartphones and mobile-based applications with the integration of tourism service sectors and other business entities has introduced a new business model and a

new value chain. The growth and availability of the internet with high bandwidth has enabled the customers and business houses to communicate in real-time and share the requested information in real-time. The latest introduction of digital cash has enforced the concept of cashless business and tourists now can get connected to their banks in their home country to make payments for consumed products and services in Nepal. Technological developments have made the tourism business cost-effective, faster, and easier.

Besides these advantages, the implementation of technology still faces problems from the landmass and geography of Nepal. The problems remain in the rate of literacy and exposure to technology in the rural and remote areas. Though many technological tools are available, Nepal still struggles in terms of quality, manpower, and price issues. The government also lacks the proper vision and strategy for the implementation of technology in the tourism sector of Nepal.

## **V. CONCLUSION**

This paper talks about the analysis of the ICT infrastructure and tourism informational needs for Nepal. It is observed that tourism and ICT have a close dependency and due to technological innovation, the mode of tourism business has changed. This fact is realized by the government of Nepal and it has initiated many development plans and introduced policies to prioritize science and technology. Tourism which is the second biggest industry of Nepal is also prioritized and several important components of tourism are included in the digitization process. The digital framework for Nepal is seen as an important initiative to enforce technology in development and tourism.

Technological development is also seen promising with the development of ICT, faster broadband services, digital payment systems, and mobile applications. It can be concluded that it has created immense opportunities for tourism businesses to utilize this development and target policies and plans based on it. Further, the introduction of policies and regulations for these developments addresses the area of conflict, legality, and operational space. This illustrates that the Nepal government and business sector have realized the importance of technology in development and have paved the way in terms of legality and acceptance. The current status of technology is also promising for the tourism and business sector and hence new initiation can be confidently introduced in future.

The biggest concern as raised by this study is in terms of information segregation, information quality, storage space, and availability. Further, these issues are also related to infrastructural development, geographical structure, business issues, and technical issues. The solution to these problems is addressed by proposing the integrated ICT Framework for the tourism industry of Nepal. The proposed framework addresses the needs of the current and future developments for the ICT-based tourism business. It can be seen that the proposed model constitutes of all government entities, internal entities, and external entities that make a part of the tourism business and governance. The ICT technologies, communication modes, application technologies, and other related technologies are represented as the core components of the proposed system. The study also identifies the factors at the national, technological, and business levels to provide a full understanding of the implementation aspect. Thus it

can be inferred that this study is vital to research for the ICT implementation in the tourism industry of Nepal.

### CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare. The authors confirm that we have no affiliation with any organization with a direct or indirect financial interest in the subject matter discussed in the manuscript.

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