

Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Information Technology



Bachelor Thesis

Open Data in Nepal: An Application Prototype Development

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

BACHELOR THESIS ASSIGNMENT

Bibek Tamang

Informatics

Thesis title

Open data in Nepal: an application prototype development

Objectives of thesis

The main goal of the thesis is to design and develop an application prototype using open data.

Partial goals of the thesis are such as:

- to conduct an analysis of the current state of the use of open data in developing countries, its barriers and opportunities,
- to design and develop a prototype of application based on open data,
- to evaluate an open data application prototype development process and suggest further recommendations.

Methodology

Methodology of the thesis is started with introduction of open data including its objects and research question. Literature review will be done with explanation about open data principles, their development, uses and challenges drawing from the latest literature sources. The practical application will be done by using prototyping and software engineering methods and tools. At the end, evaluation, discussion and conclusion will be provided.

The proposed extent of the thesis

30 – 40 pages

Keywords

Open data, Nepal, Information technology, paper prototype, development, data collection, analysis.

Recommended information sources

- Adam Bode, (April 4, 2013) open data, [online] April 5, Available from, www.data.gov/blog/open-data-history
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2. BODE, Adam Bode. Open Data: A History [online]. 2

Expected date of thesis defence

2017/18 SS – FEM

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Declaration

I declare that I have worked on my bachelor thesis titled "**Open data in Nepal an application prototype development**" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break copyrights of any third person.

In Prague on .../03/2018

Bibek Tamang

ACKNOWLEDGMENTS

I would like to express my heartfelt gratitude to my supervisor **Dr. Milos Ulman, Ph.D.** of Czech University of Life Science for his invaluable guidance and steadfast support throughout the thesis and the research.

Special thanks also go to **Dr. Vlastimil Cerny** (Program Director) and **Ing. Martin Kozak** (Program Coordinator), Czech University of Life Science for supporting me through my whole Bachelor study program. I would like to thank the faculty, administrator and all the professors and staff of CZU who has bestowed much help during my study.

I would also like to express my deepest appreciation to all my friends for their unwavering support and faith in me.

I extend my kind gratitude to my Mom and Dad who encouraged me to continue my study towards Bachelor Degree in the Czech Republic. They have always motivated me in my life to do my best to achieve success.

Bibek Tamang

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Open Data in Nepal: An Application Prototype Development

Abstract

This thesis is focused on open data published by government to the public use in Nepal based on Nepal.gov.np and help of Open Nepal.Net. The fields studied are uses of open data, barriers and difficulties for using open data, its development processes, government rules and regulation for open data. This thesis mainly focuses on Nepali citizen, health and education, increase employment rate, country development and foreign aid.

Research and study about the thesis might be helpful for government of Nepal and some private NGOs, INGOs, and public or anyone who can find it useful.

In practical part of the thesis, a prototype of NPL OPEN APP is visualised using the online prototype tool named as **just mind pro**, and its design and development process provides using standard software design tools based on software development process

Keywords:

Nepal, Open data, Data set, Reuse, Redistribution Data, paper prototype, development, data collection, analysis.

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List of abbreviations

GDP	Gross Domestic Product
ISS	Improving Social Services
ICT	Information & Communication Technology
OGD	Open Government Data
GODI	Global Open Data Index
DDC	District Development Committee
NPC	National Planning Commission
PDF	Portable Document Format
HTML	Hyper Text Mark-up Language
SQL	Structure Query Language
IO	International Organization
NGO	Non-Government Organization
GO	Government Organization
NIC	National Information Commission
SSM	Soft System Methodology
TDD	Test Driven Design
NOA	NPL OPEN APP
UCD	Use Case Diagram

1 Introduction

The first time the term of open data appeared in 1995, when the all the democratic country's government began publishing data in standard formats on the web to increase transparency and confidence in the company (Open Knowledge in Nepal, 2015). Providing data in a standard format that can be processed by machines and software agents to facilitate data reuse for the development of innovative software applications.

Open data is the data that can be used free of cost without any restriction as the user requires. Its mean it's an idea that some data can be freely available to the public to use, re-use or republish as their requirement without copyright or patents rights issue.

Currently, open data become an attractive subject who takes lots of attention from the public in recent years. One of the central ideas of open data is to make all the data available to the public and so that innovations are created from this data. To give the access of such data to the public, we can expect that financial value of the country can be raised because of the information that include in the open data (Dr. Madan P., 2007).

2 Objectives and Methodology

The main goal of the thesis is to design and develop an application using open data. The open data system gives the information through manual and automatic interface. All the data are machine readable formats, so people will get engaged very easily. In this development project the advantage of open data is identifies in practice.

An open data an application development is the main object of the thesis. The application will be open source application that can be used and accessed from anywhere around the world without any cost.

The first partial goal of the thesis is to conduct an analysis of the current state of the use of open data in Nepal and developing countries and talk about its barriers and opportunities.

As second partial goal to design and develop a paper prototype of an application based on open data.

The third partial goal is to evaluate an open data application development process and suggested further recommendation. In the case of web and mobile applications about the open data there will be paper prototype which shows us how to develop and use of the data in standard format for the practice in the real world. It will provide the step by step information about open data process and tell us how to take a benefit from it. They will realize the advantage of the use of open data system which are secure and easy to use and effective in improving their business and services. This project helps everyone from top to bottom, everyone can access and take the information from this application that is useful for them. The application will provide all the open government information including with open laws, foreign aid, current situation of open data which will be helpful for government agents, business person and the General public.

The core theme of the problem is to show how “open data is being used”. The study will dwell upon the following issues:

- What are the existing solutions for making an open data system?
- Why open data is the appropriate solution?
- How to implement an open data system in practice

2.1 Limitation of the Thesis

As with any thesis, this research also has some limitations. Data collection of related field is very difficult in Nepal because there are no many resources available for research and an open data is new for them. It is difficult because the latest technology is not available. Public will not introduce with new technology because it is either expensive or they are unaware about it. For that reason, not enough research done on this topic. As well as open data is not organized very well like in Europe. To make a study on such topic more fruitful, it is essential that the study on this topic conducted on frequent time intervals. The study is limited to:

- Since this type of study hasn't been conducted much, there will be limitation in secondary data collection.
- Above all, there is time constraint as it is only a study to fulfill partial requirement of confining bachelor's degree.

Despite these limitations, full efforts will be made to make this study reliable and valid.

3 Literature Review

In this section of the thesis, a background research will be provided to track the current state of open data around the world and developing countries including Nepal. Short definition will be described about the open data followed by its principles and the challenges. Based on different level of data openness advantages and disadvantages will be described including the application development throughout the paper prototype and functional prototype. CATWOE and FURPS+ analysis are uses for prototype. Current state of open data about Nepal will provide, including its evolution, discussion and conclusion. This chapter contains following sections:

I. Background

II. Conceptual Review

III. Review of Related Studies

3.1 Background.

About the open data history, the first name we can use Mr. Robert King Merton. He is the only person who purpose the scientific research should be freely available for the public use in the 1940s. He said it should be freely shared for the common good and service. Its mean the term of open data, not even 20 years old.

In Sebastopol, California a group of the leader gather and discuss about the open data and finally the term of Data.Gov was born in December 2007. Until that time the open source software movement was in full swing and people are starting using data from the internet as their work requirement. The product and the data are free and visible to everyone via real-time and the internet. From that time, the idea of open data actively promoted and user of data increasing continuously.

In mid-2010 there was some Russian travel to the Finland, this time they face many problems such as, process of getting a visa, border problems, language barriers etc. There for improving social service (ISS) project, which is co- founded by the European Union and the Russian federation including the Republic of Finland Invented the one

website portal name CrossBoderTravel.eu where all the data are available for all the visitors who wants to come Europe from Russia.

About the E- government system of Nepal, in 1972 they introduce about computer for census and in 1974 they established electronic data processing center after that a private company invest money for established a company Data system international (p) LTD for software development and they start sharing the data via internet and some other electronic media in 1982. People start using personal computers and exchange data in 1985. Computer Association of Nepal established in 1992 for the development information and communication technology (ICT) after the ICT public start using the online education blog they are already known about open data portal. Establishment of Ministry of science and technology in 1997 people is becoming more interested in open government data. In 2000 Nepal introduces first IT policy in their constitution which is more visible for the public through the electronic media, which is a big development of open government data source. The National Information Technology Centre and high-level commission for information system was established in 2001 and 2003. Up to this time Nepal government has started sharing all the information about government on their blog so people can reach easily and full fill their requirement. Because of that Nepal constitution made another law about information which is Electronic Transaction ACT 2007.

So, last ten years' user of e-government increased by almost four times that 1997. Since that period to now there is so many developments in ICT and e government. Now a day, it's very easy to find out the data and the information. Now so many web pages such as opennepal.net, Nepal.Gov.np, Omaha.Gov. np, codfornepal.org etc., (Pariyar, 2007).

Publishing data on the webpages which is a machine-readable format for public access and developer. Published data will be able to use for creating and innovating the services. In the case of that not only the government or other business owners will benefit, but also civilian and other government agencies will get help to provide the new services and chance to improve the financial condition of the country, (Bode, 2013).

3.2 Conceptual Review

All the basic knowledge involve in research can be cleared from the conceptual review and it makes theoretical framework in the field of research. The concepts of those required basic knowledge are as follows:

3.2.1 Nature and Outlook of OGD

This section OGD describe from different angles. In the sub-section 3.2.2, definitions, principles, and the objectives of OGD form the first step towards explaining the nature of OGD. A further step in studying similarities and differences between OGD and E-Government extends the knowledge on the nature of OGD as a new stage of traditional E-Government. In sub-section 3.2.4 the brief description about OGD will be covered and show the ecosystem how government will publish a data in the Nepal.

3.2.2 Definition

Open data is the well information about government sector of data that published on the computer or different kind of social media for publicly accessible from anywhere with free of cost. Data must have to be machine readable format. Data can be used for any kind of purpose without any copyrights problem. Most of the open data related from the government sector. its mean the published data must be possible to copy, share, republished as a user requirement.

One of the definition by Cerri & Fuggetta, (2007) describes open data is an idea of closely related notation of the open source software where users can access the data freely without any cost and the patent right. Those data are machine readable format where user can use - reuse and redistribution as their requirement. Open data give power to the developers and the businessman to innovate the new services and opportunities.

Another short definition by, Lapi, Tcholtchev, Bassbouss, & Marienfeld, (2012) explains that open data mostly deal with data that related with government and non-profit organization and the data must be open and transparent for the public. Open data unlock the potential information for the businessman, government and entrepreneurs and its

Open data is often considered as data which is related to government and it is supposed to be open to increase transparency in the society. However, other organizations, companies and citizens can publish open data too. Open Government Data (OGD) means publication of government data in raw open format (Open data) [Machado & De Oliveira, 2011].

3.2.3 Objectives of OGD

According to the above definition and principles of OGD, we must describe its main objectives. Objectives of OGD are to make appropriate solution for open data system, to implementation open data system in practice through the paper prototype and software development process, to forecast the potential research about how open data related with country economics, promotion of government data transparency.

Furthermore, the research mostly related of open government data about Nepal so key input is we mostly describe about country background, it's economics portfolio, how data are published and reach to the public, the whole process plan will be visualized through practical part of the paper prototype of *NPL OPEN APP*.

Moreover, the research question will have solved in this chapter of the thesis. The existing solution for making open data system that will show through the practical part of the thesis and reading part will describe next chapter 3.2.4, open government data in Nepal.

NPL OPEN APP paper prototype application draws the attention and participation of the public, which increases benefits to user and makes a two-side communication between government and General public.

The plus point of OGD is part of the revolution in how governmental public services will be delivered in the future. Economic crises, shortages and to lead the budget government have to re-think in how they provide public services in more reliable ways. In the future, governments will depend more on crowd sourcing to deliver public services. soon OGD will be the virtual database system for the Web enable governments technique to provide public services in a cost-saving manner.

3.2.4 Open Data Nepal

Open data about Nepal is not so old. Using the open data in Nepal started after finished civil war. Nepal has been the part of this global assessment continuously for the four years with lots of ups and downs.

In 2013 the Global open data was launched in Nepal. At that time Nepal was ranked in 52nd position with 30% score in open government data. But in 2014 Nepal ranked in 63rd position although Nepal score 34% in open data. Again in 2015 Nepal score 30% in open data but ranked in position 61st [Open government data. 2013].

According to global open data index shows negative and went that graph downward, Nepal was ranked in 69th position with just 20% openness. Due to this rank and percentage of openness many open data civil society and activist working in Nepal become disappointed. Index also shows that progress made by Nepal is difficult to compare with other countries because it is very slower, and it cannot match the standard of Global open data, which hampered not only rank but also the openness percentage of Nepal.

From all this evidence it shows that Nepal has not made serious gain over these four years. To improve and to gain score, we should examine the issues and realise more government data in the public data. Also, technical issues for example open licensing and machine readability continue to take our score back.

3.2.5 Open Government data of Nepal

Open Government data of Nepal is a collected by the district level of government committee from the public sector. Open data will increase an awareness and understanding of the potential level of information that will need to support for development of country. It will work to develop the country by collecting availability of data via its Open Data Portal through support to those who want to share their data and make it more accessible. It helps a range of higher level development person to improve their projects via increase of information use by providing technical support, information capacity materials and a platform for sharing experiences. In this process it aims to support and increase an open data user in Nepal. Open data supply on demand information that required by the user. It plays important role to collect the data from low level to high level and to share the collected data for national and international level.

Advantage of open government data

Open data can be used free of cost its mean you don't have to pay for any data. Data are available for use re-use as user requirement. All kind of open data are accessible any time and it can be use anywhere around the world. Open data system allows external contribution for international media and the user. It's the best place to challenge the problem and solve the problem. Open data system creates new thoughts in the public. Open government data increase the employment of the country because of open government data public and business person keep updating with the new government rules and regulation. Open data are helpful in formulating maps by considering the location of buildings and roads with respect to topography and boundaries. Open data give the information about country finance such as expenditure and revenue of government and information on financial markets such as stocks, shares, bonds, GDP of the country.

Disadvantage of open government data

Most of government data to be open, but not data are needed by everyone. Government data is free but when compared to cost of publishing, storage and maintenance, it's not sensible to open all government data. Most of data are not needed or neglected by most people. There need to be some benefit for publishers but there is not. Data owners need to connect directly to re-users to understand their needs but it's not they make all the data through the report. Open data Analysis is not always easy all the time it's very difficult. Open data is not always good for decision making sometimes it leads to better decisions and certain times to poor decisions. Public money used to make the open data which is looks free but still public must pay for it. Government will not publish fact of the data. They just give side information for it. In general, thought the fact or actual data can't be copyright.

3.2.6 Public overview on open government data

Government uses the public money through collection of taxes etc. so public want to know uses of their money. It need to be transparent for the public how the money is used. Data are an important enabler of socio-economic development such as public health education economics productivity. In scientific research, the rate of discovery is highly influenced by the better access to data. So very important for to have or get the real data while we try to access from the source. Data on genomes, data on organisms, medical science, data on

environment are important for human in some perspectives of day to day life. Restrictions on data re-use create a situation where potential user can exclude one another. Government and private enterprises should co-operate to optimally serve open data to people.

3.2.7 The Government Data Ecosystem

Nepal government data ecosystem means how all the information is collected and shared to the government agencies and other department of government. Its mean how a government of Nepal use there date more efficiency to develop the country. Below us the little map how the data are collected and distribute in Nepal.

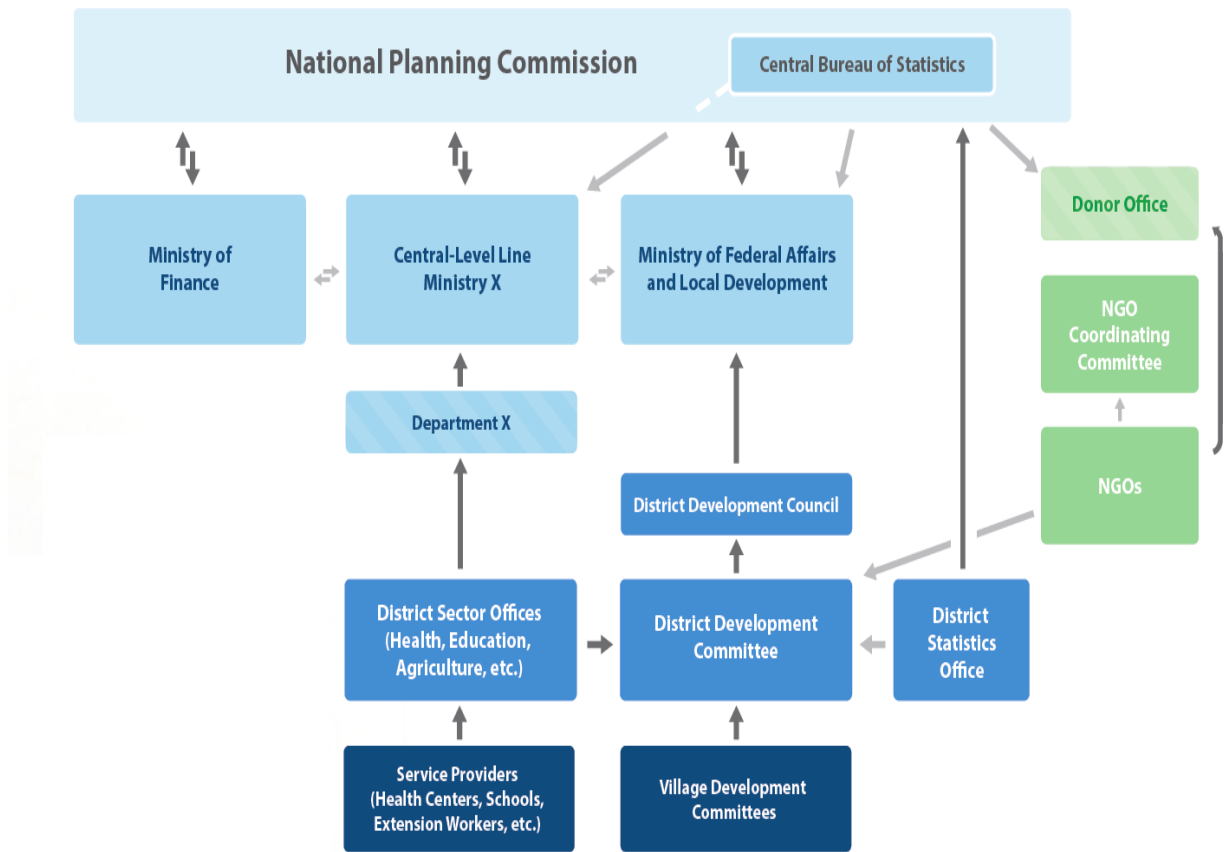


FIGURE 1 METHOD OF DATA COLLECTION IN NEPAL

Source: Homer & Abdel-Fattah

As above Figure financial and administrative data are collected at the village and district level, then all the collected data will have reported upward to implementing government departments such as the Department of Agriculture or the Department of finance all the

data are typically collected by government staff at the district or village level then it will aggregate well format and forward to the responsible government sector or agency (such as the Ministry of Transport or the Ministry of Education).

Every district also has a central investigating body, known as a District Development Committee. (DDC) which reports on district progress to the local development ministry of Federal Affairs. All the report that they get from DDC are similarly aggregated, summarized, and reported to the higher level of government sector staff for further decision.

Once obtained data reach to the related field sector ministries use their data to report the Ministry of Finance and the National Planning Commission. (NPC) These data will be in hard-copy reports and a meeting between two senior level sector ministries officially discuss about data for overall progress.

Central Bureau of Statistics generally works in parallel to other ministries as well with several independent district statistics.

In sum, Government of Nepal agencies have strong official incentives to report information upward, but the process for sharing data look like longer way which take more time and human resource.

3.2.8 Principle of Open Data

About the open data principles, team of Carl Malamud and Tim O'Reilly had a meeting in Sebastopol, California and they introduce the eight principles about open government data who gives information to the public sector about how to use and in which condition data are available for the public. They introduce eight different principals about open data which include data must be complete format with format of machine readable also. The data are freely used without any patent rights and data are made for as much as quickly view of the public and it's used for a wide range of user and wide range for the purpose.

But in 11 August 2010 Sunlight Foundation updated and executed the ten different principals about open data. Which are License free, non- discriminatory, no charge, complete, primary, timely, accessible, machine readable, uses of cost.

1. Completeness

That data which is release for public sector should be as complete as possible. Data are must be subject matter. Data supposed not to be published if it is incomplete and all the data must be available in original format and source should be published, (Tychon, 2013).

2. Primacy

When government released the data, it must be in primary source of data. this include all the original information collect by the government and it must describe how data was collected by the government and source must be published, (Tychon, 2013).

3. Timeliness

As all the government data are case sensitive so the collected data must be published to the public on time. Whenever data and information collect by the government it must be visible for public as soon as possible, (Tychon, 2013).

4. Electronic accessible

Data must be published for a wide range of use. It can be accessible from anywhere as a user want and his requirement. Concept of open data is it has to use freely so when a user wants to use it, they do not need to accept any kind of agreement and it can be downloaded as user wants, (Bode, 2013).

5. Machine readability

While publishing the data, data must be in machine readable format it must not be in somehow scanning text. scanning text gives errors while matching the formats. As data and the information are wide range use so it's must be in some portable document format PDF or document format .DOC which is easy to read and reuse as user wants, (Tychon, 2013).

6. Non-discrimination

When government published the data, it must be freely available for the everyone. It has no barriers and registration of membership requirement, (Bode, 2013).

7. Non – proprietary

Data are mostly available in standard format. Its mean when any kind of data release in the web it must not need the software to read it. For example, any company releases the data in Excel format its need Ms Excel to open it which means if the user wants to read the data user must have to pay for Ms excel software, so open data must be released in standard format, (Tychon, 2013).

8. License-Free

Now days most of data stored in the web is not free or they have any license agreement for view or read it. Some data have a copyright or patent rights or there are barriers for read or use it. Open data always need to consider about this problem because open means free to use and reuse it must not have any license agreement, (Bode, 2013).

9. Permanence

The ability to search for information about time is called durability. Information issued by the government Online should be stable, it should be available online in the archives in permanence. Often, the information is updated, changed, or deleted without noticing that the change was made. Or is available as a stream of data, but not archived anywhere. To ensure, the best use of public information should remain online, with appropriate version tracking and archiving over time, (Tychon, 2013).

10. Usage cost

Open data means open for everyone there is no cost include for any types of uses of it, but now days you can find there is cost include for use of information even the cost is de-minimize from the user. Government charge a money to public to access their own data, the cost includes the creating the data and collecting information. The cost is applying for retrieve the information such as a per page data or per inquiry cost etc.

3.2.9 Levels of Openness

The data which is in their original format is known as Primary data. This data is in original source. Data are classified in three groups.

1. Unstructured data

The data which are not in format is defined as unstructured data. In this type of data only contents are available but not in proper format for e.g. PDF files or HTML pages. In this type of data no one can predict from where this information is available.

2. Semi-structured data

The data where there is information, but they are not in organization's in database but some information like logo or some organization's properties are there. Its mean from where we get data and how they are linked. For e.g. journal of some organization

3. Structured data.

This type of data is much easier to understand from where they are generated and from whom they are belongs to. All date is stored in database SQL format in tables and columns from so, we can easily recognize about the data sources.

3.2.10 Benefits of Open Data

Open data can be used by different people and various types of organization for many purpose and requirement. Open data is used for both academic and private purpose. Open data can be used both directly and indirectly way for e.g. in carrying out research and for developing mobile application [The City of Waterloo. 2012]. We can have classified people in different category according to the people how they are beneficial from the open data.

1. Citizens

First group which is maximum benefited by the open data is citizen. In other word General public can utilize the open data to be job opportunity and the society can take a benefit from open data. By the help of open data new software will be developed which helps the citizen of country to develop [Oliver, Palacin, Valls& Domingo, 2012].

2. Developers

From the open data developer will also be benefited. By the easy and free data from the government and non-government organization they can get idea and knowledge which helps them to have economics software development opportunity to develop initiative applications [Oliver, Palacin, Valls& Domingo, 2012].

3. Governments

Government is also benefited from the open data, not only by using open data also by publishing and sharing their data in open formats. From this mean citizen of country will be benefited and other many organization and company will get opportunity to gain some knowledge by which country can be developed and government will also be benefited. “offering government data in a more useful format to enable citizens, the private sector and non-government organizations to leverage it in innovative and value-added ways” [Open Government Canada. 2013].

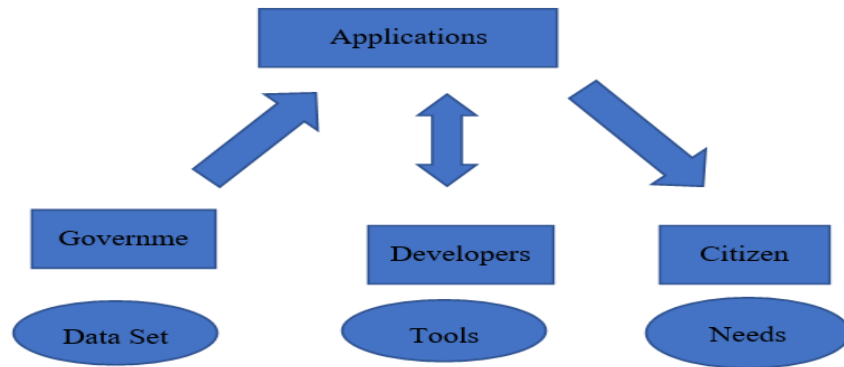


FIGURE 2 ILLUSTRATE THE IMPACT OF OPEN DATA

SOURCE: OLIVER, PALACIN, VALLS & DOMINGO, 2012

In this figure government provides the data for common people from that companies and organization are also benefited they use the free data to develop the application which can be innovative. From their common people will get knowledge and benefited by that new developed application and the transparency data provide by the government [Oliver, Palacin, Valls & Domingo, 2012].

3.2.11 Data and Planning Process

The data Planning processes begin in the district level of government committee, where the leading role will have played by the Local Development Officer, who work as DDC chairman. District planning and resource allocation decisions are present during an annual District Development Council meeting. All the information and reports are to inform this Council are created by DDC staff using sector-specific data. After an agreement are reached, an annual budgeting plan are submitted to Ministry of Federal Affairs and Local Development for approval.

While local budgets are always need to approval from district level officers or higher-level officer. The budgets will not realize while the level of information not especially important and insignificant.

3.3 Review of Article/Journal

Review of literature is important to explore what other research in the area have uncovered. A literature review is the process of reading, locating and obtaining the relevant subject matters in student's interest. The purpose is to develop some expertise in the area, to see what new contribution can be made, and to review some idea for developing a research design.

Srijana Acharya & Han Woo Park (2017) showed the trend of open data in Nepal based on the webometric analysis method to obtain data from website by using search engines to trawl. The results also show that several national and international non-profit organizations, public sector organizations, educational institutions and some commercial organizations are the promotor of open data in Nepal. Webometric Analyst 2.0, Inter-linkage analysis, co-mention analysis, and link impact analyses are performed to explore the behavior of networks on the World Wide Web. Also, found that IO are strongly connected. NGO's GO's and IO's relate to each other but weakly. Co-mention network analysis shows IO's with IO's were more significant than the NGO's with other organization (NGO's GO's or business organization) because IO's are working from many years. Also, link impact analysis is operated using its indicators of seed sites linked to external websites in terms of the estimated number of country code and top-level domains.

Krishna Sapkota (2014) brought results resonate with the need for an open data model based on commitment, presented in the five stars of the previous open data commitment, and based on the creation of links between RTI and open data to strengthen the concepts and communities. Throughout the work on open data for aid and budget transparency, it is important to be explicit that this should contribute to the emancipation of Nepalese and work towards a common understanding of the problems that open data supposed to solve. The attention of potential dark sides of open data.

In the word of Nurfilzah Rohaidi (2017) the country's national action plan is inspired by the increasing use of open data in many other countries. The plan was based on the study of the use of government open data in the world. National Information Commission of Nepal (NIC) admit government open data highlight the right of citizen to have access to

information, also motivate innovation and accountability also transparency. Earthquake of 2015 has been bringing out the release of government data. After few months of disaster government collected the data on the level of damage and now public can access an anonymized version of the data in free of cost.

Louisa Dennison (2014) explains that Nepal has low levels of Internet connectivity; a culture of secrecy in government agencies; and limited evidence of the demand for open data beyond the educated urban elite. Nepal has few social and economic indicators, and it is unclear how open data could work in an environment with limited financial resources for infrastructure and data exchange, and with high levels of social inequality. While open data in many developed countries has been formed from counter-cultural roots, the report found that strong social hierarchies in Nepal could hinder similar attempts to challenge the mainstream. If the concept of openness through data exchange can thrive in an environment of social exclusion is an interesting question for our work in Nepal. The study found that, while there is open data, there is a lack of technical capacity among key stakeholders in the information ecosystem to use it and, therefore, it is unlikely that an impact is produced on the development results.

4 Practical Part

The thesis practical part includes analysis current state of open data in Nepal and provide the practical prototype picture of *NPL OPEN APP* to make it clearer. Describe about NPL OPEN APP and development process. About application, its development process, the role plays actor and it cost about application owner will be describe in *CATWOE ANALYSIS*.

FURPS+ will provided information about application and its functionality and its performance and supportability. At the end of practical part prototype of application will be provide with its use case diagram which mean the reader of thesis will get more information about open data about Nepal and its development process.

4.1 Analysis of Current State

Currently Nepal open data system is in progressive way. Transparency of study increases all the sector such as, health, Geography, Energy, Climate change, Disaster, Agriculture, Tourism development, Education and government and civil society. Which means Nepal open system is become more openness than before. More people are involved and doing the research about open data. Government and people put the concern on research and development on open data. More NGOs and INGOs are working to publish the data on online machine-readable format rather than paper print where people are easily get engaged with the information.

But, past few years progress of open data in Nepal is much disappointed because the development progress is slower. Specially in civil society and some government sector such as finance department, water & energy department, foreign Aid, infrastructure etc.

Still Nepal has not made a satisfaction improvement. The reason Nepal continue peg the score back in GODI because its lack of latest technology for publishing data and shortage the finance for publishing data, every government change new rules and regulation for data polices for data publishing and open licensing. This thing paly the big role to put the score backward. To improve our score, we need to consider these issues and problem along with publishing the more government data in the public.

4.2 Design of New Application

More over detail analysis of current situation of open data of Nepal to make it more impressive and function ability this thesis introduces an application called *NPL OPEN APP*. *NPL OPEN APP* is an application where you can find all the updated information about open government data about Nepal. The application is still on development process. This thesis will provide the prototype view of application and its performance of functionality. The application is responsive for all kind of electronic devices and the application covers all the sector of the data set in Nepal not only for government data.

The purpose to make an application there is not enough application available who give the huge information about Nepal there is webpage but not application. For design and development of the application Microsoft visual studio will be use.

Currently there is big changes happening in Nepal government. The new constitution divided the country in eleven municipality. Every municipality have one local government its mean before the data was collected and directly send to the ministry level but now all the data process through local government to district level and ministry level. If the collected information need to execute urgently local government has an authority for it and according to the requirement they will release the funding for the to execute the information. So, based on currently change Nepal consultation main purpose of the developing and design the *NPL OPEN APP*

1. To make more understandable current practices and demand of local governments at municipal level for sharing information
2. Study about knowledge and capacity of local governments at municipal level to share and use information to the public
3. Find out the present knowledge of citizens, and sector.
4. Research about current demand and supply and use of information by citizens,
5. Finding the present barriers and opportunities for citizens, civil society groups

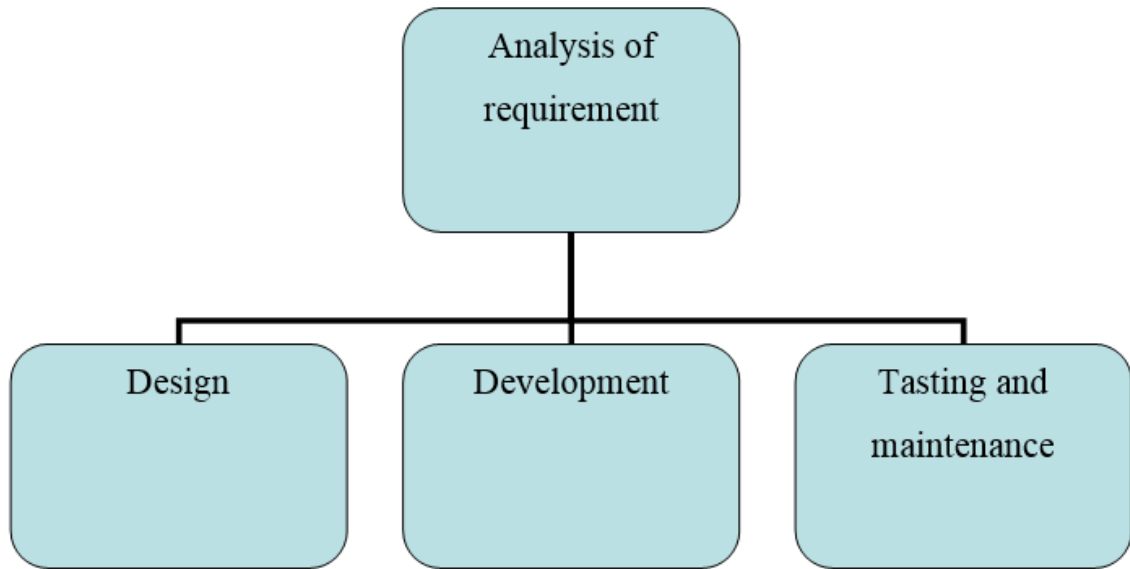


FIGURE 3 PROCESS OF DESIGNING THE APPLICATION

Source: Own source

4.2.1 CATWOE Analysis

CATWOE is a method or tools to solve the problem *peter checkland* was the first person who developed the soft system methodology (SSM) to solve the problems but he is not a person to invent the CATWOE method. CATWOE Method was developed by *David Smyth* in 1975 he is a member of *checkland* team. For CATWOE analysis it need to consider six elements which is play big roll to solve the problems. They are customer, actor transformation process, world view, owner and environmental constraints.

Customer

In the thesis *NPL OPEN APP* is an application and the end user of this application is mainly intended to General public and business person. Right now, they are facing problem with devices that need high configuration and costly to run application but *NPL OPEN APP* do not need high configuration of devices it will run minimum requirement and provide the all the information that user is trying to get it. Uses of application is so simple user can interact with it very easily just they need to download form the available source and login with their email-id.

Actor

Developer team of the *NPL OPEN APP* is the actor here. But it could also include the vendor of application. The main role of team is solving the issue and problem that are identified from the customer's feedback. Administrator of application will react immediately after receiving the issue from the end user. Before solving the problem, every actor need to figure out the role they going to pay to solving the problem or issue.

Transformation Process

Transformation process start from starting phase of developing application to end or execute the application. So, it is period between first stage of developer team to until the final application done for the user. In this section all data that need to publish to public are input and process them by application developers through collecting them from different sources. Must of the data collect through individual field visit as a raw data and process them for final execution.

World View

After reaching this stage of the analysis the find out issue or the problem is for long term or it could appear only for short period. Is this issue going to have a wide reaching, long lasting effect or just contained for short lived? *NPL OPEN APP* will fixed the problem to the public that facing by the government sector such as openness license, data transparency protocol, high tech requirement solution etc. this application help to the user save the time form temporary problem and make them understand that do not underestimate the serious problem in same time. Problems and issued must solve from the world view that will help for application development process.

Owners

In this section owners mean not a person who invest the money or owner of company that develop the application. *NPL OPEN APP* covers the all the sector of government data mainly focus on civil society and related with country development. So, owners are Administrator level of developer in the 1st stage then it will transform to the Nepal

government but after transform the ownership the administrator will be responsible for maintenance and data input for the correctly execution of data.

Environmental Constraints

In this section *NPL OPEN APP* describe about the problem that take long time to fix such as government rules and regulation, finance and funding, law of open license technical obstacles, data collection resources, low quality of data but that problem can be minimized and go through the final execution of the application. This kind of problem that face while developing the *NPL OPN APP*.

Using CATWOE is may not be the solution for the all kind of the problem but using this kind of thinking might be good idea for the *NPL OPEN APP*. The six approaches of solving problem informed to find out problem from the all side to the developers and administrator and provide the right idea for the solution. There is time you need to spend to understand CATWOE properly but at the end developers gets good credit.

4.2.2 FURPS+

FURPS is a way to know the requirements the client’s necessities by understanding their needs. The main aim to analysis the FURRS+ in this thesis to make understand the reader of this thesis how application works. This analysis will provide the information about the *NPL OPEN APP* and focus its functionality, usability, reliability, performance and support that user get it through the application. FURPS+ technique classified the requirements to understand the different types of non-functional requirements more.

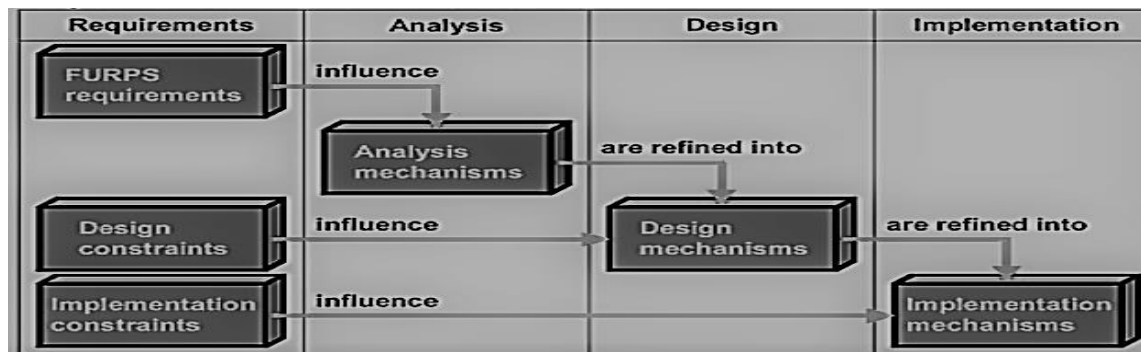


FIGURE 4 FURPS ANALYSIS

Source: IBM.COM

FURPS+ is classified by the below terms.

Functionality- In the term FURPS+ F represent functionality, its mean how *NPL OPEN APP* WILL approach or function to the end user. It will send push notification to user via email that they registered for it. Provide online help support to the user. It is also technically oriented architecturally significant system so, *NPL OPEN APP* function mainly purpose for open licensing agreement supportive and responsive way while uploading the data. providing secure protocol for exchanging the data.

Usability- U stand for Usability in FURPS+. Based on the end user interface *NPL OPEN APP* is approach to the user as Android and IOS devices with no cost. This application is completely acceptable by user and government because the documentation of application developing process is accurate and complete using the simple user interface. It will process the information in one approach.

Reliability- *NPL OPEN APP* Availability is almost 100% after finishing its development process and it has recoverability database backup system also. The accuracy of communication guaranteed and delivering information is high rate and its free of charge provision. *NPP OPEN APP* is less failures and the problems are not repeatable. And positive part of this application is, In the case of system failure the database backup system helps to recover the data.

Performance- About the performance of the *NPL OPN APP* it is faster than other it will take 3-5 second to start up it is more effective while its run in the low configuration hard ware devices. Any kind of devices screen will supportive and responsive also. And the size of application is less than 50 MB which is faster to download also.

Supportability- *NPL OPEN APP* provide the cloud backup system. Its mean user no need to use local storage devices. And application upgrades deliver via stores.

The + includes the other things like interface, design, physical constraints requirement.

Design Constraints- Design constraint about the *NPL OPEN APP* is work like some other I/O or android devices application design and built process of application fully follow the rule of DBMS a software development process.

Implementation Constraints- *NPL OPEN APP* is full Implementation by test driven design (TDD) constraint. This application is standard format so there is no coding needed for used the application

Interface Constraints- *NPL OPEN APP* is developed and design as simple user interface. This application covers all the possible action that an end user may perform while they are using the application.

Physical Constraints- *NPL OPEN APP* do not need high level of hardware constraints for run. It is supportive for all kind of screen and responsive for upcoming new technology also. [Peter, 2004]

4.2.3 Use Case Diagram

Use case diagram is graphic display of all the interaction among the elements within the system. It is a methodology used to identify, analyze, clarify and organize all the system requirements. Use case diagram provide the high level of visual representation to the user. Study about UCD in this thesis how the application will work and how the data are collected and upload. Use case diagram provide the outline information that agent will perform while using the application.

NPL OPEN APP application that was developed, the use case describes outline view of application that perform by agents and actor including focusing on primary goal of application. UCD try to purpose that data are collected through the individual research like a raw data. All the collected data will transform to the administrator for analysis and study. Here is 1st stage of data processing and the valuable data will send to the developer's team for upload.

So, In *NPL OPEN APP* all the collected data will upload and edit by developers with the authentication of the administrator.

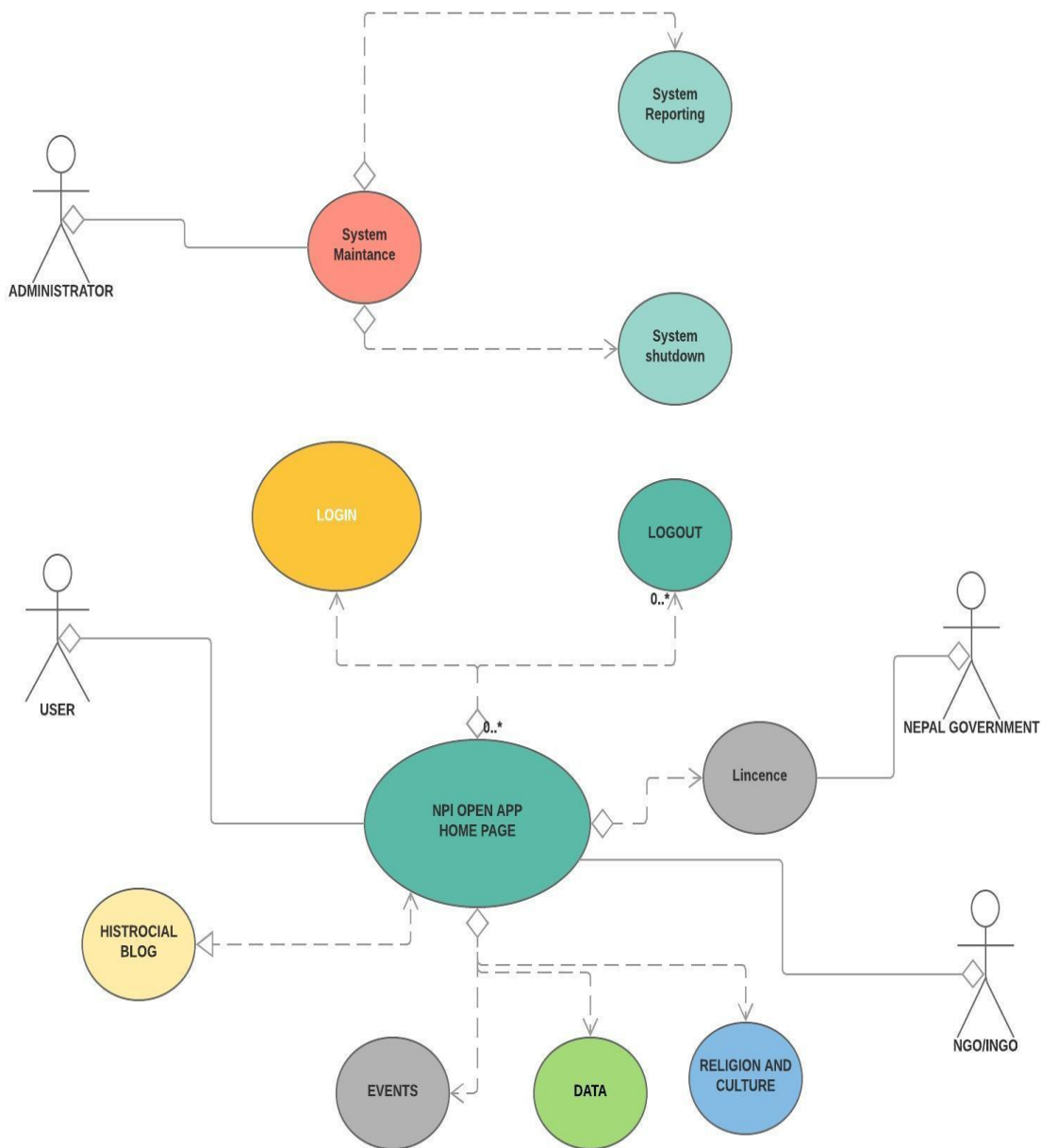


FIGURE 5 NPL OPEN APP USE CASE DIAGRAM

USE TOOLS: LUCID CHART

4.2.4 Prototype

“*NPL OPEN APP*” is an application prototype design for android and IOS system. This application prototype is design for real application which is available in apple store and android market you can download this application free of cost. It will be available as soon as its development process is finish. The aim of this application is to give the information about current situation of Nepal e-government system.

Its help from public to enterprise level. The application is always update so using this application people will know upcoming government news and development project. its helps them to understand current situation of country. So, they will know where and when they must invest money on it. Its mean it will help to increase the GDP of the country.



FIGURE 6 HOME SCREEN FOR NPL OPEN APP

This is a Desk top view of “*NPL OPEN APP*”. From the above prototype it provides every detail about country government data. The good thing about this application is you can download the recent data for your project and re-use it free of cost. This app is help full for

end user public and business people because from the data section you can find last ten years data which make user to more helpful.



FIGURE 7 DESK TOP VIEW OF NPL PROTOTYPE

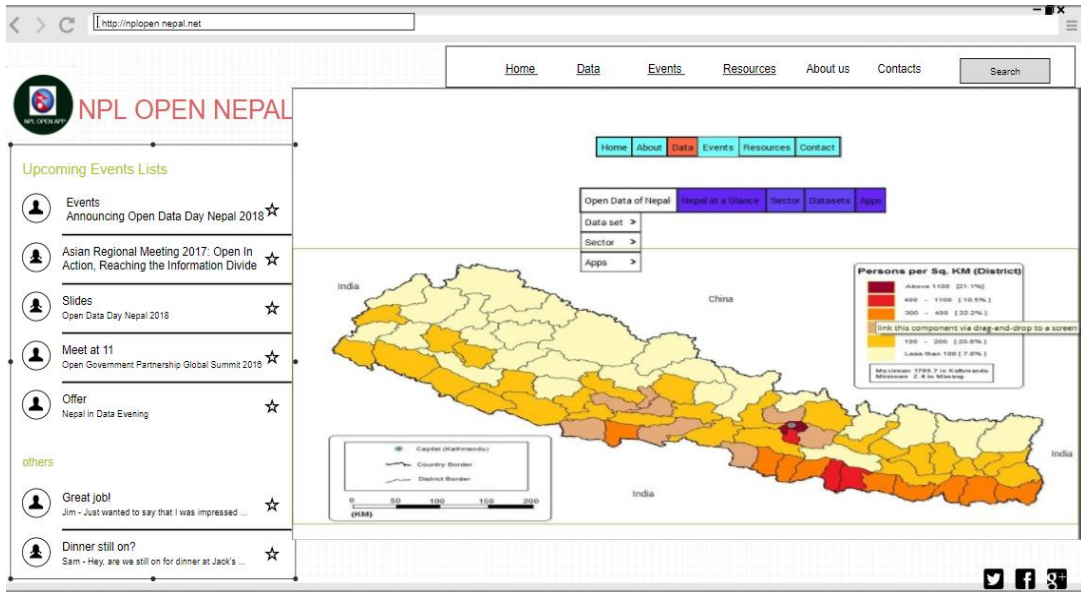


FIGURE 8 WEB VIEW OF NPL PROTOTYPE

5 Results and Discussion

This thesis attempts to explore and provide an overview of open data in the Nepal. Mainly focus on data that related with government and private sector based on Nepal government Act 2072. Furthermore, concept about open data and how it can be useful for different areas will be explain with example of application using the open data. In this digital age open data is very likely to increase with the rise of the internet, because it stands for the changing relation between citizens and the government. In these days many citizens no longer accept the passive stance representative democracy held for them. Open government is to be seen in the context of citizens' rights the right is actively participate in the process of agenda.

5.1 Current state of Open Data in Nepal according to the Open Government Partnership

The OGP is an international association of reformers in government and civil society, committed to Governments are more transparent, responsive and responsible. To achieve these objectives, the OGP ensures commitments of governments to promote transparency, encourage civic participation, fight against corruption and exploit new technologies to strengthen governance. These commitments are intended to make government more open to increasing public confidence in the government, promote the investment climate and economic growth, and alleviate complaints that facilitate conflict and violence.

The OGP was officially launched in 2011 by eight heads of state from Brazil, Indonesia, Mexico, Norway, Philippines, South Africa, the United Kingdom and the United States and nine leaders of the civil society of the UN General Meeting. Since its launch membership has grown from eight to seventy members including Côte d'Ivoire, Papua New Guinea and Sri Lanka.

An important feature of OGP is that it brings together governments and civil society organizations partners in the development of reforms at the national level to promote open and transparent government. The process implies a dialogue between civil society and government officials, a high-level political commitment interaction with the Heads of State and a mechanism for regular participation through biannual action plans.

Thanks to OGP, more than 2,700 national commitments have been generated, aimed at improving more than 2 billion people. These national commitments range from the passage or modernization of freedom of information, the application of anti-corruption measures in the public and private sectors and mechanisms to facilitate dialogue with citizens and allow their participation in the policy process [Open Nepal, 2017]

5.2 Comparison of the application NPL Open App

NPL OPEN APP is an application that gives an information about current condition of open data Nepal. This is the only application where you can find the all information about Nepal government, Politics, history, culture, religion, and many more about the Nepal. This the only application that give the huge information about Nepal. But there is one website name as *OPEN NEPAL.NET* and it is good for the updated information about Nepal open data.

SWOT analysis

Before developing the application it is better to study about issues that affect to the application. Issue are consider as internal and external. So SWOT analysis is approach in the thesis for *NPL OPEN APP* prototype development process where strength and weakness will include internal issue of application and opportunities and threats include the external issue of application.

Strength

- Support of open data and open science by Government.
- It is the first mobile application with complete and accurate information.
- Involvement of young generation.
- Available for both major platform.

Weakness

- Not available for windows platform.
- Clear sketch between what belongs in the public domain and what represents IP
- Information only content about Nepal.
- It will be common ground for expert and individual.

Opportunities

- Gateway to explore much more.
- Partnership between public and private.
- With this application there is changes happen on public thinking in near future.

- Development of open platforms create more job opportunities its mean there is chance to increase the employment rate in the country.

Threats

- Changing government rules create the problem for open license
- In ability to push on centralization of application.
- Lack of finance to collect information
- In near future, there might be same application available in the platform.

6 Conclusion

This study focused on design and development of an application prototype using open data sets from the open government data of Nepal. The developed application is very applicable and helpful for the users to receive information in a more understandable way. Users have the option to interact with the data through the application where he can find data charts and tables with statistical analysis and does not require advanced knowledge about latest technology and statistics. To achieve the partial goal, there was a brief analysis from public sector such as OpenNepal.Net, Nepal.GOV.NP, www.nepalimmigration.gov.np etc.

Furthermore, concept about open data and how they can be useful in different areas was explained through practical part and shows how it benefits the application in the Nepal and other developing countries. Application development process and its advantage is also described through prototype.

Moreover, how this application prototype was developed and how the download data sets were used, were clarified through a full prototype view of application and processes from the designing and developing system called “*NPL OPEN APP*”. It also provides meaningful information by selecting the latest published data.

“*NPP OPEN APP*” application supports all kind of devices such as desktop, tablets, kindle and the mobile phones. The application was designed to response for all kind of screens.

The recommendations for the further research and development of an open data about the Nepal are to increase the transparency of open data to the public, use of the latest technology to publish the data, explore the relationship between public and government including business entrepreneur, etc. The data must be collected with proper tools and published with standard format that public and other can take advantage of them. Data must be real time data, which give real and valuable information to the readers.

Most of data need to link with social media using the worldwide web tools, which means the user can easily engage with the newly published data.

Government must introduce new strategies for open data and provide a fund for further research and development such as provide trainings, support for publishers, create favorable environment to publish and make a new constitution for open data portal.

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President Obama's statement about open data

The US president Obama (2009) on his first day in office signed the Memorandum on Transparency and Open Government, stating, *“Information maintained by the Federal Government is a national asset. My Administration will take appropriate action, consistent with law and policy, to disclose information rapidly in forms that the public can readily find and use.”* (Source: <https://www.data.gov/blog/open-data-history>)