4.1 Introduction

Major objective of the study is to contribute in the security and overall analysis of various state and country portals so that people may use these portals effectively without any hesitation from security point of view. These portals provide various online services to its citizens in various countries and states. In the beginning certain metrics for measuring the educational web portals and e-governance (G2C) portals of various states and countries have been developed. All portals were analyzed on certain metrics and certain suggestions for the improvement have been provided.

A website can be evaluated qualitatively or quantitatively. In either case one will have to choose adequate instruments and parameters for evaluation. One can monitor website traffic by keeping a count of the actions initiated by users on server within specific periods of time. But very precise statistics cannot be provided with server information. Transactions, visibility, awareness, user activity and awareness, cost and cost-effectiveness can be monitored. But it requires a lot of time for data collection and analysis. But here certain metrics have been taken into account for measuring the effectiveness of the portals and websites. Metrics are the ways or parameters to measure the security of any complex system. E-governance systems come under this category.

Study has been conducted on three types of portals

1. E-Governance (G2C) portals
2. Grievance redress portals
3. Educational portals
Vulnerability analysis of all the above type of portals has been done on the certain metrics related with vulnerability. Various metrics were designed for each category.

4.2. Metrics for assessment of G2C e-governance portals

The main aim of the study is to consider the Government to Citizens (G2C) portals. A G2C portal means those portals which provides various information and services to citizens. Examples of such portals include various state government portals and portals of various organizations being utilized by general public. State government portals provide services to its citizens in the form of various downloadable forms, services and information. One such portal in case of Haryana is haryana.gov.in that provides various services to the general public under column ‘How do I’. Various types of services available on the portal are according to various departments providing these services.

In daily life in the modern age one comes across so many websites and web portals related with different sectors and areas. Initially at the time of birth one needs a birth certificate, for getting reservation he may need caste certificate and for applying a job a student has to visit websites of various departments and various state and centre government staff selection boards or commissions. One can switch to more good employment and he again will have to search jobs of his choice online by using websites and portals. Different services are required at various stages of life and are shown in Figure 4.1.

Education sector was considered and certain metrics related with these portals were designed for making them more effective. Vulnerability available on these portals was pinpointed using vulnerability scanners available in the market. Various portals chosen for the purpose are portals of educational institutions and e-governance portals of various states and countries. E-governance portals of countries like Sweden, Denmark, India, China and Pakistan were taken into consideration on the following metrics. Certain metrics for the educational and general portals are here as under.

In the beginning many people, organizations and politicians had argued about use and application of ICT in India because of more manpower and less requirement of manpower by computer related work. A computer will take the place of many persons in
offices and unemployment problems (India facing already) will increase. But now those people are in position to see the change and benefits general public is availing from ICT tools through various e-governance applications by sitting at their homes. With the reduction of cost in tablets and other ICT tools various governments and institutions have agreed to provide such devices free of cost to their students so that users can tap this opportunity provided by E-governance and ICT.

Figure 4.1 Basic services required by common man in life; adopted from (Saaransh, 2011)

4.2.1 Metrics for assessment of Asian region countries

In this age of ICT and digitization many countries around the world are developing digital information vigorously and implementing wired as well as wireless Service Delivery Programs (SDP). Various Asian countries are providing e-governance services to its citizens with the help of internet. There are various countries in the world but countries taken into account on the basis of some criteria like neighbourness, population, digital economy ranking. No doubt all the countries are trying their best to apply ICT for governance for their citizens. Firstly population factor is taken into account while selecting portals of various countries. On this basis China being the most populated
country of the world and India being the second populous and native country, National portal of India (NPI) has been taken into consideration. Secondly being the neighboring country Pakistan has been taken into consideration. Thirdly e-readiness score of various countries selected is also taken into consideration. E-readiness is a medium to know the status of ICT adaptation of a particular country. E-readiness ranking scale helps to know where a particular country stands on e-ready scale. As per Economic Intelligence Unit (available at www.eiu.com), Digital Economy Ranking 2010 beyond e-readiness, the status of these countries is China is at the 56th place, India at 58th place and Pakistan is at 66th place and all the three countries have retained their position of the year 2009 ranking. Various metrics taken into account are here shown in Table 4.1.

Table 4.1 Metrics for assessment of various G2C portals

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Metrics for G2C General Portals</th>
</tr>
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<tbody>
<tr>
<td>(1)</td>
<td>Content</td>
</tr>
<tr>
<td>(2)</td>
<td>Usability</td>
</tr>
<tr>
<td>(3)</td>
<td>Accessibility</td>
</tr>
<tr>
<td>(4)</td>
<td>Privacy and security</td>
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<tr>
<td>(5)</td>
<td>Feed back and general services</td>
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<tr>
<td>(6)</td>
<td>Traffic Analysis</td>
</tr>
<tr>
<td>(7)</td>
<td>Use of Websites</td>
</tr>
<tr>
<td>(8)</td>
<td>Creation/look of websites</td>
</tr>
<tr>
<td>(9)</td>
<td>Reliability</td>
</tr>
<tr>
<td>(10)</td>
<td>Size and complete information</td>
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<tr>
<td>(11)</td>
<td>Language</td>
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<tr>
<td>(12)</td>
<td>Server side analysis</td>
</tr>
<tr>
<td>(13)</td>
<td>e-ready</td>
</tr>
<tr>
<td>(14)</td>
<td>Services at websites</td>
</tr>
</tbody>
</table>

(1) Content
Content is the most important component in case of e-governance portals. Success of the portal depends on the informative content available on that portal. Providing information and services is must in case of developing populous countries like India. Non availability of such information and services on portals gives rise to other social problems like red-tapism, corruption and delay in services. Delay in services means service denied. The above mentioned problems are burning issues in modern time. Delay in providing services to citizens gives birth to corruption. Content on the portals must include information about various services and time taken (in case of long processes) in execution of these services. Relevant content on any portal gives that information to the user which is not feasible by other ICT tools. Information provided to users in time gives confidence to users for utilizing such portals. Moreover such information and content provided on home page gives more motivation to users.

(2) Usability

This metric takes into consideration whether the portal can be used in user friendly manner, has good design, no overlapping information and search option. Portal must be utilized by all users whether deaf, blind or physically handicapped. Many times information provided on the page is overlapped with other new page opened on the portal. Information available on the portal must be accessible to users through various assistive technologies. These technologies may include features like screen readers and magnifiers. Usability also considers about language barrier as a person knowing Hindi may not knowing English and other national and international languages. Hence each portal must provide major language options so that users may choose the language of their own interest. On the other hand portal must provide facility to learn some languages available on the portal. Language option increases the usability of the portal. Length of home page is also considered good indicator of usability of the portal. Searching facility available on portals is also desired since it may not be possible to visit all the pages available on the portal to get any information. In a way search option also helps in increasing the usability of the portal. Portal may be having hundred or thousands of web pages and to search particular information from all these pages is a cumbersome task.
3) Accessibility

Being citizen centric service portal special care must be taken regarding accessibility and font size of the portals. Various web standards implementation has ensured that website remains accessible to all, and meets government standards. Portal must be accessible by each and every person. Various governments over the past several years have employed or outsourced various agencies to create websites, put services on the sites, and make them accessible to their citizens. In this age of ICT many new tools are available to general public. Hence portals must provide facility to interact or use such tools. In the modern age mobile devices are very common and are used by large number of population. It is highly penetrated device in India because of its increasing capabilities, functions, facilities and decreasing cost. Use of mobile phones is increasing at a very large scale in rural areas also. New applications based on mobile phones are taking birth day by day. In the beginning device was used only for talking and listening but now a days its various applications have motivated to various users may be children, young or old persons living in a village, small town or big city. Moreover there is a long list of services that can be availed through mobiles, some examples of common citizen services using mobile phones are Indian meteorological department weather information, kisan call centre’s agriculture related queries solution, CBSE’s Exam result of class 10th and 12th, electoral details, account balance in a bank account, PAN card status and so on. There must be certain mechanism to interact with such devices through portal. Newly designed portals must have facilities to interact with such tools.

Accessibility metric takes care of such options on portals. If any website is not accessible to its target users, it will not be successful website. Accessibility also include the feature that enables one to increase or decrease the font size and/or change color scheme of portal according to his preferences. One can change the text size and contrast of the portal. More accessible portal can be viewed from a variety of devices like mobile devices, PDAs, WAP phones and so on. Persons having different type of disabilities must have facilities to listen, touch, and look at the websites easily. Best efforts must be made to ensure that all information on websites and portals is accessible to people with
disabilities. A user with visual disability must have facility of using devices like screen readers and magnifiers. Font increasing facility will help the persons or users having visibility problems.

(4) Privacy and security

Data and information available on portals must be kept secure as it also contains various type of private information. Such private information must be kept secure and it is the duty of people and system that maintain the portal. Private information must not be accessed by unauthorized users. To access private information about citizens or governments certain authentication checks must be there. This job is completed by providing various checks to access secure and private information. Hence providing user login and password is must to access such type of services and information. Privacy and security include the features like privacy policies, authentication, encryption, data management. Data available on the portal must be managed properly for its effective use by users of the portal. While using portals users exchange information with the database of the portal. Hence to send information in a secured manner first use encryption and then decryption at the target end. For authentication part one can use login details and after providing these details information should be in encrypted mode. One algorithm for encrypting data at the sender’s end and decryption at the receiver’s end is proposed by the authors for transmitting data on various e-governance portals. To measure security of various portals there is requirement of certain tools like various vulnerability scanners.

(5) Feed back and general services

Through surveys one can measure the effectiveness of administrative actions of the government toward its citizens. But if surveys are done online, one can measure the effectiveness of various programs and problems faced by users without making more efforts. Such online surveys are done with the help of feedback options and providing email addresses for any suggestion about the portal. Feedback is one of the major
contributors for citizen participation. Regarding citizen participation and feedback, every visitor is an important recipient and resource of information. Factors which constitute citizen participation include online citizen engagement, citizen services, internet based policy deliberation, feedback and citizen based performance measurement. For citizen engagement there is need to stress on providing more and more services online. It is very important to get feedback from the visitor as much as possible. Through feedback one can know about the problems, likes dislikes and other comments of citizens or users of the portal. Feedback is the most easily and freely way of getting information from the users of the portal. General services mean services and information that are available on the home page of the portal. These services include whether feedback, language, search options are available on the portal or not. Other factors which are included in the general services are transactional services involving purchase or register, interaction between citizens, businesses and government. Feedback is an important metric to improve a web portal. Until one does not know what are shortcomings in a particular process, hurdles and shortcomings from that process can not be removed. Feedback option must be available at each portal linked with citizens. Certain suggestions provided by citizens are very important and diminish lot of harassment and save a lot of government money involved in these processes.

(6) Traffic Analysis

As the name suggests traffic means the visitors/users of the portal. Traffic analysis provides the details about popularity of the portal among users. By analyzing it one can have idea about the problems faced and use of online services by various types of users/visitors. One can know about the exact number of users of the portal month wise, which can help in the deciding the factors that increase the traffic in a particular month. Traffic analysis is an important step as it shows the total impact of ICT and e-governance on the citizens of a particular country. Hence traffic analysis is must for the success of every portal. With the help of such information, popularity and usability of the portal can be known easily. Analysis of monthly visits on a particular portal can help in answering
certain queries related with usability of the portal. NPI has facility to find monthly hit analysis that shows the visitors interest towards the portal from various states and countries. It also shows hourly report about number of hits on the portal. This hourly report shows that NPI is being used mostly in the office hours. It also shows that there are many users who might be working in various offices as well. Traffic analysis is done by having a look on hourly, daily, fortnightly, monthly, bi-monthly and yearly number of visitors on a portal. Various state, district and national portals have no place for the number of visitors. Such information helps in improvement of various aspects of the portal and hence it should be available on each and every state portal also.

7) Use of websites

Many government agencies are viewing online interaction as their primary method for interacting with citizens. But websites are not useful until these are utilized by the users. There are many websites in India that are not utilized very much by people. One such site in case of Haryana is grievance redress portal of Haryana named as ‘Har samadhan’. This portal is utilized by less people moreover those who have used they could not get their grievances redressed. Not redressing the redresses may be one of the reasons of not using such a portal. But such portals may be very helpful for the people who are not much educated and not know whom to approach in case of particular grievance. One reason for not using the portals may be lack of awareness among target users. Another reason may be complex user interface designed for the users. The users may find it complex job to lodge a grievance over such online systems. There is lack of awareness among Indian users and hence government websites are not very much utilized by people of India. People in India prefer to rely on information received from unreliable sources that may be from neighborhood, asking from their friends and visiting certain offices to gather information instead of checking that on website. Lack of awareness impedes the use of websites. Citizens still show a strong preference for phone-based or in person interactions with government representatives when they have questions or are seeking services. Employees working in such department may very well explain to people coming in
offices about the existence and working of such portals. There is need to popularize various such initiatives by government through seminars, media, newspapers, hoardings etc.

8) Creation/look of websites

A good and effective website should be easy on the eyes, easy to understand and easy to maintain. A website will be more effective if it simple one. It takes a lot of planning and work to make simple website. To make a good and simple website look for someone with plenty of experience, common sense and with a respectful attitude towards you and your audience. Website must be pleasant to the eyes and should not have much blinking effects since such effects affect the eyes and one can not have a look on that site for a long time. Home page of any website is the center of complete site. There are just a few seconds to convince visitors that this site is worth any more of their time. It is the only medium to create first impression among users of the website. Also make sure the home page has the words or pictures that are already on the person’s mind. Make sure the main page delivers on any promise your external advertising or search engine description makes.

9) Reliability and Trustworthiness

At any portal, if one has any grievance query and that is answered or redressed within a certain timeframe. Normally such time is 30 days which is more time to wait for a person and leaves no meaning for grievance redress. Hence time for sorting out such queries should be as less as possible and maximum 15 days otherwise it dissuades the users to utilize such online services. Trustworthiness of the portal is decreased if grievance query is not answered within stipulated time.

The information provided on the portals must be relevant, accurate and reliable. Relevancy of the information means the information must be relevant and based on the number of the estimated and future users in the state. As example a state like Punjab has a
link about information regarding visit to other countries since many people of the state are residing and may be thinking to reside in other countries. Information regarding various ways to communicate with the people sitting in other countries may be given some place on the portal. The hardware and software requirement and place from where to communicate may be provided on the portal. Accurate information regarding the distance within districts, other general information about the tourist places directories, links to NPI and other adjoining state portals may be given some place on all states portal. But all such information must be accurate and reliable.

Reliable, independent and available information lays the foundation for a democratic society. Reliable, timely, comparable and available information on social, economic and environmental conditions are main factors for the development of a country. This information is based on the statistics of a nation. Statistics provide the information or evidence needed for government daily administration, for policy makers, for planning business decisions and citizen’s possibility to hold their government accountable. Policies based on evidence will be much better at targeting their purpose, increasing efficiency and financial sustainability. Timely and reliable information can help governments improve the life of people by planning developments more correctly. The availability of reliable information is an important element for good governance in a democratic country like India. Reliable information on society should be free of charge, user friendly and easily accessible to everyone. Online delivery of government service is more user friendly as compared to traditional means and it will be much better if careful consideration is given to perceptions and expectations of users. Reliable information about country not only helps in making decisions by local people and investors but also to the private sector and foreign companies to invest in a country more confidently. Thus reliable information will help in making more investment in a country and eventually will lead to new employment opportunities, income generation, and poverty reduction which improve the life standard of people leading to economic growth of the country. Information available on websites and portals must be updated in time and this step will help in providing reliable information to its people as well as people living abroad. NPI explains which type of information is being updated in how much time. Certain information like news, announcements, press release, natural calamity and latest who’s
who is reviewed immediately, some other information like services, forms, acts and rules are reviewed every fortnightly, whereas programmes, schemes, policies, acts, rules documents etc. are reviewed once in a quarter as a policy. Content review policy is available on the Indian website which provides reliability of information available on the website.

10) Size and complete information

Well known proverb ‘a little knowledge is dangerous thing’ seems fit here and should be kept in mind while launching new e-governance websites and portals. Useful, related and complete information must be available at the home page of the portal. Size of the homepage decides the information to be accommodated on the home page. The information available at main page is very large at India portal. Complete information means one should at least be able to contact through other means if a particular portal is not working at particular time. From NPI one can have information about whom to contact if there is any query/problem/providing new information about the portal. Also site map is also available here which provides complete map of the website. Citizen portal must have facility to get related information on each of the portals one may require. There is need of having sufficient information on the portals so that users may not need to visit other websites and portals to get more information. If there is such a portal having complete information gets a lot of popularity.

11) Language

Language plays an important role in providing and getting information from any source. If a source (may be a book, film, conversation) is not in the language that user knows than that is of no use. On the similar lines if any portal and website is not in language known to the user then it is of no use how best it may be. Language options are necessary for the success of the website. More language options provide more chances of usability and accessibility. Portals having more language options are usable by more people knowing those languages. Each country portal must have facility of using the portal in the
national language of that country. NPI is having the option of Hindi language, the national official language of India except English language in which the portal is available. NPI is having fonts of ten other Indian languages that may be downloaded and installed on the systems to use. Such fonts are helpful to people not well versed in the national language and English language as well. In India and foreign countries there are many people who understand their native language and not understand English and Hindi. Such types of various fonts can be helpful to people living in India and abroad.

12) Server side analysis

Any project related with general public must be evaluated on the basis of its effect on the public. Project must be evaluated on whether it is fulfilling its aim for which it was launched or not. To do such evaluation there is need to know the number of users and number of problems sorted out by the stakeholders of the portal. Server side analysis does the same kind of job. It includes features like visibility assessment, hit counts, page-loading speed, and interface design. These features will be beneficial in the technical arrangements of portals. On many websites one can see the column named ‘number of visitors’. The purpose of that column is clear to have some idea of the number of users of the portal. NPI takes into account monthly report of number of visits and visitors along with list of countries and states. Also peak load time is also taken into account i.e. 9.00 A.M to 5.00 P.M. Such type of analysis helps in knowing peak load time and helps in deciding whether there is need of more infrastructures for that peak time so that system may not collapse in want of resources including bandwidth. Visitors’ summary shows the popularity of website.

13) E-Ready

An e-ready society is the society that has necessary strong physical infrastructure for using electronic gadgets. E-ready country has great use of computers in schools, business, Government working and houses. E-readiness measures the nation’s capacity to participate in digital economy. E-Readiness indicators at international levels include
mainly four fronts namely policy, infrastructure, resources and usage. Policy includes policies of ICT, e-governance, rules and regulations, architecture and standards. Infrastructure includes network, access and hardware. Resources include political, human, employee, ICT and financial resources. Usage includes use by citizens, business, and government. In order to reap e-governance benefits, policy makers should conduct regular evaluation on electronic government readiness and suggest certain solutions to increase the level of e-governance.

14) Citizen services at websites

E-governance portals must provide basic services to its citizens. Basic services mean services that are required by all users time to time. Such services may include the birth certificate, caste certificate, income certificate, land records certificate, death certificate etc. NPI provides such type of necessary services under the column ‘How do I’. More useful and necessary services are available at India web portal. The number of services and other related information on grievance portals is an important issue. Also applicants can know status of their application through SMS which is most commonly used feature of mobile phones in India. Mobile phones have been available for over two decades and their exponential spread in India during 2011-2012 is due to low cost and affordability, through large number of players in 2G arena. Not only their penetration has exceeded landline, it is bound to displace the existing inefficient BSNL set up. Mobile penetration is increasing day by day in India which will help in popularizing such features and grievance portal itself. Citizens facing difficulties in utilizing the available features and facilities may also talk telephonically or email the concerned officials.

4.2.2 Metrics for assessment of G2C state portals

For better utilization of services available on the portals instructions regarding how to use the available services must be available on the portal. Various metrics for G2C portals were analysed on metrics shown in Table 4.2.
Table 4.2 Metrics for of various G2C portals

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Metrics for G2C portals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Home page</td>
</tr>
<tr>
<td>2</td>
<td>Availability of pull down menus</td>
</tr>
<tr>
<td>3</td>
<td>Running text or news</td>
</tr>
<tr>
<td>4</td>
<td>Pictures and services sufficiency</td>
</tr>
<tr>
<td>5</td>
<td>Contact us</td>
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<td>6</td>
<td>Clarity and efficiency</td>
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<tr>
<td>7</td>
<td>User convenience</td>
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<td>8</td>
<td>Timeliness and relevance</td>
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<tr>
<td>9</td>
<td>Content Level</td>
</tr>
<tr>
<td>10</td>
<td>Infrastructure</td>
</tr>
</tbody>
</table>

1) Home page

Home page is the main page of the portal that is linked with other pages. Home page carries the necessary and important information desired by the users. This is the only page that has power to attract and maintain number of users. At least some information must be there that can be used by various users of the portal without creating an account and username and password. Portals having log in facility may dissuade the users for using the portals. Portal of any state must have links of various district websites without login facility so that users may access information about districts in that state easily. The complete details of various services of the portals and process to get such services from the portal must be clearly explained with time taken in utilizing the service. The information, about related services that are not available on the portal, must be available on the portal.

2) Pull down menus

Many websites do not have this feature of pull down menu. This feature helps in providing a lot of information in less space comparatively. Feature suggests if one rolls
mouse over a particular option he may get a list of all options available under that heading so that one may open the desired link. It is good feature and must be incorporated as it makes the front end spacious and hence increases information readability. Users will be able to easily access the desired services available on the portals. Various type of information like contact numbers, email addresses, telephone directories and other related website links can be provided in the pull down menus.

3) Running text or news

Portals related with grievance redress must flash certain news related with the use of the portal or its grievance mechanism so that more and more people may start using it. Particular information and news related with the portal may be flashed to the users so that they may utilize the facility. Grievance related portals can flash news related with the number of grievances registered and redressed. Similarly education related portals may flash information regarding exam dates and admission. Latest news and events related information must be placed on the portal so that users may have look on such news at the earliest and work accordingly.

There is need that citizen centric portals must take care of the seasonal requirements and non seasonal requirements of its citizens. Such information can be provided in a news column which is unavailable mostly at all the portals. News or latest happening can be shown in this column. The basic hardware and software requirement for getting information from these portals can be displayed in such columns so that users may be well prepared before using service on any of these portals. Income tax related website must have news related with the last date of filing tax return in months of May and June. Academic institution portals should have the news related with the admission dates in months of July and August. Such type of information may be provided in the running text or news on the portal homepage so that every user opening the portal may get necessary information immediately.
4) Pictures and services sufficiency

Services on the portal must be relevant and sufficient as per basic services required by each and every user. There is relevance of having a link regarding recharging of mobile options in these days which was not relevant 10 years back. Hence services which are gaining popularity must be available and will be utilized up to maximum level. The services like pay bill may be provided by electricity, telephone and public health departments to avoid time wastage of standing in long queues. Moreover the related services to a particular job must also be available at the same portal. As example Telecom companies can have facility of recharge, top up, bill enquiry and payment etc. While launching so many services bandwidth requirement is also an important issue to consider otherwise portal may betray users for the purpose it was started and may become panic for the users. It is happening in case of UGC portal for inviting online applications for UGC–NET exam. Pictures must be available on such portals only if necessary, because it can make the time consuming process for the citizens and makes the portal slow while availing such services on these portals. Uploading and downloading of pictures take a lot of time and makes system slow.

5) Contact us

In case of any difficulty in accessing the information from portal by citizens there is no option left with the users except adopting the other traditional mediums to perform the job. If information is available but not up to date then citizens have to wait for a lot of time which again leads them to the other traditional ways of performing task. Hence contact us facility on the e-governance portals is a solution of such problems and is must so that (in case of) wrong or incomplete information available on portals may be verified by the users. In contact us facility one can have contact numbers or email addresses of concerned authorities. Such contact information must be available at the home page and may have one or more contact addresses or numbers to be utilized by users.

6) Clarity and efficiency
In how much time the query is answered is related with the efficiency of the portal. Also information available on the portal must not be vague. The information about services and how to utilize these services must be taken care of while rolling out portals and websites related with e-governance. Available services on the portals must be clearly defined about how to use and what can one do with the services available on the portal. Moreover the query related with the use of services available on the portal must be answered at the earliest possible. The option of Frequently Asked Questions (FAQs) on home page of the portal may help a lot in it. FAQs must clearly describe the procedure of utilization of typical services available on the portal. Moreover the information available on home page and FAQs of the portal must not have short notations which are not in frequent use by general public. As example on the Haryana citizen centered e-governance portal (E-Disha) under download option short notation CIDR is used that is not in frequent use by general public and users may not know the meaning of the CIDR. The use of such vague information like Central Identity Database Repository (CIDR) helps in dissuading the users to use the portal. More number of downloadable forms must be available on such portals so that more and more users may utilize the facility available.

7) User convenience

Ultimate users of these portals are citizens hence their convenience must be taken care of. For their convenience there must be provision of the native languages of the states at their portals. For example Punjab state may have option of using Punjabi as a language on the portal. Portals are desired to have general useful information that can be easily accessed by every user of the portal without authentication. Every time login facility on portals makes it difficult for use by users. Long registration forms asking for private and personal information further increases the burden of the user and ultimately user willing to get information starts thinking of using other options to get information. Nobody will like to give his/her bank account information for such deeds. Citizen centric portals must be having telephone directories, links to various other related websites and with minimum authentication complexities so that users may feel convenient while getting the information from the portal.
8) **Timeliness and update of information**

Any information not available in time is not of any use. Information on these portals must be available in time. If a service regarding selling of produce by the farmers to the government is not given in time farmers may not be able to get the best price for their products. Only relevant and reliable information must be given a place on such portals for which they have been designed. Hence before rolling out any such project basic motive/aim for the portal must be kept in mind otherwise it may not be able to fulfill the aim for which it has been designed. The information regarding updating of portal i.e. date and time of the portal information updated is desired so that users may be convinced about the validity of relevant information and certain decisions based on that information may be taken well in time. But most of the portals do not space to this necessary information about updating time and date of the information on portal.

9) **Content level related to current projects**

Content is the soul of the portal and it should provide link to every information that may be required by the citizens of a state. An important link that shows the interest of state in e-governance is the link for the largest e-governance project to be created known as ‘Aadhar’ is given. With the help of this link one can know the status of his UID number and number of UID’s issued till date even district wise detail of UID can be made available. Emergency contacts like fire services, gas leakage, blood bank, ambulance, police, hospitals, air, road, bus transport, animal welfare, search option and link to National Portal of India (NPI) need to be available at various state portals. Information available on the portal must be available in systematic way and drop down menu must not overlap other options as it is happening in case of Haryana portal.

10) **Infrastructure**

The infrastructure information needs to be readily available at various portals. Each district website needs to have certain other useful links like state portal, NPI, online
agriculture marketing information system, NIC etc. so that citizens need not to remember the addresses of various important organization websites and can visit them directly. Online agriculture products rate needs to be available on various district websites of states having large agriculture produce so that farmers may get benefit by selling their produce at good price. Many times services are available online but availability of these services is not known to the users and hence popularity of these services is to be increased through various online and offline media so that users may get benefits from facilities.

### 4.3 Grievance redressing mechanism

Grievance redressing mechanism is the major activity in democratic states like India. Department of Administrative Reforms and Public Grievances (DARPG) are performing this duty at the national level. Various states have provided online grievances redressing mechanism for the people of their states. Online grievance redress systems adopted by states like Haryana (Harsamadhan), Himachal Pradesh (eSamadhan), Gujarat (SWAGAT) and Karnataka (Janmitra) have been analyzed in detail on designed scale and the following metrics. Various grievance redressing portals were assessed on certain metrics shown in Table 4.3.

#### Table 4.3 Grievance redressing metrics

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Metrics for Grievance redress portals</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Broken links</td>
</tr>
<tr>
<td>(2)</td>
<td>Performance and efficiency</td>
</tr>
<tr>
<td>(3)</td>
<td>Site map</td>
</tr>
<tr>
<td>(4)</td>
<td>FAQ</td>
</tr>
<tr>
<td>(5)</td>
<td>Grievance status knowing Facility</td>
</tr>
<tr>
<td>(6)</td>
<td>No. of visitors and convenience</td>
</tr>
<tr>
<td>(7)</td>
<td>Impact on general public</td>
</tr>
<tr>
<td>(8)</td>
<td>Grievance redressed rate</td>
</tr>
</tbody>
</table>

Source (Chander S., Kush A., 2012)
1) Broken links

Such links are symbols of underutilization of resources and hence these broken links should be as less as possible on portal. A broken link is any link that should take you at a document, image or web page that actually results an error. In a way it can be said that resources are not maximum utilized if there are more broken links on a portal. More broken links on a portal also dissuade the users to use the portal. Broken links create problems in proper navigation of the portals. It means that particular (broken link) page was linked from the website but is inaccessible. Certain issues related with the accessibility and contact us should not have broken links. These links are important for general citizens for accessing the information on the portal and providing suggestions for the portal. The broken link screen shot is shown in Figure 4.2.

![Broken link screen shot of CDLU portal](image_url)
2) Performance and efficiency

Performance of a portal depends on number of factors. Some of the factors may be updated information, ease in usability of the portal, information search option, language option and many more. Unavailability of these options degrades the performance of the portal. Performance of the portals can be increased by providing options for redressing of grievances related with services and information available on both of these portals. Moreover stale information available on the portals decreases the performance of the portal. Last update information on the portals enforces the users to utilize the services and information effectively and such information must be available on each portal related with the citizens.

Performance depends on the time taken in redressing of the grievances of various departments. If there is case of birth certificate related grievance then it may take maximum time as one month or 14 days. It has been verified on the two of these grievance portals, one portal of Himachal Pradesh is having 14 days time to redress the same grievance and Haryana portal is taking one month. Moreover the grievance is not redressed till last three months at Haryana portal. After implementation of service delivery acts citizens will be able to lodge grievances if a particular service is not provided in a certain time frame in the near future. Since many states have implemented or are in the process of implementation of right to service (RTS). On the whole portal should have minimum time to redress the grievances and that will increase the confidence of the citizens in utilizing the portal.

3) Sitemap

Sitemap is an important facility required for the smooth functioning of a portal. It provides ease to the users while working on the portal. This option helps in finding the information on the website. It is not possible to visit every page of the portal and hence to look for particular information on the portal sitemap option is used. This option helps the users in knowing the availability of the particular information on the portal. With the help of this option on the portal one can have complete knowledge of links and services
available on the portal without using search option. Moreover search option if utilized may take more time in displaying results whereas with the help of this option one can have a direct look on the links and services available on the portal.

4) FAQs

Home page of the portal must include the frequently asked questions (FAQs). With the help of FAQs users will be able to get detailed information about various services and other functions and characteristics of the portal. It is an important option and must be available at every portal to go further for getting information from the portal. It must have questions that what information or functions can be performed with the help of the portal. The important question that must be given a place in FAQ list is the motive or aim of the portal. FAQ must include the questions about maximum time to redress a grievance of a particular department and that will increase the transparency in the system and would increase the utilization of the portal by users.

5) Grievance status knowing facility

Once grievances/complaints are lodged by citizens they must be able to know the status of their grievances or complaints. They must be able to know the action officials have taken in this regard. The tool that can be used for this purpose may be the SMS facility available on the portal. Haryana and Himachal Pradesh grievance redress portals have this facility for getting information about the action taken by the officials about the particular grievance on the basis of the grievance registration number which is obtained at the time of the lodging the grievance. But SMS facility is not being used for this purpose. Explaining stepwise information, about the process involved, to its citizens provide transparency and confidence to the users of the system. Information, about the completion and result of the grievance redress process, must be provided to the users of the portal.

6) Number of visitors and convenience
The number of visitors on a portal shows its usability and ease of the users while utilizing the portal. This number of visitors also ensure that the portal provide the convenient way of interaction with the users. More the number of users more convenient the portal is. Such a facility on the portal explains the popularity of the portal. This facility is available on the NPI in various formats. One of the reasons of less number of visitors can be inconvenient interface of the portal. Convenient GUI can be provided to users to increase the number of visitors and popularity of the portal.

7) Impact on general public

Impact on the citizens can be known through the number of visitors and information available on the portal. More and more people will be using the portal if their grievances are redressed within a short span of time. There is also need of providing grievance redressing facilities for those departments which are mainly attached or related with public dealing and rural population. Jan Mitra provides the facility for rural people and SWAGAT program in Gujarat has been extended up to village level in the name of GRAM SWAGAT. SWAGAT Online program has helped the rural people living even in remotest corner of the state in getting their problems solved quickly. Various assessment studies have shown that there is need of developing projects having large impact ratio. India being an agriculture country e-governance projects related with the agriculture will have large impact ratio.

8) Grievances redressed rate

It is necessary that grievance redress portals must redress the grievances in time. Portals redressing more grievances in time may be called having high grievance redressing rate whereas resolving less grievance on portals provide less grievance rate. Grievances must be redressed in given time frame and to motivate the users acknowledgement and status of grievances must be sent to users. This grievance redress rate has been found very less
in case of Haryana grievance portal as compared to portals of Gujarat, Himachal and Karnataka portal.

4.4 Vulnerability related metrics

To know the basic flaws in any system is must. Until and unless one does not know about the deficiencies in the any system prevention of such flaws and deficiencies can not be possible. It is sure that vulnerabilities always exist in various information systems whether system may be simple or complex. It would be better if one detects the vulnerabilities at the earlier stages of development of the information system. Since e-governance portals are designed by the government organizations and normally on the same guidelines and patterns. Hence vulnerability available on various portals can be easily detected and after detection it will be easy to prevent these vulnerabilities in future implementation of such e-governance portals and websites. Certain academic, grievance redress portals have been taken into account and same can be replicated for the other e-governance portals in various states of country. The analysis is done by selecting a tool to scan vulnerability of various websites and web portals. Most of the tools may not be designed for the purpose they are used for. But tools discussed here should not be considered inferior or inappropriate. The value of any tool is not assessed in general or in terms of comparison with others.

Vulnerability of various portals has been tested using Web Vulnerability Scanning (WVS) tools available in the market. Out of various tools (like Nmap, Nessus and Acunetix and Sam Spade), Acunetix WVS tool has been used for measuring vulnerability of the various educational institutes portals and grievance redress portals of various states. It has been chosen out of various other tools because it gives more and better results as compared to other available tools. For measuring vulnerability on such portals, metrics taken into account are shown in Table 4.4.

1) Vulnerabilities found

Number of vulnerability alerts shows how much vulnerable a particular Portal is. Various portals need to be scanned for knowing the status of their vulnerability.
Moreover portals having high level of vulnerability are more vulnerable as compared to portals having low level of vulnerability. Certain portals may be having many low level alerts of vulnerability but may not be having even single high level vulnerability such portals may be counted secure in comparison to portals having some high level of alerts and not low level alerts. Moreover monthly analysis of such alerts helps in decision making. It can be done through monthly vulnerability report which helps to explain how much vulnerability have been removed or patched and furthermore how much new vulnerabilities have appeared on the portal. SQL injection and cross site scripting (XSS) related vulnerabilities are taken/considered under high risk vulnerabilities.

Table 4.4 Vulnerability assessment metrics

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Metrics for Vulnerability Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Vulnerabilities found</td>
</tr>
<tr>
<td>(2)</td>
<td>Scan time</td>
</tr>
<tr>
<td>(3)</td>
<td>General Vulnerability features</td>
</tr>
<tr>
<td>(4)</td>
<td>Vulnerability level and possible sensitive directories</td>
</tr>
<tr>
<td>(5)</td>
<td>Email addresses and unencrypted data</td>
</tr>
<tr>
<td>(6)</td>
<td>Operating system</td>
</tr>
<tr>
<td>(7)</td>
<td>Server</td>
</tr>
<tr>
<td>(8)</td>
<td>Technology used</td>
</tr>
<tr>
<td>(9)</td>
<td>Open ports</td>
</tr>
</tbody>
</table>

2) Scan time

More scanning time requires more resources. The resources are computer, Internet and power. This time may depend on the computing capacity of computer. From the analysis it has found that number of vulnerabilities does not determine the scan time. Interestingly it has been found that portal taking less time in scanning were having less number of vulnerabilities. In a way scan time is independent of number and level of vulnerabilities.

3) General vulnerability features
Many studies and researches have been done in the areas of trust and security but there is shortage of research that addresses the impact of security and security awareness on various online activities for e-governance. There are various authentication, encryption and data management techniques so that data available on the portals can be managed properly. Portals having less number of threats and vulnerabilities are known to be more secure. Enabling the debugging facility on websites and portals is not good for security purpose. Yet certain portals have enabled this facility and debugging facility enabled screen shot of CDLU portal is shown in Figure 4.3.

4) **Vulnerability levels and possible sensitive directories**

Vulnerability level is categorized into three parts namely high, middle and low level vulnerability. Information related with databases on the portal, photos, accounts, images and admin related information is considered to be very sensitive. If such type of
information is accessible by everyone from any portal it may provide irreparable loss to the image of the organization. Sensitive directories and information must be secured through various known methods. In case of online information and data it is must that sensitive data and information must be transmitted in encrypted form. The possible sensitive directories screen shot of a scanned portal is shown in Figure 4.4.

**Fig. 4.4 possible sensitive directories of CDLU portal**

5) **Email addresses and unencrypted data**

Email addresses found on the portals are beneficial for the general public. But vulnerability related alerts related emails should be very less. More the number of such alerts invite more vulnerability. Majority of spam come from e-mail addresses harvested off the internet. The spam bots are the programs that scour the Internet looking for e-mail addresses on any website they come across. These spam bots programs look for strings like anyname@anydomain.com and then record any such email addresses found. In case
of online information and data it is must that sensitive data must be in encrypted form. Portals having more unencrypted data will be more vulnerable. E-mail addresses related vulnerability screen shot has been shown in Figure 4.5 and Figure 4.6 shows screen shot of sensitive data in unencrypted form.

6) Operating system

Portals working on latest platforms will have less number of vulnerabilities. As compared to windows operating system Unix/linux is considered to be more secure. Moreover latest versions of windows are considered to be more secure as compared to basic earlier versions of windows. The reason behind is that certain vulnerabilities which are known to public are removed from the earlier versions while offering new operating systems in the markets. Certain patches are also provided by vendors to genuine customers to remain
secure. Windows XP service pack 2 was provided to windows XP users to remove certain flaws from the Windows XP operating system. Conclusively it can be said the latest operating systems are more secure as compared to earlier versions of particular operating system. Hence operating system must be latest on server as well as on client machines.

![Figure 4.6 Sensitive data in unencrypted form of CDLU portal](image)

7) Server

Server used by host can easily be known with the help of scanner. After knowing the server its particular vulnerabilities are taken into consideration by hackers. Hackers stress on each exploitable vulnerability of the particular server and try to exploit any of the vulnerability if success can take over control of your system and may use your password to access database related/ attached to the portal. The monetary and image loss depends on the type of organisation whose portal is scanned.

8) Technology used
All these details of technology used, server and operating system used are screen shot shown by scanner of a portal in Figure 4.7.

![Figure 4.7 Scan details of a KUK portal](image)

9) Open ports

More ports are open implies more ways to attack on the system. Some ports are necessary to keep open for smooth functioning of the portal or website while others are not. Hence keep the minimum number of ports open so that working of the portal or website is not affected and on the other side hackers may not be able to utilize the open ports for exploitation. The complete list of open ports can also be provided by scanners. One example of open ports shown by the scanners is shown here in Figure 4.8.
Summary

In this chapter various metrics designed for the G2C e-governance and grievance redressing portals have been taken into account. Various tools, metrics and their objectives have been explained in detail. Metrics for the general and G2C, grievance redress portals have been implemented on certain states grievance redressing portals. Various metrics related with the vulnerability available on the portals are implemented on certain educational portals.

Various state government portals, national portals, certain grievance redress portals have been tested and views presented here are based on results of such tests. Maximum portals taken in account were of the G2C type portals. The complete details of various studies done related with the vulnerabilities and metrics are shown in graphical way in the next chapter of results and discussion. A complete list of all developed metrics is shown in Annexure-1.

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