Design & Implementation of Intuitive and User-Friendly Citizen-Centric Websites for Government of Assam for Sustainable eGovernance

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The research work presented in this thesis entitled ***'Design & Implementation of Intuitive and User-Friendly Citizen-Centric Websites for Government of Assam for Sustainable eGovernance'*** has been carried out under my supervision and is a bonafide work of Suchitra Pyarelal. This work submitted for the degree of Doctor of Philosophy is original and has not been submitted for any other degree or diploma to this institute or to any other institute or university. She has also fulfilled all the requirements including mandatory coursework as per the rules and regulations for the award of the degree of Doctor of Philosophy of Indian Institute of Technology Guwahati.

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Certificate of Authenticity

I, Suchitra Pyarelal declare that the Ph.D thesis titled ***'Design & Implementation of Intuitive and User-Friendly Citizen-Centric Websites for Government of Assam for Sustainable eGovernance'*** contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my work.

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ABSTRACT

E-Government systems targeted at various stakeholders aim to promote good governance and to bring in more efficiency, transparency, and accountability. The overall ease with which the end-user can avail the services from an E-Government system is paramount to its usefulness and thereby its effectiveness. The Government-to-citizens (G2C) interactions offer the widest range of information and services. The E-Government Systems built for Government to Citizen (G2C) services are intending to provide quality services, in the minimum possible time. The main benefit is improved relations between a government and its citizens. In such systems, some features require a fine balance in confidentiality and transparency.

The user experience of a citizen begins from the time of receiving the information about a service and its benefits and accessing the service through multiple channels to the final interaction with the system itself. The end-to-end experience of the interaction that the user has with the system can be termed as the human-system or human-computer interaction (HCI). The different stages combine to form the user experience. Although E-Government is high on the agenda of the Indian Government and many resources are set-aside for it, E-Government systems still face significant challenges as it continues to evolve. The success of electronic service delivery is not always clear. Adoption and use of the new services are still rather limited and need to be stimulated.

The focus of the research is on improving the information and services delivery through the E-Government websites in the context of the Government of Assam. The research work is combined with real-life implementation of websites and the learnings factored into the E-Government website development model and framework.

***Keywords*:** E-Government Websites, Citizen Interface, Design

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NeGP	National e-Governance Programme
ICT	Information and Communication Technology
MMP	Mission Mode Project
GIGW	Guidelines for Indian Web Sites
SGIA	Standard Government Website Information Architecture
G2B	Government to Business
G2C	Government to Citizen
G2G	Government to Government
HCI	Human-Computer Interaction
IS	Information Systems
SWF	Standardized Website Framework
UCD	User-Centered Design
PD	Participatory Design

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CHAPTER 1 E – GOVERNANCE AND GOVERNMENT WEBSITES

1.1 Introduction

E-Government can be broadly defined as a government's use of ICT, particularly Web-based Internet applications, to enhance the access to and delivery of government information and service to citizens, business partners, employees, and other agencies and entities (Wang & Liao, 2008). E-Government systems have become one of the most important channels for public service delivery and citizen-government interaction. OECD, 2003 defines E-Government as 'The use of information and communication technologies as a tool to achieve better government'. The adoption and use of the e-government strategy can provide significant benefits for the government in the delivery of more effective and efficient information and services to all e-government sectors (Alshehri & Drew, 2010). The performance of these systems ultimately reflects the effectiveness of a country's e-Governance (Yuan et al, 2012).

Citizens are by and large the largest beneficiaries of e-Governance. The majority of the E-Government systems have therefore been centered on the delivery of services to the citizen. E-Government systems aimed to improve the quality of the services and delivering these in the minimum possible time at affordable costs. These were built for delivering Government services electronically to various stakeholders[1] while ensuring efficiency, transparency, and reliability of the services. Citizen satisfaction is considered synonymous with good and effective governance. The overall ease with which the citizen can avail the services from an E-Government system directly co-relates to its usefulness and thereby its effectiveness.

1.1.1 E-Government systems: Indian context

The Indian Government has laid considerable emphasis on adopting e-Governance at all levels by leveraging Information and Communication Technology (ICT). The National e-Governance Programme (NeGP) that was put in place by the Government in 2006 marked a major step towards setting the stage for e-Governance. The vision of the NeGP was to 'make all Government services accessible to the common man in his locality, through common service delivery outlets and ensure efficiency, transparency, and reliability of such services at affordable costs to realize the basic needs of the common man'. Under the NeGP, several steps had been taken to establish the ecosystem of e-Governance program implementation. Augmentation of Bandwidth Infrastructure through *State Wide Area Networks (SWANs), Data Centers at National*

[1] Stakeholders: G2C- Government to Citizen G2G - Government to Government, G2E - Government to Employees, G2B - Government to Business, G2N - Government to Non-Profit Organizations (https://meity.gov.in/writereaddata/files/Framework%20for%20Citizen%20Engagement%20in%20NeGP.pdf),

and State levels (NDCs and SDCs), National and State Service Delivery Gateways (NSDG and SSDG), Mobile e-Governance Service Delivery Gateway (MSDG), and Government Cloud Infrastructure (Meghraj) are to name a few of the initiatives under the NeGP. The initiatives of e-Health, e-Panchayat, e-Municipality, and e-District were some of E-Government systems that were taken up for execution as Information and Communication Technology (MMPs) for reaching to the common man. (https://meity.gov.in/divisions/national-e-governance-plan). By drawing up the 'Framework for Citizen Engagement[2], an important step was taken by the Government for deeper engagement to ensure citizen centricity. Yet another step in the direction for citizen centricity was the drafting of the 'Electronic Service Delivery Bill' (https://meity.gov.in/content/draft-electronic-delivery-services-bill-2011). The bill required the public authorities to deliver all public services electronically within a maximum period of eight years.

To deliver all Government services electronically to the citizens through integrated and interoperable systems, the various existing E-Government systems had to meet the required standards for ensuring interoperability. E-Governance Standards for Technology, Data and Metadata, and Language have been prescribed for E-Government systems (http://www.egovstandards.gov.in/). The standards are based upon the policy on Open Standards for ensuring the integration and inter-operation of E-Government systems. In 2014 the Government of India launched the 'DIGITAL INDIA PROGRAMME' with the vision to transform India into a digitally empowered society and knowledge economy and to take the e-Governance to the next level. The Digital India program was centered on three key vision areas:

- Digital Infrastructure as a Core Utility to every citizen
- Governance and Services on demand
- Digital empowerment of citizens

The 'E-Kranti - Electronic delivery of services', 'Information for all', 'E-Governance-Reforming government through Technology' have been included as the three key pillars in the Digital India Programme. The vision areas and the three pillars are indicative of the renewed thrust on effective and efficient e-Governance for the citizens. Further, India as a country, which was ranked 107 in 2016 by UN E-Government Development Survey[2] has jumped 11 places to be ranked 96 in 2018. It is an indication of the impact that the 'Digital India' program has had on the overall e-Governance in the country. The UN E-Government Development Index Survey (EGDI) has three indicators:

(i) Online Service Index (OSI),

[2] https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2018-Survey/E-Government%20Survey%202018_FINAL%20for%20web.pdf

(ii) Telecommunication Infrastructure Index (TII) and

(iii) Human Capital Index (HCI).

OSI measures the online presence of the Government and online services available to the citizens. TII measures the status or availability of various Telecommunication Infrastructures in the country through which the citizens can access online services and HCI measures the education level of the citizens that will help them in accessing the online services. For India, the measurements were as OSI (0.5433), TII (0.1372), and HCI (0.4698). Although promising strides have been made by the Indian Government on several fronts in the area of e-Governance, studies on the outcome of its impact indicate that the benefits have not fully been realized.

1.2 Research Context

Adoption of the E-Government systems by the citizens has been slow even after years of the systems being in place. E-Government systems provide the window to the government information and services that are moving to online mode (Shareef et al, 2011). In the digital medium, government websites remain the primary source of information and service delivery for citizens. With the increasing levels of online mode of information and service delivery, the design of the citizen-facing government websites has become important. The Government has taken several steps to improve the usability of the citizen interfaces of the websites which are front ends of the E-Government Systems. The *Guidelines for Indian Web Site (GIGW)* brought out by the Indian Government provide the guidelines for web site usability and standardization. The *Citizen Engagement Framework* released by the Government advocates the participation of users through information sharing, collaboration, and consultative participation

This research focuses on the E-Government websites of the Government of Assam (GoA) that are the front-end for delivering government information and services to the citizens. Initial survey and studies of the existing websites of the GoA had brought forth several challenges being faced by the citizens in using the websites. The major issues that emerged are:

(i) low user-friendliness and lack of ease of use of the websites

(ii) website content not relevant to the citizens

(iii) website content not updated

(iv) websites not meeting the needs of the citizens

(v) inconsistency in websites which makes it difficult for a citizen to find the required information

(vi) lack of ownership of the websites by the departments

(vii) lack of visible identity for the Government websites.

1.3 Research justification

Several research works in the area of E-Government systems have resulted in identifying the elements that contribute to good website design. A few of the expected outcomes from the research work are as follows:

- Web usability guidelines
- Generic user interface models
- User-centered design
- E-Government website usability constructs

Despite the wide research on the design of E-Government systems, it is still fraught with challenges related to usability, reliability, and consistency of user interfaces. An important concern is that the literature in the E-Government domain lacks theoretical grounded empirical researches (Gonzalez, Pilar, et al, 2010). The usability of E-Government citizen interfaces is hard to predict due to the diverse nature of the citizens.

The GoA websites when studied were found to be having too much information that citizens found it difficult to locate the relevant information. The information provided in most of the websites of GoA was not attuned to the needs of the citizen. It emerged during the exploratory study that the requirements of the citizens were not kept in mind while the websites were developed. It was also seen that the information was not categorized based on the different categories of citizens. To address this, *research on techniques for information management, categorizing context-specific information based on the diverse nature of citizens will be required*. Those involved in providing the relevant information should understand the needs of the citizens best and in this case, it was the department themselves. However, while doing the exploratory study it was clear that the departments had no role in identifying the content for the websites. The information had to be regularly updated to meet the growing needs of the citizens. The websites of GoA had issues in their navigation, inconsistency in the content, and many links that did not work. This led to the challenge of the trust and credibility of the websites. *Research should support the development of improved design and interface architecture for usable website interfaces.* Keeping the specific nature of requirements of Government websites, which have to cater to diverse users, *research should support in developing best practices for making the websites usable and identifying factors for building trust and credibility*.

From the shortcomings in respect of the citizen-centric E-Government websites of GoA, the scope of this research work became evident. The justification for this research work is summarized in Table 1.1

Table 1.1 Justification of the research based on the exploratory study of websites of GOA and supporting literature review

Sl. No.	Elements contributing to good E-Government design	Literature review	Justification for the areas not adequately brought out in the past research work
1	User-centered design	Effective E-Government systems need to factor in the requirements of their users and stakeholders (Olphert & Damodaran, 2007). Usability affects citizens' usage and acceptance of e-government and influences their day-to-day interaction with E-Government websites (Clemmensen & Katre, 2012).	*Research is needed to produce methodologies that will capture the diverse needs of the citizens.*
2	Generic user interface models	The users of E-Government systems have widely varying abilities, age, education, and digital literacy and hence 'one size fits all' approach is not feasible (OECD, E-Government Studies, 2005).	*The technical architecture for the citizen interface design needed to be evolved.*
3	Web usability guidelines	Usability is a critical element in the success of E-Government Systems (Youngblood & Mackiewicz, 2012).	*Usability to be built into the entire design process.*
4	E-Government website usability constructs	Technical and design issues, particularly the complex user interfaces have hindered many E-Government systems from achieving their objectives (Tambouris et al, 2009).	*Standard interface design architecture for the websites*

1.4 Research Questions

The research questions that follow are broadly classified under the major requirements:

(i) What are the factors that contribute to user interfaces for E-Government websites for the citizen?

(ii) What design practices are to be adopted by the developers of the websites for meeting the diverse nature of citizens?

(iii) What are the techniques to build content attuned to the needs of the citizens?

(iv) How to build usable, consistent, and reliable user interfaces for the websites?

(v) As usability for E-Government citizen-centric websites are hard to predict, what are the techniques to be adopted while designing the interfaces?

(vi) What methodology to be adopted for integrating usable design techniques at the development stage of E-Government Systems?

(vii) How to evolve the best practices for building, structuring, and managing content for citizens?

(viii) How to bring in the ownership of the departments which was important for the sustainability of the websites?

1.5 Problem Statement

The success of E-Government systems is dependent not only on government support but also on citizens' willingness to accept and adopt those e-government services. An understanding of the factors for bringing about citizen acceptance is required (AlAwadhi & Morris, 2009). Patel and Jacobson [2008] in their study on the factors influencing the adoption of E-Government by the citizens have identified usability, design, trust, and empathy as the important factors. The design of an e-government system must simultaneously address the user experience requirements of diverse users such as people from varied educational and professional backgrounds, senior citizens, physically disabled, those who are illiterate, and people with different languages and cultural preferences.

"Several paradoxical principles thus need to be applied while designing the user experience for e-government systems. 'Personalized' versus 'designing for masses', 'simple to understand' versus 'informative', 'feature richness' versus 'ease of use', and 'government-centered' versus 'citizen-centered' being some of them. A fine balance is demanded with regards to strategy while designing the user experience for e-government systems" (Katre & Clemmensen, 2011). Ease of use, Simple and convenient, the relevance of content, consistent in structure and content, good navigation capability, reliability, credibility, working seamlessly

across all devices, and meeting the needs of diverse citizens are the important factors that have emerged from studies.

To understand various issues and challenges in the Websites of the Government of Assam, the front-end information and services delivery to citizens were first evaluated. Initial studies of the existing websites of the Government of Assam had brought forth several issues faced by the citizens. Apart from the content not being updated, the low user-friendliness of the websites was an equally important issue. The government websites were inconsistent and difficult for the common man to use. On gaining a deeper understanding of the process of development, hosting, and maintenance of the Government of Assam websites, several challenges emerged. The major challenges that existed in the websites of GoA that came out during the initial studies made are as follows:

(i) Information about the users and the needs of users were not kept in mind during the design and development of the websites;

(ii) User Experience of the websites was very low;

(iii) Department Websites existed as silos with no cross-sharing of information;

(iv) Website management was carried out by one or two individuals and ignorance of department officials about their website;

(v) The content was not updated and not relevant to the citizens

Failure to develop usable and credible websites may change users' attitudes, reduce their satisfaction, and raise their concerns about the use of information and services offered on those websites (Wathen and Burkell, 2002). The Government websites not only represent the window to the public but also represent the face of the government. Design of the E-Government websites of GoA have to be not only user-centered but must build trust and credibility and thus increase its use and adoption by the citizens.

1.6 Research Gap

Researchers have made important advances in certain categories of citizens. There are gaps when it comes to applying the same to the general category of citizens who access E-Government websites. There is a need to combine the design into the software development process, which will involve interdisciplinary research. Research done so far has not produced any reliable model that can be adopted end to end in E-Government systems.

1.7 Research Aims & Objectives

This research aims to identify website design elements and their parameters that will improve the overall effectiveness of ICT enabled services across all GoA websites and propose a standard guiding framework for their implementation.

The main objectives are as follows:

(i) To identify the main factors that have resulted in the low usage of websites.

(ii) Study of literature review where similar research has been carried out on both the limiting and contributing factors in the usage of citizen-facing websites.

(iii) Study the global and national best practices adopted for citizen-facing websites

(iv) To leverage the findings to improve the quality of E-Government websites.

(v) Develop a standard guiding framework that can be implemented in the Government of Assam websites.

(vi) Development of usable and credible websites and make the usability of E-Government websites an integral part of the development lifecycle.

(vii) Develop a sustainability model for websites.

1.8 Overview of the Research

Several empirical work and studies have been carried out in the area of website usability. From the fact that many of the websites are not meeting the minimum requirements in terms of functionality and usability, emerge two possibilities.

One, more work is required to be done to translate the earlier research findings into a practical mode.

Second, that the research works have not factored in the specialized needs of designing E-Government systems viz: hard to predict usability, tradeoffs required in the design, to run on different devices of varying bandwidth and optimal information display.

This research will focus on the following areas that are considered essential to the design of the interfaces, meeting the requirements of the citizens, and ensuring sustainability:

1.8.1. Information and content

A clear understanding of the requirements of the citizens is to be decided as the starting point of the design. The focus of the research will be on the strategy for attuning the website to the specific needs of the citizen:

(i) Gather the needs of citizens

(ii) Categorize the needs

(iii) Identifying the required content

(iv) Intuitive content

1.8.2. Design principles for the user interfaces

(i) To establish the set 'must-have', 'desirable' design principles

(ii) To establish the set of 'parameters' that contribute to a good and effective citizen interface.

(iii) To extend the existing usability guidelines.

1.8.3. Adapting the technology development for the design interfaces

(i) To develop design methods for consistent, intuitive, and usable citizen interfaces.

(ii) To extend the IS models and Human-Centered design life cycle for Citizen Interface designs so that all the above areas can be factored as a design discipline in the life cycle of design and development of citizen-centric interfaces of E-Government systems.

(iii) To develop usability evaluation models based on the target age groups and levels of computer literacy, and prototyping techniques for the design life cycle.

(iv) To build techniques for making the design principles an integral part of the development.

(v) To establish a Technology Architecture for Government of Assam Websites: User interfaces and user interaction points.

1.8.4. Process for bringing ownership, commitment, and a sustainable model

(i) Capability building approach for all stakeholders of E-Government Systems.

(ii) An institutional mechanism to be established in the departments to bring in the ownership.

(iii) Establish specific guidelines, best practices, and processes for the design of citizen interfaces.

Finally integrate all of the areas that relate to the 'Information', 'Technology' and 'Process' to establish a 'Design Framework for Citizen-Centric E-Government Systems'.

1.9 Research Approach and Methodology

The research approach to be considered will be partly a case study driven and partly empirical. The learning from the case study will be factored in to evolve a model that can be implemented in a real-life project for the GoA websites. The methodology may have problem identification as the first stage. Identifying the gaps, collection of research data; and evolving a pilot model case will be the second stage or the solution stage. The final stage will be the validation of the resulting websites against the major success indicators.

1.9.1 Study of the existing websites

A study of the existing 29 websites of the Government of Assam will be first carried out to understand the following:

(i) Factors contributing to the low usage and acceptance level of the websites by the citizens;

(ii) Challenges in the user interface of the websites;

(iii) Factors that led to the website content not meeting the citizen needs.

1.9.2 Study of the Best Designed Government websites (National and Global)

A study will be done to understand the best practices adopted by some of the best-designed websites. The emerging National and Global E-Government websites will be studied. An exploratory study of the governmental websites of the Indian states such as Rajasthan, Haryana, and Kerala was found to have features that scored over the other state's websites.

Among the global sites, the websites of the UK, Australia, and New Zealand were considered among the best replicable models. These websites will be studied for the features which are the strengths of these websites.

Further, the UK Government had established standard styles, components, and patterns to ensure consistency and usability in their websites.

1.9.3 Discussions with the 29 departments of the Government of Assam

Discussions with the stakeholders (29 departments of GoA) will be held to get answers to the following questions:

- Why were the websites not providing the basic information sought by the citizens?
- Why was the content not being updated?
- What was the process adopted in website development?
- Were the requirements of the end-users of the website kept in mind while designing?
- Was any feedback gathered on the experience of the end-users of the website in terms of usability, usefulness, and level of satisfaction; are the interaction design of the information and service delivery to the users adequate?
- What are the problems in the websites that are preventing its wider usage?
- Are the required information and services being provided in the right manner?
- Do the citizens get what they look for in the minimum time with minimal effort?

The answers to the above can be obtained only from the Government departments that were the owners of the departmental websites. Consultations with the departments are therefore

considered necessary. For this, focus Groups of Nodal Officers are to be identified in every department.

1.9.4 Identifying the desired features to meet the need of citizens

Citizens should be able to reach the information that they are looking for, in minimum possible time (findability), with minimum efforts (ease of use), minimum support (intuitiveness); obtain the right and relevant information (trust and authenticity) in an efficient manner (navigability). Winning the trust of the users of the website and building the confidence of the department officials emerged as critical parameters to building effective websites.

1.9.5 Types of citizens

The E-Government websites need to cater to citizens who differ in their needs and requirements, age, literacy, the medium of access, and socio-cultural background. This diversity will require that the information content is targeted to the specific citizen. While designing the website, it is important to understand the user and the information they seek. The role that a citizen can assume can be as a farmer, health worker, businessman, job seeker, student, and many more. The information delivered through the website must cater to the specific role and nature of the citizen.

1.9.6 Execution

The first step is to understand the gaps in the existing websites of GoA concerning three areas: Information, Technology, and Process.

Information

- Content to be relevant to the citizens
- Understand the users and then delve into their specific needs
- Involvement of the department for obtaining the information content
- The categorization of the content
- Information placement based on the importance
- Adopting the best practices for content
- Uniform content and templates

Technology

- Development of usable interfaces
- Design practices to be adopted during the development stage
- Sharing of content between departments
- Common hosting environment
- Websites to be in Government domain

Process

- Capacity building
- Sustainability
- Ownership and Commitment of the department
- Feedback mechanism for continuous improvements

To achieve the above, the required numbers of Tool Kits will be designed so that the Aim and Objectives of the research are fulfilled.

1.10 Analysis/Inference

The analysis based on the findings from the exploratory study, qualitative and quantitative research will be carried out in stages. From each stage of the research, the determinants for the E-Government websites will be established. Finally, it will be narrowed to the most important determinants that will form the basis for the analysis.

1.11 Validation of the research

The research planned will be validated for its success using few parameters identified initially from a pilot study of the existing websites of the Government of Assam. These are mentioned below:

Improved interface with expert support

The design of the citizen interfaces of the websites was lacking in visual aspects, basic design principles, and usability, and user interaction.

Validation can be considered based on a comparison of the Website of the existing department before and after implementation of interface designed with expert support for building user interfaces considering the role of human-computer-interaction in building the user interaction for citizen-facing websites.

Increased hits in the Government websites

Validation can be considered based on a comparison of the visitor counts of the website of the existing department before and after implementation of interface design. If it results in increased hits in websites for almost all the Government websites in the terms of the visitor count, this will mean the increased acceptance of websites by citizens. Thus we will be able to validate Improved user acceptance and revisit to the sites will indicate that the citizen was obtaining the required information.

Validation of User Interface principles

User interface design needs to consider the psychological and physical constraints of humans and how short-term and long-term memories work (Mandel,1997). This can be achieved by making the user interface consistent, which will reduce the users' memory load and give users

more control over the website and the need for external support. This can be validated through Consistency in websites designed.

User-Centered and Participatory approach

From the initial study made of the websites of Government of Assam website, it was concluded that the websites had been developed based on the requirements provided by the government department officials, without considering the user and user needs. Identifying the end-user of the Government of Assam Websites and then understanding their needs is to be undertaken in the early stage of the website development.

The above can be validated through the proposed methodology where user participation is built-in and hence should result in a more accurate definition of requirements, improved user interfaces, greater buy-in from the users, and decreased resistance to change. It can validate the importance of aligning the website to the requirements of the users.

Sustainability

Stakeholders in E-Government Systems refer to the Government (departments), Citizens (who will use the system), and Technologists (who will build the system). All the stakeholders are to be brought to a single platform for achieving the common objectives. The capability and skillsets required from each stakeholder which is specific to their role in the overall cycle of systems design and development. To build the capability within the Government at all levels specific to the user segment, training is to be conducted for content managers to identify the needs of the website users, in content preparation, developing the capability and language of the websites. The active involvement of all stakeholders should result in:

(i) Greater acceptance of the websites by the citizens

(ii) Commitment and ownership of the department

(iii) Department content updated regularly

(iv) No dependence on the external agency for updating

The positive results on above will validate the research outcomes.

1.12 Scope and Limitations

Modeling and understanding the users' interaction experience is an important challenge in the design and development of adaptive intelligent systems. Designing a Standard interface that meets all the diverse requirements of users will be a key challenge during the development of a Standard Website Interface. This is mainly because the interaction requirements of websites cannot be generalized.

The scopes are to develop improved design methods and metrics, improved tools for building usable, consistent, and reliable user interfaces, software architectures for the next generation of user interfaces, and improved methods of delivering online assistance.

The measure of Usability and Interaction is not easy to predict especially when it comes to citizen-centric systems.

i. Hence the research and studies need to first simulate the model of HCI with the Websites.
ii. Design practices for the diversity of users and design patterns for seamless access need to be evolved.
iii. How these can be dovetailed into the life cycle development is needs to be evolved.
iv. Techniques for user participation, end-user usability evaluation tool for studying the interaction patterns at different points during the design cycle of the E-Government system.
v. Methods to develop usability evaluation models based on the target age group, level of computer literacy.

The biggest limitation that can be anticipated is that Assam is having different ethnic groups with different languages. All websites of the Assam Government at the time of starting this research are in the English language, whereas the official state language of Assam is Assamese and ideally the websites should be in the Assamese language too. But since there are other associated languages in the state, there is always a demand for using other languages in all official matters. This will limit the present work and hence to be accepted by this researcher as such and scopes should be limited to having the websites initially in the English language by accepting the limitations.

1.13 Research contribution and Expected outcomes

The key aim of the research is the development of usable and credible websites. This requires the usability of E-Government websites to be made an integral part of the website development lifecycle. The initial research studies of the websites have brought forth two challenges for addressing the usability area.

One, the development did not take into consideration the usability and credibility factors.

Second and more important is the lack of skilled expertise in developing user interfaces.

This research is expected to contribute to overcoming these shortcomings.

1.13.1 Expected research contribution

As a part of the research, a methodology is to be evolved in the context of GoA for preparing and creating the website content. The Content Managers (if existing and if not to be created) of every department can be taken through activity-based exercises that require them to identify the functions performed under their area of work and information generated from each of the functions performed. The content managers have to identify the target user groups of their websites. The content is then to be grouped to meet the specific target user groups of the websites. As the Content Managers represent every branch in the department, obtaining all information of the department can be ensured through these exercises based on toolkits prepared for each activity.

For the credibility of the websites, the content of the websites expected to be updated, and most recent. The departments themselves are required to take ownership of the content and ensure the updating. The need for capacity building is considered important for regular content updating. A methodology is to be evolved as a part of the research work to make capability building an inherent part of the website development process. The approach will be to build a core workbench within the department through a team of 'Master Trainers'.

1.13.2 Expected Research outcomes

Following major outcomes are expected once the proposed research:

Research outcome 1

The proposed methodology if found successful, maybe adopted while developing websites of every department of Govt. of Assam. This will ensure that the needs of the users are considered, content attuned to the target users in content preparation, developing the capability and language of the websites. The websites should have specific sections and content targeted for the end-users.

Research Outcome 2

Usability testing practices are to be adopted for improving the user experience of the websites. With support from experts of IIT Guwahati, design standards for usability and user interaction are expected to be applied to the websites. Websites are expected to have more focus on the user interface and user interaction.

Research Outcome 3

The capability of the departments for managing their respective websites can be ensured by building the core workbench of 'Master Trainers'.

Research outcome 4

A Standard Website Framework is expected to be established which will have guidelines for the process, information, and technology areas for website development. The process is expected to ensure the institutional mechanism for website development, ownership and commitment, and sustainability.

1.14 Outline of the thesis

The thesis is divided into 7 chapters and various topics covered under each chapter is as under:

Chapter 1 is an Introductory chapter on eGovernance followed by setting the Research Context, Research Justification, Research Questions, Problem statement, Research Gaps, Aim and Objectives of the research, Overview of the Research, Research Approach and Methodology adopted, Analysis and Inferences from the research, Validation of the research, scope, and limitations of the research, Research Contribution and expected outcomes and Outline of the Thesis.

Chapter 2, Literature review on the research area covers E-Government systems: Indian context, Adoption of E-Government Systems: Key factors, User-Centered design and Participatory Design, E-Government System design, Human-Computer Interaction in G2C E-Government systems, Interaction Design Principles, Design Models and Frameworks for E-Government systems, etc.

Chapter 3, is on the Study of websites of the Government of Assam. National and Global governmental websites.

Chapter 4 outlines the Methods of Analysis and Inference from Chapter 3.

Chapter 5, covers the Standardized Website Framework (SWF) for the websites of the Government of Assam.

Chapter 6, Case study: Government of Assam websites- Methodology.

Chapter 7 provides the Summary, Validation, Conclusions, and Recommendations and is the concluding chapter of the thesis. Findings from the research, conclusions drawn from the research, recommendations based on the research, and Scope for future research are the topics covered in this chapter.

In addition to the above, there are various Annexures and References placed at the end of the chapters to complement the research work.

CHAPTER 2 LITERATURE SURVEY

2.1 Studies on E-Government systems: Indian context

The objective of E-Government systems for citizen-centric services is to improve the way Government services such as land and property registration, birth and death certificate services are provided to citizens. Patel and Jacobs (2008) had made a fair assessment on the scenario of E-Government systems in India where they have recommended a comprehensive review of the empirical studies in the context of G2C E-Government adoption by citizens. It considers the lack of E-Government studies in developing countries, especially India and suggests that individual characteristics of citizens are important to study the factors that influence E-Government adoption. Also, these factors can be influenced by the varied cultural background of citizens. Due to a lack of empirical and theoretical G2C studies examining cultural influence, the paper acknowledges the contextual exclusion of culture and its influence on the adoption of e-government usage by citizens; which is also a limitation indicating that culture can have a profound impact on E-Government service adoption.

2.2 Adoption of E-Government Systems: Key factors

The key to making G2C E-Government work successfully does not depend on technology but the citizens (Akman et al, 2005). The model proposed by Kumar et al.2007 of E-Government adoption considers citizens to be the focal point of e-Government services. Public services through E-Government have mostly been developed with a government perspective in mind with other users given less attention (Holgersson and Karlsson, 2014). The rate of uptake of the citizen services is currently very low, as a result of which, the end objectives of E-Government systems are not fully realized (Capgemini, et al., 2009). Two factors are directly attributed to this scenario: (i) lack of usability of the systems and (ii) lack of user-centricity in the interfaces of the systems (Olphert & Damodaran, 2007).

2.2.1 Usability

Usability refers to the extent to which the user and computer can 'communicate' clearly through the interface (Huang & Benyoucef, 2014). Usability (also known as seamless interaction) has been considered as a key factor that influences the adoption of E-Government services (Patel & Jacobson, 2008). Measurement of success factors of E-Government services has identified usability as a critical element in the success of E-Government systems (Youngblood & Mackiewicz, 2012). According to (Clemmensen & Katre, 2012), usability affects the acceptance of the services by the citizens, usage, and the day-to-day interaction with E-Government websites.

Developers of E-Government websites need to aim to enhance the usability of the websites to attract and satisfy the users (Scott,2005). The investigation of Verdegen and Verleye (2009) has shown that users' adoption and use of E-Government services relates to usability in terms of navigability, flexibility, and degree of access. A high level of usability can benefit E-Government websites in two ways. First, as the website is the window to the users, it provides the first impression of the government to the users. Secondly, usability improves the satisfaction of the users with the E-Government (Huang & Benyoucef, 2014). Much of the usability requirements in E-Government websites are driven by legislation that mostly addresses the accessibility issues (Kotamraju & der Geest,2011). Existing guidelines do not meet the requirements for the holistic development of E-Government systems which will cover usability, user-centricity, and user experience.

2.2.2. User centricity

Generic characteristics, such as age and education have a considerable impact on the use of E-Government systems (de Róiste, M., 2013). This holds more relevance in the case of users of E-Government services where users are very diverse and heterogeneous (Verdegem & Verleye, 2009). The diversity of users accessing the E-Government systems makes user-centricity central to providing effective citizen services. Most E-Government services are however seen as falling short of being citizen-centric (Soufi & Maguire, 2007). Although citizens are the key stakeholders of E-Government systems, they appear to have very little input into the creation and development of the systems (Olphert & Damodaran, 2007). The lack of early understanding of users and their requirements in E-Government systems has often been cited as one of the main reasons for the slow adoption of the systems. There are documented case studies of systems that have failed due to the non-involvement of users (Olphert & Damodaran, 2007). To realize the true potential of E-Government systems, the initiatives need to be grounded on an in-depth understanding of citizen needs, perceptions, and other factors influencing its uptake (Lai & Pires, 2010).

2.2.3. User experience

Garett in his book 'Principles of User Experience' has described websites as a self-service product where a user has no external support when facing the website. There are no user manuals or representatives to guide the user. It is the experience of the user that will be the only factor that will determine if the user will come back to the site. The user experience of a citizen begins from the time of receiving the information about an information service and its benefits, accessing it through multiple channels to the final interaction with the system itself. The end-to-end experience of the interaction that the user has with the system combines to form the user

experience. In this, the actual interaction with the website for obtaining the information is considered as the longest stage and plays an important role in determining the effectiveness of the site. The quality of navigation and ease of website usage determines the amount of content read, users' response to the site, and their intention to revisit the site (Fisher et al). Recognizing that user characteristics directly influence E-Government adoption, many governments are adopting strategies based upon a citizen-perspective approach.

Usability is recognized as a critical factor for the success of E-Government systems. Developers of E-Government systems need to consider usability as an important factor and enhance the usability of the systems to satisfy users.

2.3 User-centered design

User-centered design (UCD) is an approach involving users and addressing their needs throughout the design process of E-Government systems (Kotamraju & der Geest,2011). The extensive research work in the field of Software projects and Information Systems, the role of user and user involvement have been considered as critical success factors (Verdegem & Verleye, 2009, Kumar et al, 2007, Kotamraju et al,2011).

According to Karlsson et al. 2012, UCD has nine main goals, as summarized in Figure 2.1. The overall idea of UCD is that the developed system is there to serve the user (UCD-G1). Hence, the development process should be designed to consider an 'individual user's capabilities and fully satisfy his or her needs related to the system to be developed'.

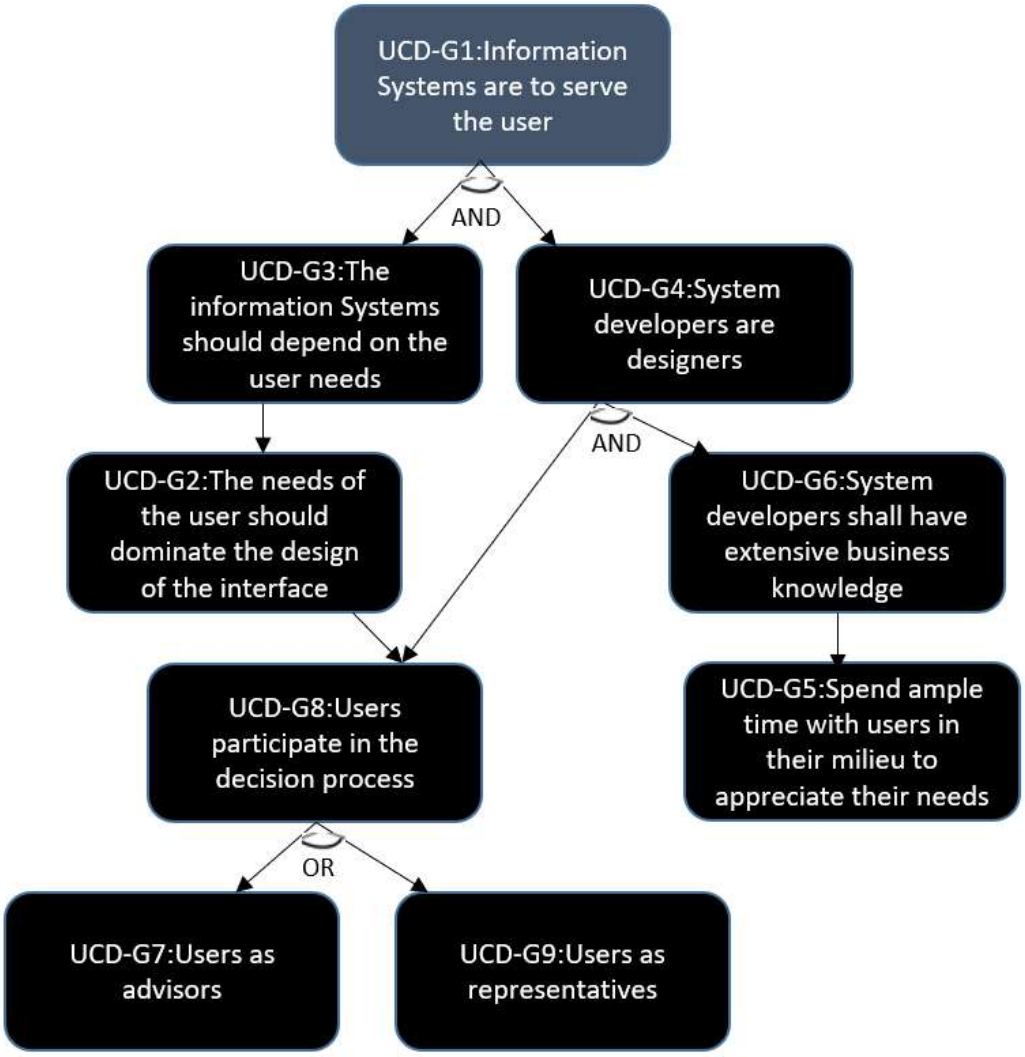


Figure 2.1 Goal Analysis of UCD (Karlsson et al,2012)

2.3.1 Identifying the users

The user-centered design should be the base while identifying users (Shneiderman & Plaisant,2010). The design should represent trustworthiness for increased adoption by citizens (Kotamraju & der Geest,2011). Noyes and Baber,1999 proposed two simple steps for identifying the users: (i) define the characteristics of the user population, and (ii) work with a representative sample of the user group. All design should begin with an understanding of the intended users, including population profiles that reflect age, gender, physical abilities, education, cultural or ethnic background, training, motivation, goals, and personality. Findings in Kujala & Kauppinen, 2004 further support the view that varied kinds of users should be selected for user-centered design. The unclear target segments pose a challenge in identifying the users which in turn can affect meeting the usability goals ((Holgersson and Karlsson, 2014).

2.3.2 User needs

For effective e-Service delivery, knowing citizens and their needs are essential building blocks of E-Government systems (Velsenan et al, 2009). Services research community emphasizes that for citizen services to be satisfactory, it must meet the needs of not only end-users but also of the organization (Kotamraju and Van der Geest, 2011). A widely accepted principle of UCD is to take the needs of users as the core of user-centered design (Marti & Bannon, 2009, Kotamraju & der Geest, 2011). The UCD School implies 'an up-front commitment to taking the needs of the user as the central point for design' and an understanding that information systems are to serve the user. Understanding user needs is considered as a principal goal of user involvement (Kujala, 2008). Users' needs should dominate the interface design (UCD-G2) and the starting point is to understand users' requirements concerning the user interface (de Róiste, M.,2013). This UCD principle is in line with the requirements elicitation part of generic software development (Maguire, 2001).

2.3.3 Participatory design (User involvement)

Getting the users involved is the next logical step after identifying users and their needs, notwithstanding the challenges associated with user involvement. User involvement is expected to cover user-centered design, participatory design, ethnography, and context of use (Kujala, 2003). Involving prospective users provide more accurate requirements (Velsenan et al, 2009). User involvement prevents 'superfluous features' and 'increases acceptance' (Kujala, 2003). The need for involving users is increasingly shared equally by designers and practitioners (Holgersson and Karlsson, 2014). Many studies have come up with techniques for user involvement. Users perform various roles as informative, consultative, and participative (Kujala & Kauppienen, 2009). Karlsson et al recommend three techniques: Participatory Design (PD), User-Centered Design (UCD), and User Innovation (UI) in their study. Three levels in participatory design recommended by Mumford (1981) are advisory, representative, and consensus. Use case scenarios and assessment frameworks (SERVQual) are recommended for citizen-centric service design (Lai& Pires, 2010).

With the increasing use of ICT to provide governmental services, the interaction and mutual dependency of the design of services and the supporting E-Government applications are becoming more visible. The redevelopment and the integration of the services can only be achieved with the participation of the practitioners involved. Participatory Design and methods can be deployed to mediate between the architectural concepts and elements and the concrete practices of service provision (Marchese et al, 2002). The following parts have been identified as key ingredients in the overall methodology:

(i) design workshops between developers and users

(ii) usage of concrete representations like mock-ups and prototypes as boundary objects between developers and users

(iii) using ordinary language and easily understood

(iv) using an iterative and evolutionary approach allowing for feedback and learning

The recommendation of Verdegen and Verleye, 2009 as 'Rethinking of government services with an outward-looking approach starting with citizens' needs, in place of an inward-looking approach, starting with the citizen services' sums up the research findings. Existing research concludes with the necessity of the knowledge of users and their needs in the design of E-Government systems. Technology that incorporates users and their needs is not an easy process (Kotamraju & der Geest,2011). The research studies also bring out the challenge in identifying users of E-Government due to the heterogeneous nature of users. The importance of incorporating the user requirements in the development of E-Government systems has been discussed at length in several studies. Extending this concept to E-Government systems, identifying the users and user characteristics should be the first step. User-needs should get precedence above all in the planning stage of the E-Government system. The conclusions to be drawn from the literature review are that, even though the user is recognized to play a pivotal role in the design, E-Government systems rarely engage a fully involved user-centric process. Pre-design research is extremely rare and the most important cycle of identifying users and their needs is not completed (Kotamraju & der Geest,2011).

2.4 E-Government system design

Studies have shown that including user-centered requirements in the design of E-Government systems have added value (Damodaran,1996; Kujala, 2003). Many studies have pointed to the lack of integration of user-centered design in E-Government systems (Capgemini, et al., 2009). There is not much expertise for the developers in user interface design and lastly, it is difficult to find usability experts (Vanderdonckt & Beirekdar,2005).

For E-Government systems to succeed, there is a need to sharpen understanding of factors involved in integrating user-centered design in E-Government (Kotamraju & der Geest, 2011). The design of the E-Government systems is guided more by technological possibilities rather than by user needs (Verdegen and Verleye,2009). Too much attention is paid to the technology itself than to the real needs of the users (Bertot et al 2008). The developers of E-Government systems focus mostly on coding and system functionality. Although studies have pointed to the

need for user-centered design made as an integral area in the life cycle for E-Government systems, there are very few documented techniques available.

Surveys and studies indicate that a formalized approach is required for generating user requirements (Velsenan et al, 2009). From the literature review, the recommendations of three studies (Maguire, 2001, Velsenan et al, 2009, Kujala S, 2003) are attuned to the nature of E-Government systems. The salient methods recommended in the three studies are further discussed here. The intrinsic nature of E-Government services with its heterogeneous user groups, complicated content, and incidental use is considered for user requirements engineering (Kujala S, 2003). Requirements engineering has been stated as the foundation of systems development. The requirement gathering methods are compared and analyzed as

1) user requirements interview
2) scenarios of use
3) user-requirements notation
4) low-fidelity prototyping
5) citizen walkthroughs
6) Stakeholder and citizen walkthrough analysis,
7) task/function mapping,
8) user, usability, and organizational requirements.

The prototype needs to be evaluated with the end-users and user inputs should go towards reformulating the requirements.

2.4.1 Human-centered design cycle

The International Standard for Human-Centered design (ISO 13407, 1999) on human-computer design prescribes five essential processes to be carried in an iterative model for addressing the usability requirements. They are

1) Plan the human-centered process,
2) Understand and specify the context of use,
3) Specify the user and organizational requirements,
4) Produce design and prototypes and
5) Carry out the user-based assessment.

The Human-centered design process (ISO 9241-210,2010) have included UCD principles (Holgersson and Karlsson, 2014). Interface requirements are important aspects in determining the functionality and behavior of the system being developed (UCD-G3). In early UCD research, developers were promoted as being system designers and builders (UCD-G4). On the other hand, users were seen as passive advisors who respond to the developers' needs (UCD-G7). For the

developers to gain the necessary business knowledge (UCD-G6), they were encouraged to 'spend ample time with the users in their milieu' (UCD-G5). However, Karlsson et al. (2012) argued that, in more recent literature, the user role has evolved, 'by involving the user more directly in the decision process (UCD-G9)'. Both cases show that users participate in the decision process (UCD-G8), although to different degrees (de Róiste, 2013). As in user-centered design, identifying stakeholders and active involvement of users are considered as essential processes recommended in ISO 13407, 1999 also.

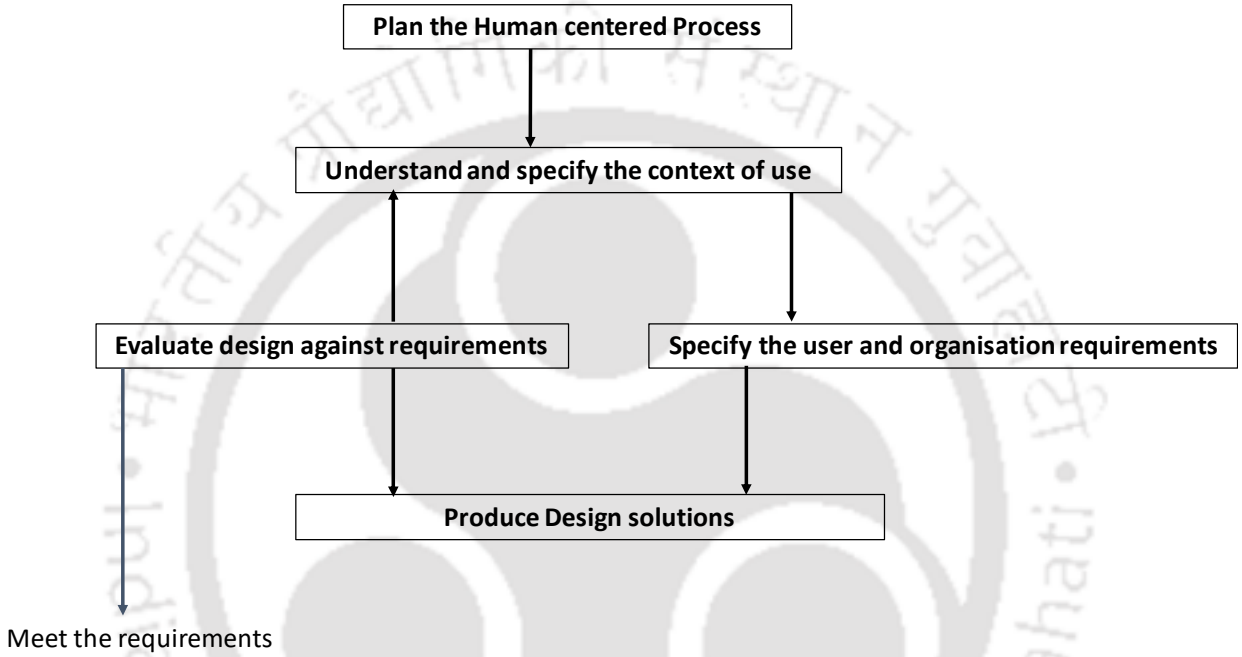


Figure 2.2 Key Human-centered design activities (from ISO 13407)

A few studies however point to the challenges in citizen participation. One view is that participation should be considered in the political and cultural context (Heeks. R,1999). Resolving conflicts between user groups, demand for changing the system at a later stage are some problems that system developers may face. The recent studies reported that citizens require incentives for participation and bringing the desired participation is demanding for the organization (Karlsson et al, 2012). Studies, however, conclude that the benefits of user participation outweigh its challenges. Having a direct dialogue with the potential users will help the developers and designers to gain a complete understanding of their needs and requirements.

2.4.2. Human-Computer Interaction in E-Government systems

The end-to-end experience of the interaction that the user has with the system can be termed as the human-system or human-computer interaction (HCI) in connection with the E-Government system. The Special Interest Group on Computer-Human-Computer Interaction of the Association of Computing Machinery (ACM SIGCHI) defines HCI as "a discipline concerned

with the design, evaluation, and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them" (ACM SIGCHI, 1992). The inter-disciplinary nature of HCI combines computer science (application design and engineering of human interfaces), psychology (the application of theories of cognitive processes and the empirical analysis of user behavior), sociology and anthropology (interactions between technology, work, and organization), and industrial design (interactive products) (Hewett et al., 1992).In a survey undertaken by the European Commission, the most frequently mentioned reasons for citizens using e-services are saving time and gaining flexibility (Bargas Javier et al, 2010).

Ongoing advances in HCI, cognitive science, psychology, and neuroscience have greatly enhanced the ability of systems to effectively diagnose users' behavior and to provide appropriate assistance and adjustment (Jraidi et al, 2014). Areas of usability, utility, efficiency, and appeal that have been identified as factors influencing the adoption of e-government services by citizens are in tandem with the goals of HCI (Zaied, 2012). This marks the importance of HCI and its role in E-Government systems specifically at the interaction layer. A fine balance concerning strategy, therefore, is recommended while designing the user experience for E-Government systems and this can be achieved utilizing suitable human work analysis and interaction design (Holgersson J and Karlsson F, 2014).

2.4.3 E-Government user interface design

The goal of the interface design process is seen as transforming the user's conceptual model via the designer's model of the user experience to finally the programmer's model (Kossak et al, 2001). Several research studies have linked the influence of HCI in the design process of user interfaces. More specifically, HCI is seen to support the development of interactional techniques in the development of user interfaces. The involvement of the user and their cognitive and behavioral factors are said to be the two dimensions of HCI in the design process. Consideration of the psychological and physical constraints of humans while designing user interfaces is recommended by Kossak et al, 2001. The approach suggested by Preece et al,1994 for achieving the goals of HCI are involving the users and the iterative design process.

2.4.4 Interaction design principles

A heuristic evaluation is a usability inspection method that helps to identify usability problems in the user interface (UI) design. Jakob Nielsen's ten general principles for interaction design called "heuristics" are the most-used usability heuristics for the user interface; the final set of heuristics also known as 'Usability Heuristics' (https/www.nngroup.com/articles/ten-usability-heuristics). Several studies have measured the usability of the websites using Nielsen's heuristics

and pointed out the effectiveness of heuristic evaluation and mentioned it as a mechanism to 'trap a high proportion of problems' (Huang & Benyoucef, 2014). The Design Principles followed by major service providers are collated in the table, Table 2.1 below. The comparison of the principles in the table brings out the common requirements that can be termed as the 'must-haves'. Principles relate to not only visual aspects but also extend to the content and accuracy.

Table 2.1 Usability guidelines and principles of major service providers

W3C	• Maintainability • Modularity • Minimum redundancy • Accessibility • Device-independency • Internationality • Extensibility • Learnability • Readability • Efficiency • Binary or text format • Implement ability	• Simplicity • Longevity • Backward compatibility • Interoperability • Repurposing of content • Timeliness • Use what is there • Design by committee • Expertise • Brevity • Stability • Robustness
Tims Berner Lee	• Simplicity • Modular Design • Being part of a Modular Design	• Tolerance • Decentralization • Test of Independent Invention • Principle of Least Power
Dieter Rams	• Good design is innovative • Good design for usefulness • Good design is aesthetic • Good design makes a • product understandable • Good design is unobtrusive	• Good design is honest • Good design is long-lasting • Good design is thorough down to the last detail • Good design is environmentally friendly • Good design is as little design as possible
UK	• Start with needs • Do less • Design with data • Do the hard work to make it simple • Iterate. Then iterate again.	• Build for inclusion • Understand context • Build digital services, not websites • Be consistent, not uniform • Make things open: it makes things better
USA	• Understand what people need • Address the whole experience, from start to finish • Make it simple and intuitive • Build the service using agile and iterative practices • Structure budgets and contracts to support delivery	• Assign one leader and hold that person accountable • Bring in experienced teams • Choose a modern technology stack • Deploy in a flexible hosting environment • Automate testing and deployments • Manage security and privacy through reusable processes • Use data to drive decisions • Default to open
Joshua Porter	• Interfaces exist to enable interaction • Clarity is job #1 • Conserve attention at all costs • Keep users in control • Direct manipulation is best • One primary action per screen	• Consistency matters • Strong visual hierarchies work best • Smart organization reduces cognitive load • Highlight, don't determine, with color • Progressive disclosure • Help people inline

	• Keep secondary actions secondary • Provide a natural next step • Appearance follows behavior	• A crucial moment: the zero state • Existing problems are most valuable • Great design is invisible • Build on other design disciplines • Interfaces exist to be used
Sandy Wassmer	• Equitable: Be welcoming. • Flexible: Provide options. • Straightforward: Be obvious and not ambiguous. • Perceptible: Don't assume anything. • Informative: Be timely, predictable, uncomplicated, and precise. • Preventative: Provide easy to follow instructions and gently guide users.	• Tolerant: Handle errors respectfully. • Effortless: Don't make demands or place restrictions on your users. • Accommodating: Be approachable, uncluttered, and give people room to maneuver. • Consistent: Follow standards, guidelines, conventions, and best practices.
Google	• Focus on the user and all else will follow. • It's best to do one thing well. • Fast is better than slow. • Democracy on the web works. • You don't need to be at your desk to need an answer. • You can make money without doing evil. • There's always more information out there. • The need for information crosses all borders.	• You can be serious without a suit. • Great just isn't good enough. • Focus on people their lives, their work, and their dreams. • Every millisecond counts. • Simplicity is powerful. • Engage beginners and attract experts. • Dare to innovate. • Design for the world. • Plan for today's and tomorrow's business. • Delight the eye without distracting the mind. • Be worthy of people's trust. • Add a human touch.
Facebook	• Universal • Human • Clean • Consistent	• Useful • Fast • Transparent
Windows	• Small things matter, good and bad • Be great at "look" and "do" • Solve distractions, not discoverability	• UX before knobs and questions • Personalization, not customization • Value the life cycle of the experience • Time matters, so build for people on the go

2.4.5 Usability guidelines

The research findings of Huang & Benyoucef, (2014), had in their seminal work, extended the usability guidelines of Neilsen (1994) and the credibility guidelines of Fogg (2002) as in Table 2.2 and Table 2.3 respectively.

Table 2.2 Nielsen's (1994) and extended usability guidelines

No	Usability guidelines	Interpretation
U1	Visibility of system	To keep users informed about their progress
U2	Match between system and the real world	To use the users' language, follow real-world conventions make information appear in a natural and logical order
U3	User control and freedom	To make undo, redo functions available during the interaction
U4	Consistency and standards	To keep the same design features and follow platform conventions through the website
U5	Error prevention	To support users to overcome errors and prevents the same problem occurrence
U6	Recognition rather than recall	To make information easily remembered
U7	Flexibility efficiency of use	To consider usage for both novice and experienced users
U8	Aesthetic design	To make a minimalist design
U9	Help user recover errors	To precisely indicate the problem and constructively suggest a solution
U10	Help and documentation	To provide help to support user's task completion
U11	Interoperability	To make all service parts, design elements, and website functions work as a whole to support user task completion
U12	Support users' skills	To support and develop users' current skills and knowledge
U13	Respectful interaction	To present a pleasant design and treat users with respect

Table 2.3 Fogg's (2002) extended credibility guidelines

No	Credibility guidelines	Interpretation
C1	Design look	A clean professional layout that fits the purpose and makes a good impression
C2	Information accuracy	Third-party references, links to source materials evidence that information is from a trusted source
C3	Real-world feel	Providing information like a physical address and detailed company background
C4	Expertise	Providing credentials and any awards won in the field
C5	Trustworthiness	Photographs of department directors and the management team help give users clues to who is behind the website
C6	Contact information	Providing clear and easy to find contact information helps to portray the image that the organization cares about the needs of its users
C7	Ease of use	Users can easily complete their tasks using the website
C8	Content update	Providing proof of when content was last updated or reviewed shows evidence that the website is being used and is current
C9	Promotional content	Using restraint with any promotional content
C10	Avoid errors	Preventing problems from all types such as typographical errors and broken links
C11	Transparency	The website should keep users informed of governmental operations and make government budgeting and spending information available
C12	Service agility	The website should provide flexible services to fit different user paths
C13	Privacy and Security	The website should protect the user's information and secure its services

{Source of Table 2.2 and 2.3: Huang, Z., & Benyoucef, M. (2014)}

The value of HCI in designing user interfaces is conclusive from the above studies. The human interaction with a citizen-centric E-Government System cannot be generalized on account of several factors viz: computer awareness and literacy, infrastructure, age groups, channels of access, and lack of Standardization in e-Governance applications. The diverse nature of citizens calls for knowledge of the HCI principles from the design stage to the execution. Human-centered design recommends that users and their needs should be addressed through the design process. The recommendations are not completely factored into the development of E-Government

development. One of the reasons from studies that have led to HCI not being factored in the design stage is the shortfall in the skilled force for user-centered design.

2.5 Design models and frameworks for E-Government Systems

2.5.1. De Lone and Mc Lean Information Success (IS) Model.

The seminal work of De Lone and Mc Lean IS model is widely accepted and many empirical studies have supported the model. The first model of DeLone and McLean was brought out in 1992 and later updated in 2003, Figure 2.3 (Zaied, 2012).

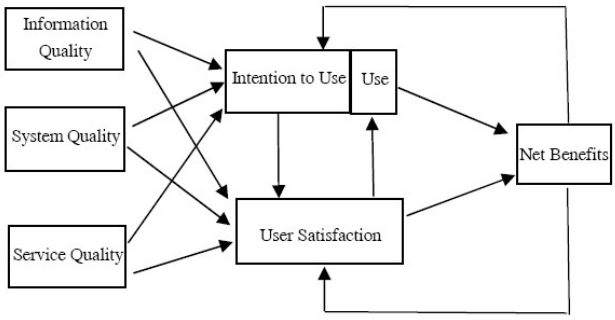


Figure 2.3 The updated DeLone and McLean's 2003 Model

They defined their model with six dimensions as follows:

(i) Systems quality: measured by adaptability; availability; reliability; response time; and usability;

(ii) Information quality: measured by completeness; ease of understanding; personalization; relevance; and security

(iii) Service quality: measured by assurance; empathy; and responsiveness

(iv) Use: measured by nature of use; navigation patterns; the number of site visits; and number of transactions executed

(v) User satisfaction: measured by repeat purchases; repeat visits; and user surveys

(vi) Net benefits: measured by cost savings; expanded markets; incremental additional sales; reduced search costs; and time savings

The elements that are brought as a measure of each of the six dimensions are in the tables below (Urbach and Miller, Chapter 1) which are reproduced in Table 2.4-2.9

Table 2.4 Exemplary measures of System Quality

Items	References
Access	Gable et al.(2008), McKinney et al(2002)
Convenience	Bailey and Pearson(1983), Iivari(2005)
Customization	Gable et al. (2008), Sedera and Gable (2004b)
Data accuracy	Gable et al. (2008)
Data currency	Hamilton and Chervany (1981), Gable et al. (2008)
Ease of learning	Gable et al. (2008), Sedera and Gable (2004b)
Ease of use	Doll and Torkzadeh (1988), Gable et al. (2008), Hamilton and Chervany (1981),
Efficiency	Gable et al. (2008)
Flexibility	Bailey and Pearson (1983), Gable et al. (2008), Hamilton and Chervany (1981), Sedera and Gable (2004b)
Integration	Bailey and Pearson (1983), Gable et al. (2008), Iivari (2005), Sedera and Gable (2004b)
Interactivity	McKinney et al (2002)
Navigation	McKinney et al (2002)
Reliability	Gable et al. (2008), Hamilton and Chervany (1981)
Response time	Hamilton and Chervany (1981), Iivari (2005)
Sophistication	Gable et al. (2008), Sedera and Gable (2004b)
System accuracy	Doll and Torkzadeh (1988), Hamilton and Chervany (1981), Gable et al. (2008), Sedera and Gable (2004b
System features	Gable et al. (2008), Sedera and Gable (2004b)
Turnaround time	Hamilton and Chervany (1981)

Table 2.5 Exemplary measures of Information Quality

Items	References
Accuracy	Bailey and Pearson (1983), Gable et al. (2008), Livari (2005), Rainer and Watson (1965)
Adequacy	McKinney et al. (2002)
Availability	Gable et al. (2008), Sedera and Gable (2004b)
Completeness	Bailey and Pearson (1983), Livari (2005)
Conciseness	Gable et al. (2008), Rainer and Watson (1995), Sedera and Gable (2004b)
Consistency	Livari (2005)
Format	Gable et al. (2008), Livari (2005), Sedera and Gable (2004b)
Precision	Bailey and Pearson (1983), Livari (2005)
Relevance	Gable et al. (2008), McKinney et al. (2002), Rainer and Watson (1995), Sedera and Gable (2004b)
Reliability	Bailey and Pearson (1983), MeKinney et al. (2002)
Scope	McKinney et al. (2002)
Timeliness	Bailey and Pearson (1983), Gable et al. (2008), Livari (2005), Doll and Torkzadeh (1988), MeKinney et al. (2002), Rainer and Watson (1995)
Understandability	Gable et al. (2008), McKinney et al. (2002), Sedera and Gable (2004b)
Uniqueness	Gable et al. (2008)
Usability	Gable et al. (2008), Sedera and Gable (2004b)
Usefulness	McKinney et al. (2002)

Table 2.6 Exemplary measures of Service Quality

Items	References
Assurance	Pitt et al. (1995)
Empathy	Pitt et al. (1995)
Flexibility	Chang and King (2005)
Interpersonal quality	Chang and King (2005)
Intrinsic quality	Chang and King (2005)
IS training	Chang and King (2005)
Reliability	Pitt et al. (1995)
Responsiveness	Chang and King (2005). Pitt et al. (1995)
Tangibles	Pitt et al. (1995)

Table 2.7 Exemplary measures of Intention to use

Items	References
Actual use	Davis (1989)
Daily use	Almutairi and Subramanian (2005), Livari (2005)
Frequency of use	Almutairi and Subramanian (2005), Livari (2005)
Intention to (re) use	Davis (1989), Wang (2008)
Nature of use	DeLone and MeLean (2003)
Navigation patterns	DeLone and MeLean (2003)
Number of site visits	DeLone and MeLean (2003)
Number of transactions	DeLone and MeLean (2003)

Table 2.8 Exemplary measures of user satisfaction

Items	References
Adequacy	Almutairi and Subramanian (2005), Seddon and Yip (1992), Seddon and Kiew (1994)
Effectiveness	Almutairi and Subremanian (2005), Seddon and Yip (1992), Seddon and Kiew (1994)
Efficiency	Almutairi and Subremanian (2005), Seddon and Yip (1992), Seddon and Kiew (1994)
Enjoyment	Gable et al. (2008)
Information satisfaction	Gable et al. (2008)
Overall satisfaction	Almutairi and Subremanian (2005), Gable et al. (2008). Rai et al. (2002), Seddon and Kiew (1994)
System satisfaction	Gable et al. (2008)

Table 2.9 *Exemplary measures of individual impact*

Items	References
Awareness/Recall	Gable et al. (2008), Sedera and Gable (2004b)
Decision effectiveness	Gable et al. (2008), Sedera and Gable (2004b)
Individual productivity	Gable et al. (2008), Sedera and Gable (2004b)
Job effectiveness	Davis (1989), Livari (2005)
Job performance	Davis (1989), Livari (2005)
Job simplification	Davis (1989), Livari (2005)
Learning	Sedera and Gable (2004b), Gable et al. (2008)
Productivity	Davis (1989), Livari (2005), Torkzadeh and Doll (1999)
Task performance	Davis (1989)
Usefulness	Davis (1989), Livari (2005)
Task innovation	Torkzadeh and Doll (1999)

2.5.2. Multidimensional Framework based on De Lone and Mc Lean IS model

Zaied 2012 proposes a multidimensional framework for evaluating e-service application success. The work is a modified D&M 2003 by canceling one dimension (intention to use) and adding many measures to assess the remaining five dimensions. The comprehensive, multidimensional framework adapted from previous researches is depicted in Figure 2.4 below; the dimensions of the success of the proposed e-services measurement framework consists of forty-four measures (thirty measures used to assess the degree of success in the design phase, eight measures used to assess the degree of success in the implementation phase and six measures used to assess the degree of success in results phase). It does not focus on any single dimension of IS success, instead, it describes the probability of success during the e-service life cycle (from design to results). Designers are expected to seek methods of improving system and service quality since these factors significantly affect user satisfaction (Zaied, 2012).

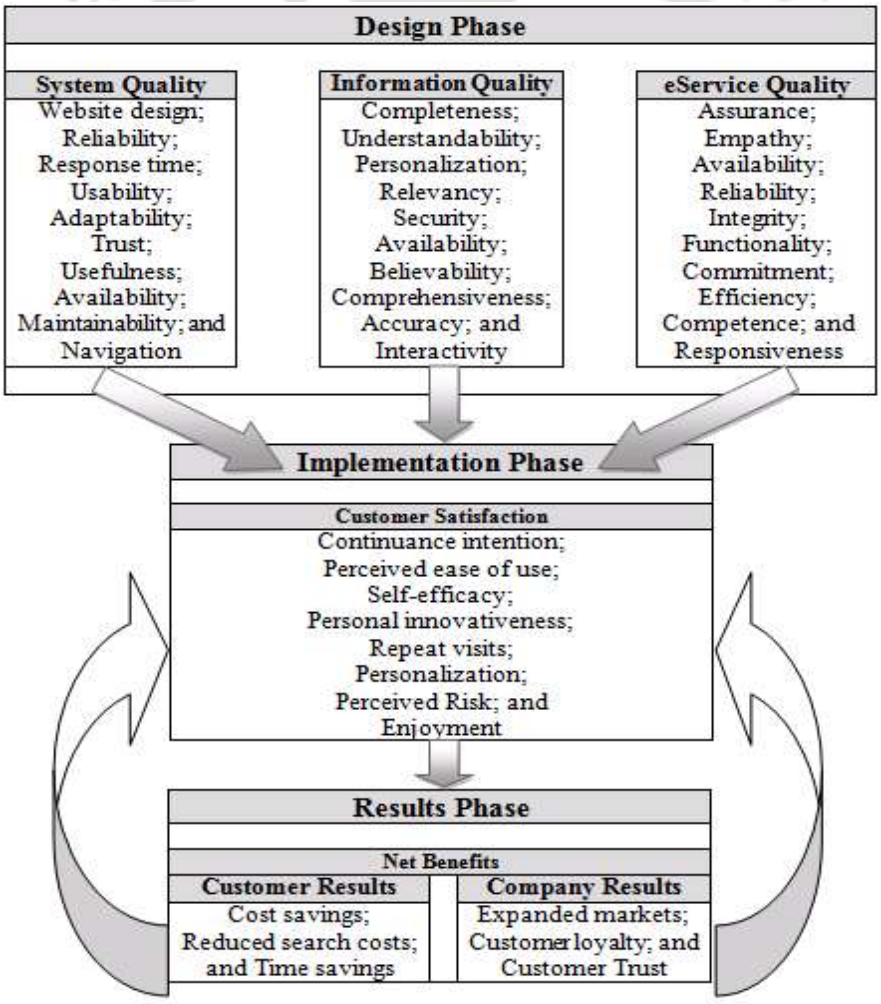


Figure 2.4 Dimensions of proposed e-services success measurement framework

2.5.3 Co-Creation model of design for social inclusion

A co-creation approach to design is proposed by Olphert W. and D. Leela (2012). In this model, key goals for e-government such as social inclusion must become an overt and central design goal' and all key stakeholders, including designers and citizens, voluntary and governmental agencies, and businesses, share responsibility for achieving the objective. The model is illustrated in Figure 2.5

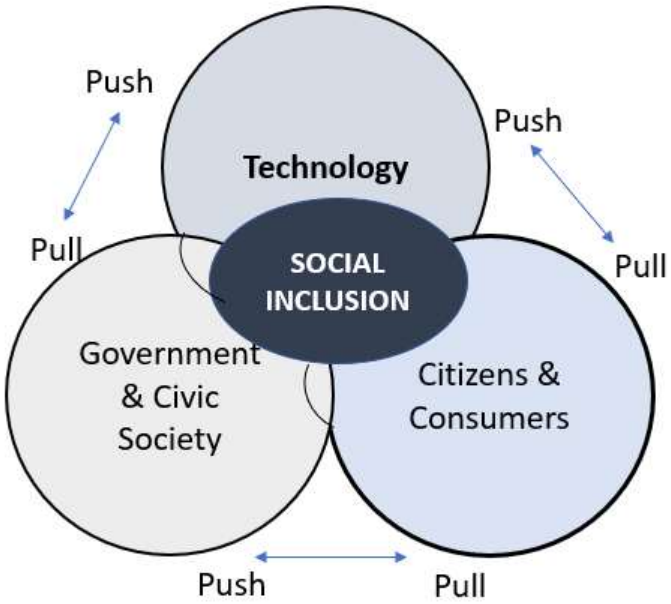


Figure 2.5 Co-creation model of Design for Social Inclusion

In the co-creation model, 'technology push' and 'user pull' are harnessed to create and shape inclusive socio-technical systems. As part of the technology push, the role of the design community will be to deliver systems, services, and products that are well-matched to the characteristics of citizens (as a result of developing and applying established and evolving human-centered inclusive design methods).

The theoretical frameworks and models in the section provide a broad set of criteria and measures to E-Government system designers.

(i) the design phase has a strong and significant influence on the remaining phases

(ii) designers should use the proposed measures to increase user satisfaction

(iii) system designers should focus on methods that attract and encourage participation.

There is a vast amount of literature studies spanning the important areas of usability, a user-centered design that is directly attributed to the adoption of E-Government systems. There is however very little guidance on their applicability to E-Government systems design and development. The measure of usability and interaction is not easy to predict especially when it comes to citizen-centric systems. Techniques for user participation and end-user usability

evaluation (prototyping techniques which need to continue throughout the life cycle) Hence the research and studies need to first simulate the model of HCI with the E-Government Systems. The research studies have not yielded any generic framework for E-Government systems that include the methods for incorporating the critical factors in the design and development of systems. Research work has produced tools that will need to be applied at different points during the design cycle of the E-Government system. Intractability Evaluation Tool is one such tool for analyzing the service delivery through several factors. Studies have stated the shortcomings in the interface design of E-Government systems. Among the several factors that have been described, the most widely concluded reason is the lack of specialized skills among the E-Government system developers for interface design.

2.6 Web Accessibility

Web accessibility aims to make websites more accessible and usable by as many people as possible, regardless of their knowledge, skills or technical characteristics (Campoverde et al, 2020). As per World Wide Web (W3C) Consortium (http://www.w3.org/Consortium), "Web accessibility means that websites, tools, and technologies are designed and developed so that people with disabilities can use them". Website accessibility plays a vital role while accessing the content by users with disabilities in the same way as for other users (Nagaraju et al, 2019). In the broader context of accessibility, it encompasses persons who have disabilities that affect access to the web categorized below:

(i) Persons with disabilities including auditory, cognitive, neurological, physical, speech and visual.

(ii) Persons without disabilities like older people, persons without access to the web due to limited bandwidth

Research studies have pointed to several barriers in accessibility of E Government websites. Some of the challenges are attributed to lack of accessibility awareness when designing and implementing websites, limited resources allocated to cover accessibility issues and scarcity of professionals who are familiar with accessibility evaluation tools (Addous et al, 2016).

W3C's Web Accessibility Initiative (WAI), which is part of the W3C, focuses on enabling people with disabilities to create and interact with web content. WAI promotes: a) the implementation of web accessibility guidelines in advanced tools, and b) the improvement of accessibility evaluation tools (Addous et al, 2016). W3C has developed Web Content Accessibility Guidelines (WCAG) to make the web accessible to people with disabilities (Campoverde et al, 2020). Adoption of the guidelines will make website content more accessible to a wider range of people with disabilities. The WCAG recommendations also help website

developers to factor the needs of users with disabilities and older users. WCAG 2.1 (https://www.w3.org/TR/WCAG21/), the latest version of guidelines has 13 guidelines organized under four principles: perceptible, operable, understandable and robust. For each guideline, there are success criteria, which are at three levels of conformance Level A (30 success criteria), Level AA (50 success Criteria and AAA (78 success criteria) (Campoverde et al, 2020). With minimum efforts websites could achieve the basic level of accessibility or conformance level A if they provide appropriate alternative tags for all images used on the websites (Ali and Salahat,2019). Testing and validation of the Web site plays an important role in achieving the highest level of e-accessibility while designing and developing in websites for people with disabilities (Ali and Salahat, 2019).

Studies have indicated that although web accessibility has become more important in recent years, most websites lack in meeting all the accessibility requirements. One major factor identified is the challenge that is usually faced by web developers on their inability to interpret or understand guidelines to enable accessibility (Addous et al, 2016). Lack of experience with accessibility by website developers and a lack of accurate information on the best ways to quickly and easily identify accessibility issues using different accessibility evaluation methods continues to limit access to websites by people with disabilities (Campoverde et al, 2020). The achievement of total accessibility is considered as challenging because of different disabilities problems, language barriers, and hardware and software inconsistencies (Ali and Salahat, 2019).

CHAPTER 3 STUDY OF GOVERNMENT OF ASSAM, NATIONAL AND GLOBAL WEBSITES

For establishing citizen-centric E-Government websites of Assam, a multi-method approach was adopted. In June 2015, there was around 29 Government of Assam department websites. The preliminary study of the initial phase (3.1) included a general assessment of the 29 websites followed by quantitative and qualitative research of the websites. A study of global and national websites was undertaken in the subsequent phase (3.2).

3.1 Preliminary study

3.1.1 General assessment.

The general assessment of the websites was carried out with the following key objectives:

(i) What are the deeper problems in the websites that are inhibiting their wide-scale usage?

(ii) Whether the desired information and services are being provided correctly?

(iii) Whether citizens get what they look for in minimum time with minimal efforts?

(iv) What are their expectations?

(v) Identify the areas of improvement

The assessment helped to gain an understanding of the status and shortcomings of the websites. Issues related to the content, its non-availability, accuracy, and low level of intuitiveness of the interfaces were the major findings. It was found that most websites did not comply with the Guidelines for Indian Web Sites (GIGW) released by the Government for website usability and standardization. The GoA websites were found to have too much content that was not relevant to the needs of the citizens. Information that was available on the websites was found to be limited to the functions of the department, documents, and details of department officials. This limited information was also not updated. Most websites were found lacking in information on their citizen-centric services. Many department officials were not aware of their respective websites. The websites had issues in their navigation, were inconsistent in the content provided and many of the links in the websites did not work. It was found that multiple websites existed for a single department. Each website had information that was inconsistent in terms of content, interface, and information.

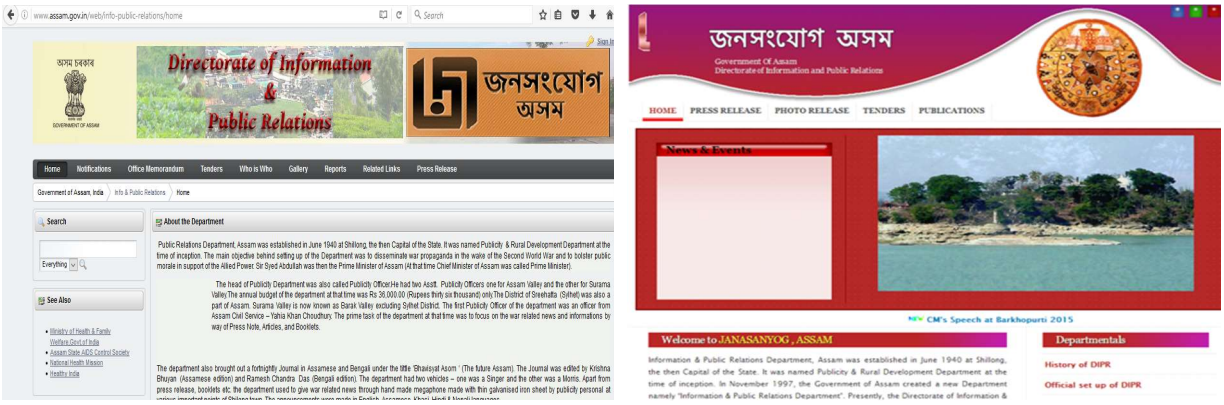


Figure 3.1: Multiple websites for a single department

Figure 3.2: Websites having too much clutter, fonts not eye-friendly, and lacking visual appeal

Figure 3.3: Government websites were inconsistent in terms of their elements, layout, and content

Figure 3.4: Website where the pages had no content

From the assessment of the websites, it emerged that the requirements of the citizens were not considered during the development of the websites. There was very little involvement of the department in the website design and content preparation. The development was largely driven by the vendor hired by the department for the development of the website. These had resulted in a lack of ownership of websites by the department. The capacity within the department for sustaining the websites was not developed. Added to this was the lack of trust and credibility of the government websites.

3.1.2 Quantitative Survey.

An online questionnaire was designed for the quantitative survey; for facilitating the discussions with the department officials of the 29 departments a standard set of questions were framed. The above approach helped to gain an understanding of the following:

- general needs of the users'
- shortcomings in the website development process

The quantitative survey formed the first empirical phase of the research. The sample size was limited to 500 respondents. A cross-section of users of different age groups and varying occupations, comprising of Students, Journalists, Service Holders, Retired Personnel, Academicians, and Self-employed were selected as respondents.

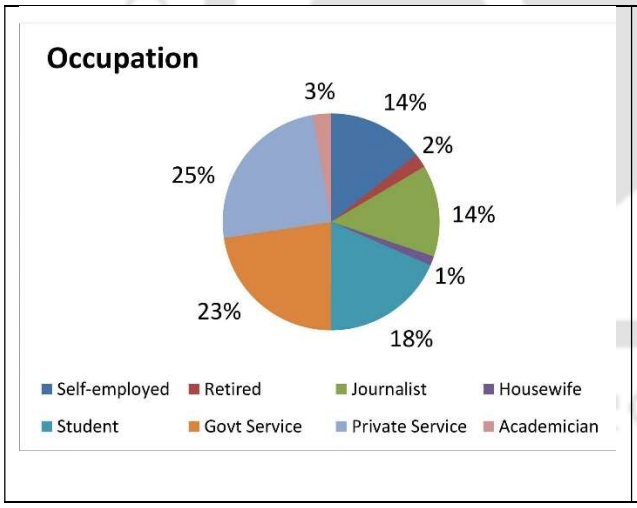


Fig 3.5: Occupation

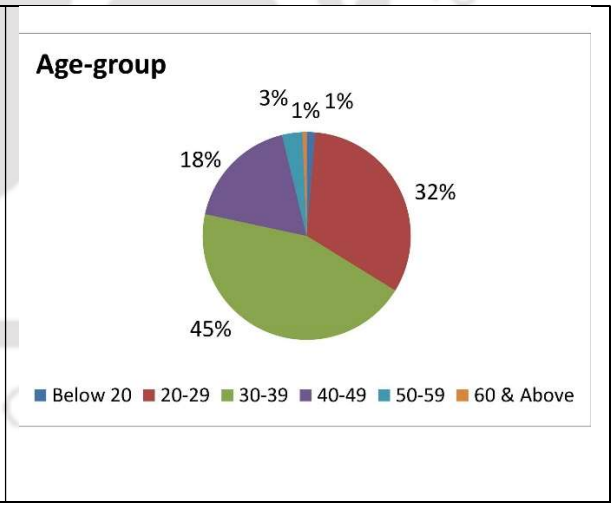


Fig 3.6 Age group

The respondents were required to respond to the following parameters:

- visual appeal
- user-friendliness
- the relevance of information, whether the information is up-to-date
- whether the information is comprehensive enough without having to visit the department

- user expectations from Government Websites
- to identify the areas of improvement.

The survey was by no means an exhaustive one nor did it consider a large sample size. However, this helped to obtain a preliminary indication of the general awareness, usage, and prominent issues and challenges in the websites.

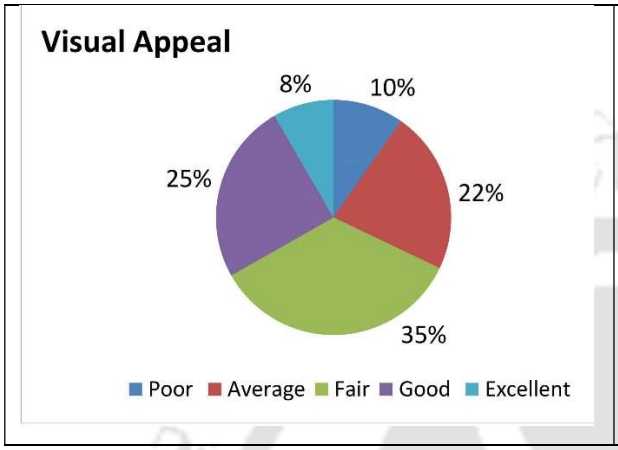


Fig 3.7 Visual appeal

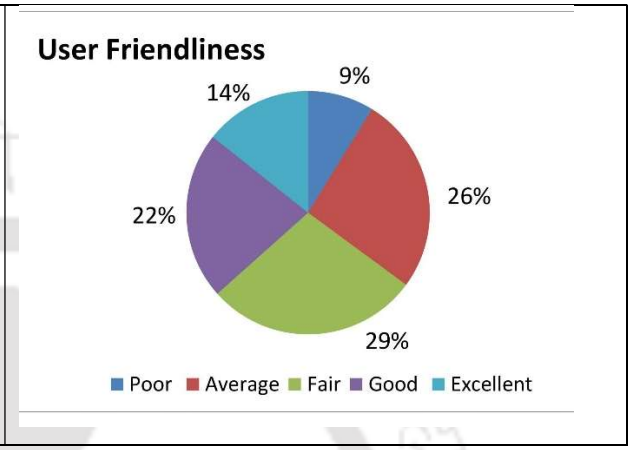


Fig 3.8 User-friendliness

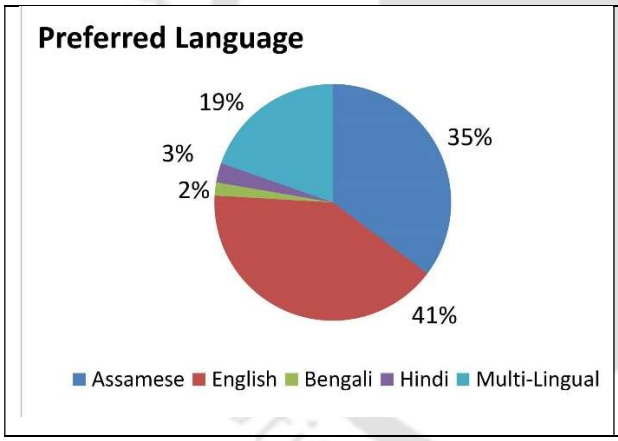


Fig 3.9 Preferred language

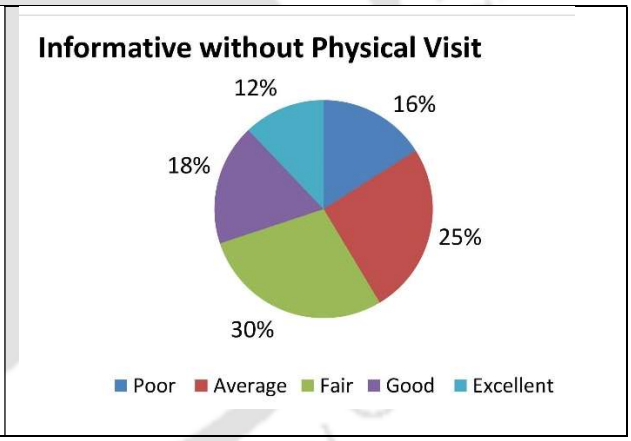


Fig 3.10 Informative

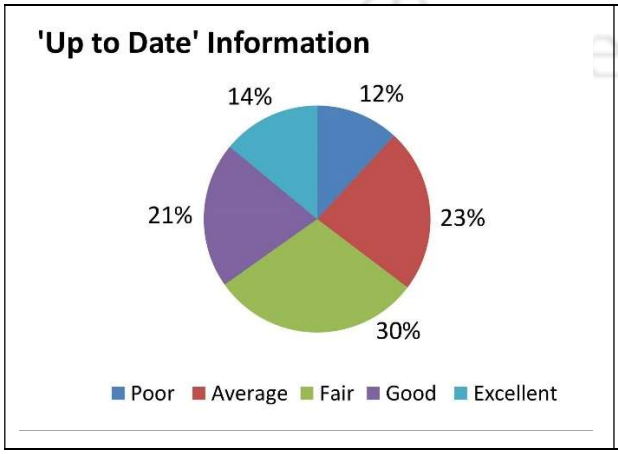


Fig 3.11 Up to date Information

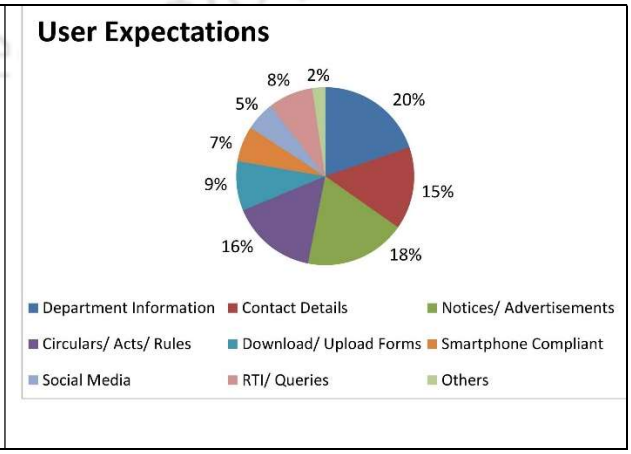


Fig 3.12 User Expectations

The main findings from the quantitative survey are listed below:

i. More Visual appeal required
ii. Images on the Websites to be good quality and resolution
iii. Navigating the site to be made easier
iv. Fonts to be eye-friendly
v. Too many photos on the website, that was distracting
vi. Sites were not bi-lingual
vii. Information on the website to be up to date
viii. There is a need to categorize information
ix. Links that did not work were present on the website
x. Sites lack professionalism
xi. No feedback mechanism to report
xii. Needed to highlight success stories
xiii. Availability of all notifications, Assembly Q & A, Inquiry reports
xiv. The necessity of the 'Search' button
xv. Smartphone compatibility is required

3.1.3 Qualitative survey.

The departments being the owners of the websites, it was considered necessary to have consultations with the department officials of the 29 websites. The qualitative research was done in an explorative manner. Nodal Officers were identified in every department with whom the interviews were held. A set of questions was framed to gain a deeper understanding as to:

-Why the websites were not providing the basic information sought by the citizens?

-Why was the content not being updated?

-What was the process adopted in website development?

-Were the requirements of the end-users of the website kept in mind while designing?

-Was any feedback gathered on the experience of the end-users of the website in terms of:

- usability,
- usefulness and level of satisfaction;

-Are the interaction design of the information and service delivery to the users adequate?

To obtain the answers to the above questions, 29 Government departments who were the owners of the department websites were visited for having discussions with the department officials regarding their respective websites. From several interactions and discussions had with

the Departmental Nodal Officers, an understanding of the technology and environment in which the websites were developed and hosted, and following are the major findings:

(i) Involvement of the department in the website design, content preparation, and regular content updating was limited to one or two officials in the department.

(ii) The development was generally outsourced to an external hired agency.

(iii) The website requirements provided by the department essentially translated the working of the department. This resulted in information that was available on the websites limited largely to the functions of the department, important documents, and details of officials. The information that a citizen looked for was found to be lacking in most of the websites.

(iv) There were no consultations or collaboration within the entire department during the design of the website. This resulted in two issues:

- First, the department users were not aware of their website.
- Second, the information and content from all sections of the department were not covered on the website. This resulted in the website content not being representative of the entire department.

(v) A Government department has the main administrative department and its constituent organizations. The websites of the main department and its constituent organizations were developed in silos. There is no information sharing between them. This resulted in the redundancy of information, as the same information that was required for both the websites were created and uploaded separately.

(vi) No single person in the department was made responsible.

(vii) A periodic review of the websites was also not being done.

(viii) Individual departmental websites of these 29 departments did not have interlinkages with the main website of the government.

From the above finding, one can conclude the following:

(i) Lack of ownership of the websites.

(ii) The vendor drove the development of websites.

(iii) Lack of capacity within the department for sustaining the websites.

(iv) User needs not studied during the development.

(v) Lack of homogeneity and interlinkages.

It was also evident that the issues could not be attributed to one single area alone. There were issues related to design, technology, content, and the overall process adopted by the departments in the development, implementation, and maintenance of the websites. There was no standard domain in which the websites were available. Government websites had to

necessarily have their websites registered in the government (.gov) domain. However, many of the websites had registered their websites registered in '.com', '.org' domains. Websites were hosted in multiple hosting environments and cross-sharing of information was not made possible.

3.2 Survey of the Best Designed Government websites (Global and National)

The next phase of the study was to carry out qualitative research on the best designed Global and National government websites. Considerable effort and time were spent in the initial few months to understand the best practices adopted by some of the best-designed websites. The emerging National and Global E-Government websites were studied.

3.2.1 National websites

Among the websites of the Indian states, the websites of the Government of Rajasthan, Haryana, and Kerala had features that scored over the other state's websites in terms of:

(i) Categorization of information based on the role of the user

(ii) Easy navigation

(iii)User friendly

(iv)Bi-lingual

(v) Content-rich

3.2.2 Global websites

Among the global sites, the websites of the UK, Australia, and New Zealand were considered among the best replicable models. The following features were found to be the strengths of the three websites:

(i) Designed by keeping the end-user needs

(ii) The intuitive design of the websites

(iii)Consistency of the content

(iv)Easy navigability

UK Government website, in particular, provided several insights from the usability design front. The emphasis laid on usability was evident from the ten design principles[3] followed by the UK Government on their websites.

Start with user needs

[3] https://www.gov.uk/guidance/government-design-principles

Do less

Design with data

Do the hard work to make it simple

Iterate. Then iterate again

This is for everyone

Understand context

Build digital services, not websites

Be consistent, not uniform

Make things open: it makes things better

Further, the UK Government had established standard styles, components, and patterns to ensure consistency and usability in their websites.

3.3 Pilot implementation in six department websites (First level validation)

The analysis of the findings from the preliminary study of the GoA, National, and Global websites was validated with the development of six department websites as pilot sites. The findings from the pilot implementation helped to gain a deeper understanding of the design interventions required for the user interface. Identification of the desired features and major success indicators was the outcome of the pilot implementation. The most desirable features in Government websites were found to be user-centricity (usable, intuitive, consistent, navigability), functionality, trust, credibility, and seamless web experience.

After the pilot implementation of the six websites, orientation workshops were held with the individual department users. The departments reported an increase in the usage of their respective websites.

The analysis based on the findings from the exploratory study, qualitative and quantitative research were carried out in stages. From each stage of the research, the determinants for the E-Government websites were established. Finally, it was narrowed to the most important determinants that formed the basis for the analysis outlined in Chapter 4.

CHAPTER 4 ANALYSIS

4.1 Methods for analysis

The findings from the exploratory study and pilot implementation of the websites of the Government of Assam (Chapter 3) formed the main basis for the analysis carried out. From the previous research studies (Chapter 2), the areas that related to the findings were taken up for mapping.

The approach followed for the analysis is described below:

(i) The six dimensions and its measures of the D & M IS Success model (Section 2.5) were found to match the majority of the findings from the studies and therefore were selected as the theoretical basis. Next, findings from the preliminary study of websites of the Government of Assam (Chapter 3) was validated with the six dimensions and the constructs of the measures of each dimension.

(ii) These were also mapped to the broad areas of Huang & Benyoucef, (2014), who had in their seminal work, extended the usability guidelines of Neilsen (1994) and the credibility guidelines of Fogg (2002) as in Table 3.1 and 3.2 respectively.

(iii) The interrelations are presented in Table 4.1.

(iv) Column 5 of the table are the interpretations from which the detailed analysis is carried out in section 4.2.

Table 4.1 Mapping of findings to results of research studies

Sl No	Study and pilot implementation	Urbach and Miller		Huang, Z., & Benyoucef, M. (2014) Extended usability and credibility guidelines	
	1 Finding	2 Dimensions	3 Measures of dimensions	4 Broad Area	5 Inferences
1	Websites lacked visual appeal	Systems quality, Information quality	Convenience, Ease of use, Interactivity, Usability	Usability, Credibility	U8- Aesthetic design C1: Design look A clean professional layout that fits the purpose and makes a good impression
2	Website content font size was too small in size and fonts to be eye-friendly	Systems and Information quality	Ease of use, Usability, Understandability	Usability	U13: Respectful Interaction To present a pleasant design and treat users with respect C1: Design look To make a good impression
3	Too many photos in the website, Images on the website to be of good quality and resolution	Systems quality	Navigation, Format	Usability	U8: Aesthetic To make a minimalist design
4	Government Departments Websites were inconsistent in terms of their layout and content Inconsistent user interfaces	Systems Information and Service quality, User satisfaction,	Consistency, Understandability, Navigation, Assurance, Credibility	Usability and Credibility	U4 Consistency and Standards To keep the same design features and follow platform conventions through the website
5	Navigation in the site to be made easier	Systems quality	Access, Navigation Convenience, Flexibility	Usability	U7: Flexibility efficiency of use To consider usage for both novice and experienced users
6	Sites lack professionalism	Systems, Information and Service quality	Sophistication, Intrinsic quality	Usability & Credibility	U10: Help and Documentation To provide help to support user's task completion C1: Design look A clean, professional layout that fits the purpose and makes a good impression
7	Lacks ease of use	Systems quality, User satisfaction	Access, Convenience Interactivity	Usability & Credibility	U3-User control and freedom, during interaction C7 Users can easily complete their tasks using the website
8	The content was not accessible formats	Systems and Information quality, Intention to use	Format, Understandability, Actual use, Nature of use	Usability	U12: Support user skills Usability Design of website to cater to all

Sl No	Study and pilot implementation	Urbach and Miller		Huang, Z., & Benyoucef, M. (2014) Extended usability and credibility guidelines	
	1 Finding	2 Dimensions	3 Measures of dimensions	4 Broad Area	5 Inferences
					age groups, varying literacy level U13: Respectful Interaction To present a pleasant design and treat users with respect
9	Websites were available only in English and not bi-lingual	Information and Service quality, User satisfaction	Availability, Scope, Empathy, Adequacy, Information satisfaction	Usability	U2: Match between the system and real world To use the user's language, follow the real-world conventions
10	Information such as feedback and contact us was not available	Information and Service quality, User satisfaction	Availability, Assurance, Trust, Completeness, Usefulness, Information satisfaction, Reliability	Credibility	C5: Trustworthiness, Provide the details of the department team to help give users know who is being the website C6: Contact Information Providing clear and easy to find contact information helps to portray the image that the organization cares about the needs of its users
11	Content not updated	Information and Service quality, Intention to use	Availability, Completeness, Assurance, Intention to reuse, Information satisfaction	Credibility	C8: Content update, providing proof of when the content was last updated or reviewed shows evidence that the website is being used and is current C5: Trustworthiness
12	Information not meeting the needs of citizens;	Information and Service quality, Intention to use	Empathy, Information satisfaction	Usability & Credibility	U2: Match between the system and real-world Make information in a natural and logical order
13	Content in the website was not categorized based on the user needs;	Information and Service quality, Intention to use	Interpersonal quality, Relevance, Nature of use	Usability, Credibility	U6: Recognition rather than recall To make information easily remembered U12: Support users' skills To support and develop current skills

Sl No	Study and pilot implementation	Urbach and Miller		Huang, Z., & Benyoucef, M. (2014) Extended usability and credibility guidelines	
	1 Finding	2 Dimensions	3 Measures of dimensions	4 Broad Area	5 Inferences
					and knowledge of users C12: Service Agility The website should provide flexible services to fit different user paths
14	More than one website existed for a single department each completely different from the other.	System quality, Information quality, User satisfaction	Reliability, Precision, System satisfaction	Credibility	C5 Trustworthiness
15	The necessity of a Search button	The system, Information, and Service quality	Interactivity, Intrinsic quality		U10: To provide support for user's task completion with Help and Documentation
16	There was no visual indication of the website belonging to the government	System quality, Service quality	System features, Adequacy, Assurance, Reliability	Usability, Credibility	U4: To keep the same design features and follow platform conventions through the websites C5: Trustworthiness
17	The website requirements provided by the department essentially translated the working of the department. This resulted in websites having only the minimum details and functioning of the department were found lacking in citizen-centric services.	Information quality, Service quality	Data accuracy and Data currency	Credibility	C2: Information Accuracy C11: Transparency The website should keep users informed of governmental operations (services)
18	The development was generally outsourced to an external hired agency that did not understand the domain and working of the department.	Service quality	Credibility, Assurance	Credibility	C13: Privacy and Security
19	No single point in the Government to oversee the design, process and be the focal point A periodic review of the websites was also not being done.	Service quality, User satisfaction	Intrinsic quality, Adequacy	Credibility	C2: Information accuracy C5: Trustworthiness C8: Content update
20	There is no information sharing between them. This resulted in the redundancy of information as the same information required for both the websites are uploaded separately	Systems and Information quality	Adequacy	Usability	U11 Interoperability To make all service parts, design elements, and website functions work as a whole to support user task completion
21	Department users did not have the skills to update the website	Service quality	IS training	Usability	U12: Support user skills

Sl No	Study and pilot implementation	Urbach and Miller		Huang, Z., & Benyoucef, M. (2014) Extended usability and credibility guidelines	
	1 Finding	2 Dimensions	3 Measures of dimensions	4 Broad Area	5 Inferences
					To support and develop users' current skills and knowledge
22	Rising expectations of citizens; Smartphone compatibility	Service quality, Intention to use, User satisfaction	Overall satisfaction	Usability, Credibility	Usability U12: Support user skills C12: Service agility The website should provide flexible services to fit different user paths
23	Websites were having non-government domains viz: .com, .org and hosted in different hosting infrastructure including some in private infrastructure	Systems quality	Credibility	Credibility	C13: Privacy and Security The website should protect user's information and secure its services

4.2 Analysis

Research studies have stated usability and user-centricity as the critical factors in the adoption of E-Government systems by citizens. The usability extends from the design of the interfaces, interaction experience, consistency, navigation to information content quality and channels of obtaining the information. The findings of the study and its mappings to the extended usability guidelines in Table 4.1 are analyzed further as follows:

Findings 1, 2, 3 relate to the usability issues in the design of the website interface. Points 4, 5, 6, 7 relate to the lack of ease in use and consistency in the websites, issues in navigation and interaction. Points 8,9,10 relates to the accessibility of content.

Analysis 1: Attention to user experience and user interaction is required for the design of citizen-facing E-Government user interfaces

Analysis 2: Intuitive navigation and interaction techniques need to be developed for the interface of the citizen interfaces of the websites.

Analysis 3: Websites to be consistent in layout, content structure, and placements. Elements in the website need to perform as per the expectations of the users.

Several research studies have brought out the necessity of the knowledge of users and their needs in the design of E-Government systems. The user-centered design (UCD) approach involves identifying users and addressing their needs throughout the design process of E-Government systems. User centricity requires that content be driven and determined by the users

and their needs. Points 11-17 relates to the challenges in the information and lack of reliability of the content in the websites. The information provided on most of the websites was not attuned to the needs of the citizen. The user needs and expectations were not studied or even kept in mind while most of the department websites were being designed. It was also seen that the information was not categorized based on the different categories of citizens.

Analysis 4: The user and their needs should dominate the design of citizen-centric interfaces and be kept as the foremost factor in the design of Government Websites.

Analysis 5: The diversity of needs of users to be considered, which is not easy when it comes to citizen-centric systems

Analysis 6: The content in the websites should be made available as per the category of users accessing (personalization).

The adoption of the websites by citizens is when they perceive a sense of trust in the websites. This could be through visual identifiers in the website to build trust, having the contact details available Accurate and updated information

Analysis 7: Visual identifiers in the website to be included to build trust and credibility.

Analysis 8: Regular updating of the content provides the credibility and assurance of the website to the citizen.

18-22 relates to some of the critical issues in website sustainability and meeting the future trends of website access. Lack of ownership and commitment of the department to the website has led to manifold issues. Minimal and irrelevant content, content not being updated, lack of skills to update the content and maintain the website are some of the major issues. The top-down approach taken in the development of websites led to two issues. One, many of the department users were not aware of their website. Second, the information and content from all sections of the department were not covered on the website. The website did not represent the information and content of the entire department.

Analysis 9: Need for building ownership of the department

Analysis 10: Responsibility to be designated to the department for updating the content

Analysis 11: Need for building the capability of department officials

Analysis 12: Need for evolving guidelines and procedures

Analysis 13: Single coordination point for enforcing standards in Government websites

Points 23 relates to the security of the websites. This is significant as the websites are of the Government. Government websites are to be in the '.gov' domain. The websites of GoA were

found to belong to '.com', '.org' domains. This is expected to affect the credibility and trust of the website. The sites were in different environments and had no means to share and exchange information.

Analysis 14: The technology environment for hosting the Government websites needs to in the Government domain. The Government websites should securely facilitate cross-sharing of information.

4.3 Steps and measures to be adopted

From the analysis carried out concerning the usability issues in the websites, it became apparent that there is a need to introduce methods for designing interfaces that are intuitive and consistent. These methods will need to be made an integral part of the development lifecycle of E-Government systems. Consistency and standards for all government websites of Assam will enable a seamless user experience for the user when they approach any of the government websites. Citizens should be able to navigate websites and find the information they are looking for in the minimum possible time. To enable easy and intuitive navigation, a standard information architecture that will be applicable for all government websites needs to be evolved. Design principles that will contribute to intuitive and user-friendly interfaces will need to be included in the design stage of user interfaces User interface design should enable consistent content placement of elements that are standard across all government websites. Although the importance of usability in E-Government systems are known and website usability guidelines available such as the GIGW, these still do not meet the diverse requirements of E-Government citizen-centric websites. From the analysis related to areas of usability issues (1-3), the following are the inferences:

(i) Need for expertise in user interface design

(ii) Developers should apply design methods for interfaces that are intuitive and usable.

(iii) Design a standard website information architecture to be developed for applying uniformly across websites

(iv) Standard Government Guidelines specific to the usability and user-centricity requirements of E-Government websites will need to be established.

(v) To establish the set 'must-have', 'desirable' design principles for the user interface.

(vi) To establish the set of 'parameters' that contribute to a good and effective citizen interface.

Identifying users and user needs have to be done in the early stages of development to factor them in the design and development cycle. Content-based on the type of users needs to be identified for user-centricity in the websites. using a collaborative approach and getting entire department users involved. The suggested measures to be taken for user-centricity (5-6) are as follows:

(vii) Techniques and tools for identifying users and their needs and dovetail then in the development lifecycle

(viii) Techniques for information management, categorizing context-specific information based on the diverse nature of citizens will be required.

(ix) Methods for building usability into the entire design process

Studies have stated that building trustworthiness and credibility for websites are important factors for faster adoption of the websites by citizens. Assurance and accuracy of content in a website provide the citizens with a sense of trust in the website. The intention to use and revisit the site also increases when trust is developed. The suggested approach for ensuring that the websites build trust and credibility are as follows:

(x) Developing best practices for making the websites usable and identifying factors for building trust and credibility.

(xi) Standard visual identifiers for all government websites

The major challenges in the websites that related to the content, its updating, and maintenance was found to be the lack of ownership by the departments. A mechanism is to be established to ensure the ownership, commitment, collaboration, and sustainability of the websites (9-13). Departments needed to be self-sufficient to update the content and maintain the websites. Investment in capacity building of the department officials is essential for the long-term sustainability of the websites.

(xii) Capacity building

(xiii) Techniques for collaboration within the department

For ensuring security in websites, the following measures need to be adopted in all Government of Assam websites.

(xiv) Uniform domain naming for all government websites in the .gov domain

(xv) Common secure deployment and hosting infrastructure for the government websites

4.4 Intervention

The measures outlined in the previous section relate to interventions in three main areas: Information, Technology, and Process.

Information strategy

Information and services related to the functioning of the department get converted to website content.

(i) Content identification will be determined by the users and their needs.

(ii) Mapping content to the user base

(iii) Meaningful grouping of content based on the category of users.

(iv) Standards in information and content

(v) Authoring the website content to make it understandable by the diverse users

Adapting the Technology

(i) To extend the IS models and Human-Centered design life cycle for Citizen Interface designs so that all the above areas can be factored as a design discipline in the life cycle of design and development of citizen-centric interfaces of E-Government systems.

(ii) To develop usability evaluation models based on the target age groups and levels of computer literacy, and prototyping techniques for the design life cycle.

(iii) To build techniques for making the design principles an integral part of the development

(iv) To establish a Technology Architecture for Government of Assam Websites: User interfaces and user interaction points

Process for bringing ownership, commitment, and a sustainable model

(i) Capability building approach to developing the skills for the department to create, manage and sustain the content.

(ii) An institutional mechanism to be established in the departments to bring in the ownership.

(iii) Establish specific guidelines, best practices, and processes for the design of citizen interfaces.

The research studies have not yielded any generic framework that is fully adapted for the design and development of E-Government systems. Several dimensions that have emerged from the analysis are found to be missing in the existing frameworks in their original form. The Human-centered life cycle (ISO 13407) defines the process for incorporating usability

requirements into the software development process. However, E-Government system development requires extending the process beyond the areas and these have so far not been produced through research. A broad framework that will include design life cycle requirements, guidelines, principles with a focus on citizen-centric E-Government systems, therefore, needs to be evolved to address the perceived gaps. The seminal research work and prominent frameworks (i) D & M IS Model (ii) HCI Design life cycle and (iii) Usability guidelines will be taken as the base while evolving the framework. A Design Framework for Citizen-Centric E-Government Systems which will integrate all of the areas that relate to the 'Information', 'Technology' and 'Process' is developed as a 'Standard Website Framework (SWF)'.

CHAPTER 5 STANDARDIZED WEBSITE FRAMEWORK (SWF) FOR THE GOVERNMENT OF ASSAM WEBSITES

5.1 Standard Website Framework

To bring the E-Government websites of Assam under a single umbrella concerning the Technology, Information, and Process requirements for the end-to-end development, the need for developing a standard framework for Government websites was considered necessary. The main objective was that the 'Standard Website Framework' for the Government of Assam websites should be able to address the common process, functional and technical requirements of government department websites at the framework level.

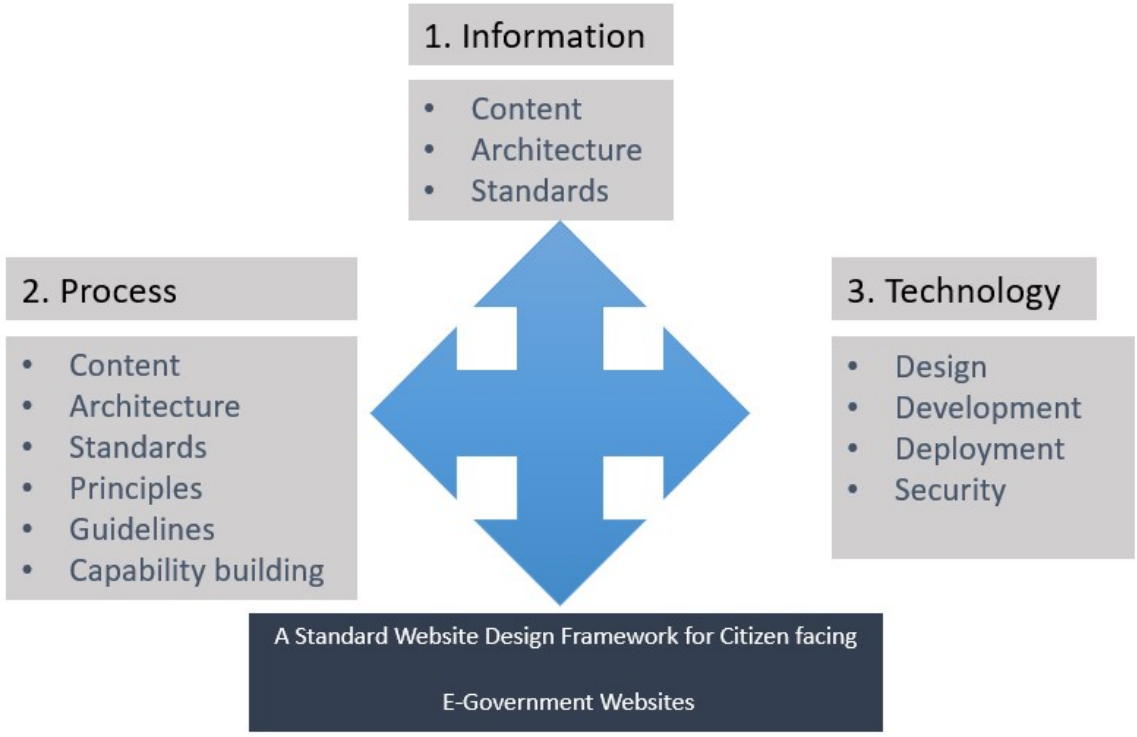


Figure 5.1: Standardized Website Framework

Table 5.1 Areas to be included in the Standard Website framework

Area	Sub-area	To be included as a part of the framework
Process		
	Identifying user and user needs	Tool kit with techniques for identifying users of websites and their needs
	Identifying the relevant content	Toolkit with techniques for identifying content and categorizing them for users.
	Evolving guidelines for websites	The guidelines specific to the GoA websites which will extend the GIGW
	Standards and best practices	Evolve the standard design templates and themes
	Institutional mechanism	To bring ownership, commitment, and sustainability to the websites.
	Capacity building	Capacity and capability building of departments
	Domain names	Government domain for all government of Assam websites
Information		
	Standard content	Establishing the standard content
	Information placement for consistency and navigability	Evolving a Standard Government Information Architecture (SGIA)
	Visual identifiers	To build trust on government websites
Technology		
	User-interface design	Expertise in designing intuitive and user-centric interfaces
	Open architecture framework	Establishing an open architecture based framework based on which all websites will be built which will be flexible and scalable
	E-Governance Standards	Data and Technology Standards to ensure that the websites are technology-neutral
	Development life cycle	E-Government Design and development will include methods to make usability a part of the entire life cycle.
	Security	Unified hosting infrastructure

5.2 Identifying user and user needs

The user and needs of users were analyzed as a dominant factor in the design of websites. Websites will serve its purpose when it is in sync with the need of the end-users of the website. End-users of government websites are diverse and their expectations are varied. An early understanding of the users and their needs was required to be integrated into the design process of the website. Identifying the website users and the user needs were therefore considered as the first and most important area in the whole cycle of the design and development of websites. A toolkit was developed to identify the users and their specific requirements from the websites. The techniques included in the toolkit were with the following objectives:

(i) Identifying end-users: who they are, what they want, how they look for in the website, and when they look for the information.

(ii) After the broad category of the user base was identified, further categorization was to be carried out based on their area of work viz: students, farmers, job seekers

5.3 Identifying website information content

Content plays a very important role in a website and can contribute to the popularity, success, and effectiveness of a website. Good quality and up-to-date content are the single most factor for drawing visitors to the site. In the entire process of developing websites, very little importance was given to content planning and its readiness. Even after the website was ready, it lacked in content. The quality of content in a website was often neglected when done without any planning. This resulted in incomplete and inconsistent information on the websites. From the analysis, it was found that the existing websites lacked good and useful content. Content identification and planning activity was therefore the second area that was given importance from the start of the website development.

A toolkit was prepared as a part of the SWF to guide the departments to plan and prepare the content for the website. It provided a step-by-step approach to identify, classify the content and categorize them based on the target users of the website. Content related to all areas of work, within a department, were required to be identified and grouped.

5.4 Design of the Standard Website Information Architecture

Standardization of the information placement concerning information, content, and placement in a website. Information Architecture (IA) of a website refers to the design of the structure and organization of the website. IA plays a very important role in providing a satisfying experience to the visitor. Organizing and placing the standard content in a uniform IA pattern for

all the Government websites was designed. A well-designed IA should be able to address all of the above and create an information structure that will help the user quickly find the information they are looking for. Users of government websites could be having different levels of experience and this is to be kept in mind while planning the website structure.

A toolkit was developed for arriving at a '**Standard Government Website Information Architecture (SGIA)** for all GoA websites**.**

5.5 Sustainability

For bringing the ownership and commitment of the department to their respective websites, a toolkit outlining the institutional mechanism was developed. The toolkit on Website Governance Structure describes the roles that need to be identified in every government department for the overall sustainability of websites.

Capacity building of the department officials through the training required a structured approach. The toolkit was developed as a part of SWF for conducting the workshops and training for website development, implementation, and continued maintenance.

5.6 E-Government System Development Cycle

The ISO 13407 standard on human-computer design recommends five essential processes to be carried in an iterative model for addressing the usability requirements.

They are:

(i) Plan the human-centered process

(ii) Understand and specify the context of the use

(iii) Specify the user and organizational requirements,

(iv) Produce design and prototypes, and

(v) Carry out a user-based assessment.

The model based on ISO 13407-process has been extended to the E-Government design needs. It extracts elements of the process to evolve a model that is in sync with the E-Government System design needs.

Table 5.2 Representation of Development Model with four stages for HCD for Indian E-Government Systems

1. Plan	2. Prepare	3. Implement	4. Evaluate
1.1Identify the users	2.1 Involve users	3.1 Produce design	4.1 Evaluate against the need
1.2 Specify the user needs	2.2 Apply design principles	3.2 Test Design with all stakeholders	4.2 Iterate
1.3 Detail the context of use	2.3 Design Prototypes		4.3 Factor and reproduce design
1.4 Finalise the scoping			

Each stage in the design cycle model includes areas where the activities are to be done manually. The planning phase of the proposed E-Government design life-cycle model is to address the challenges of user-centricity. Although the role of user and user involvement has been established through studies, they are seldom considered in the development of E-Government systems. The recommended process of identifying diverse and representative users, their characteristics, and needs suited to the needs of E-Government. An iterative process of identifying users is required in the case of the E-Government scenario, as very often all users cannot be identified.

CHAPTER 6 CASE STUDY: GOVERNMENT OF ASSAM WEBSITES-METHODOLOGY

6.1 Usability and User-centricity

6.1.1. Constitution of an Expert Committee

The design of the citizen interfaces of the websites was lacking in visual aspects, basic design principles, and usability, and user interaction. The preliminary study of the websites and research are done with users made it evident that usability aspects were considered at the peripheral level of the websites only. To meet the challenge of lack of skill and expertise in the design of the citizen interfaces, the Government of Assam constituted an Expert Committee with experts with specialized skill sets in user experience and usability design drawn from the Department of Design, IIT Guwahati. The experts guided the design, usability, and human interaction aspects of websites. Through the partnership with experts, the Government of Assam could come up with a simple, visually appealing interface. The critical review and suggestions by the experts from the Department of Design, IIT Guwahati on Website usability, User experience, Visual aspects of the website resulted in greatly transforming the citizen interface.

6.1.2. Institutional mechanism

A governance structure was established in every department of GoA to bring in the required ownership, long-term sustainability, and commitment of the websites. The structure included the senior-most officer of the department designated for overseeing the management along with Website Information Manager, Content Managers, and Master trainers. Periodic review of content, enforcement mechanism was made a part of the responsibilities of the website governance structure constituted.

6.1.3. Building the awareness and collaboration

A major challenge in the GoA websites was the lack of a consultative approach within the department while the website was developed. This lack of awareness and ownership had led to the content of the website not being updated regularly. Firstly, in all the departments, sensitization and orientation workshops were held for all the departments. The first sensitization workshop on "Standardization of Government Websites" had more than 150 participants from the Government, Academia, and Industry. The workshop invited speakers from Academia and the Government to provide their ideas on the building of websites. The daylong deliberations and brainstorming sessions brought forth many new ideas and useful suggestions. A specially designed Group exercise was conducted for the participants from the department. The recommendations of each group were then consolidated and the major ones are in Table 6.1. This

was followed by conducting orientation workshops in the 55 departments of the Government of Assam to bring in the awareness and need for addressing the challenges in the existing websites. Information content that was uniformly required in all the department websites was also identified through these workshops.

Table 6.1 Key outcomes of the Sensitization workshop

Sl no	The outcome of the sensitization workshop
1	Websites should be designed to meet the needs of the citizens. It should cater to the various e-delivery services for the citizens as well.
2	The target user group of the websites should be decided first and accordingly proceed to work on the design, usability, and interaction aspects of the website;
3	The user who comes to the department website should be able to focus on the information and content retrieval by being able to seamlessly find the right link to the information.
4	Websites should be developed around open source portal and content frameworks
5	Websites should cater to both the internal government users (Intranet) as well as for the public (extranet).
6	Content ownership should rest with the department and they should take complete responsibility for updating and making all information authentic.
7	Standardization of the layout and design of government websites will help the public in finding the information quickly.
8	Capability and Capacity building of department officials in website management so that the internal strength for the sustainability of the website.
9	The requirement of a Standard panel of Website development and security auditing agencies for development around standard guidelines, which the departments can engage.
10	Establish of single coordination point for all queries and support in website development. A Help desk mechanism is to be established for supporting all government websites.
11	Establish necessary infrastructure for hosting websites as many of the websites were hosted outside the government domain.
12	Websites should have multi-lingual support, be friendly for the differently enabled, easy to navigate, mobile compliant and should have a good feedback mechanism.
13	Many of the websites were hosted in private domains viz. .org, .com, and needed to be brought government ".gov" domain.
14	The following elements were recommended to be a part of all the Government websites: Frequently Asked Questions (FAQs), Contact information, Acts& Rules, Notifications, Schemes, plans and Organization structure, and contact details (with visual aid)

6.1.4. Identifying user and user needs

To identify the target users of the websites and their needs, several interactive workshops were held with the department content managers. The toolkit 1developed for identifying users and their needs was used during the workshop. Workshops were conducted for the content managers of each department. Each branch in the department was represented through their Content Mangers. A minimum of four workshops was conducted for each department, each one for specific outcomes. For each of the largely activity-based workshops, toolkit 1 was made the base to identify the users and their specific requirements from the website.

The users identified were further classified based on various parameters viz: age, region, computer literacy level, and also on their profile. The needs and expectations of each user group were then determined. This was to have the website attuned to the user's needs and expectations. The probability of the user acceptance of the websites was expected to increase on meeting the needs of the end-users. The outcome of the first workshop through which user and their needs were arrived at, formed the basis for the next step for the website content.

6.2 Information and Content

6.2.1. Identifying website content

In the context of government websites, content refers mainly to Information and Services being offered through the website. Content related to all areas of work, within a department, were required to be identified and grouped. Toolkit 2 that was prepared served as the guiding document for the departments to plan and prepare the content for the website. It provided a step-by-step approach to identify, classify the content and categorize them based on the target users of the website. Content Managers of the department play an important role in the activity of content identification, grouping, and the final uploading on the respective department website. The workshop conducted for content managers focused on identifying the content the department has to offer to the user. The outcome of the workshop with toolkit 2 was the identification of the relevant content of each department for publishing on the website. All Government departments were bound to have a set of common content (Information and Services) that will need to become an integral part of their websites. From the workshops for identifying the users and information content, the set of content that was common across all the government departments was finalized. This was referred to as the ‘Standard Content’ and was to be made available for all department websites. The content was categorized based on the users and priority. The common minimum content that was required to be placed under all government websites was also evolved through the workshops.

6.2.2. Evolving the Website Information Architecture

When a citizen visits any Government of Assam website, the assurance that he or she is at the right place is the first step towards building trustworthiness. This was achieved by having consistent visual identifiers for all the Government Websites. This visual identifier was made as a uniform and standard header with the government Emblem on the homepage and government logo. Secondly, the citizen would expect that every government website will provide a minimum set of information. This minimum information was made uniform in all websites and provided with a standard placement for consistency and easy navigability. Experts from IIT Guwahati finalized the design of the standard header of the websites.

A step further was the placement of the information identified by every department for their respective websites. Users of government websites could be having different levels of experience and this is to be kept in mind while planning the website structure.

The workshops were conducted with toolkit 3 - Standard Government Website Information Architecture (SGIA) as the base. The design of IA was developed with the following elements in a standardized manner.

- Placement
- Navigation
- Layout and Appearance
- Uniform wording and labeling
- Standardized header with the Government Emblem on the homepage.

6.2.3 Accessibility features

The SWF is based entirely on the **Guidelines for Indian Government Websites (GIGW)** brought out by the Department of Administrative Reforms (DARPG),GoI for all Government websites. The GIGW prescribes features that websites need to mandatorily have for the differently abled and SWF complies entirely to GIGW.

The SWF has included the key features for accessibility:

(i) Responsive – SWF is built on open standards based technology (HTML 5) that makes it accessible across all devices. This is the responsive feature included in SWF.

(ii) Entire Website functionality in SWF Framework is accessible by TAB key, which is one of the requirements for the people with special needs.

(iii) There is standard placement and formats for certain contents. Through this one can easily understand and find content in the website.

(iv) The websites support bilingual (English and Assamese both) so that the people without the knowledge the English can also read the contents of the website.

(v) All the Government of Assam websites developed using SWF has uniform and simple navigation system.

(vi) Text Size resizing and Colour contrast

(vii) Screen Reader Access -The portal will have integrated tools for converting text to speech. One can easily hear the speech by selecting the desired text.

6.3 Development of websites

The technology development of the standard framework was based on the E-Governance Standards. The four-stage design life cycle (Section 5.6) was followed while designing the framework. The design principles and techniques were applied in all stages of the development. Every government website was developed as an instance using the SGIA. This led to the development of all websites in a standardized manner. A common hosting infrastructure was established for all government websites. The recommendations of the expert committee in the user interface were applied in the design stage of the website development.

Table 6.2 Recommendations of the expert committee

Sl no	Recommendation	Implementation
1	Different views for Target user group	
2	The site to be made simple and clutter-free	The emphasis on simplicity and the principle of 'less is more' was followed.
3	Colour contrast of the website	The color scheme and contrast selection was done carefully for the content-rich website pages.
4	Logo color and its placement	The logo colors and placement were chosen in such a way that the attention was not taken from the main content.
5	Grids to be present	Without actually drawing the differentiators, the grids were
6	Portlets	The positioning of the portlets was made to allow users to find the most important area quickly.
7	Tab Menus should have clear separators	
8	Font size	The font size was carefully selected to cater to users of different age groups.
9	Size and Colour	To differentiate the Main Department and Sub departments, Colour and size should be intuitively providing the linkage

6.4 Sustainability

For bringing in the required sustainability of the websites, the department needed to take complete ownership in terms of the content, updating mechanism, and maintenance. The skill and capability had to be therefore created within each department.

6.3.1. Single Coordination point for Government websites

A Website Development Cell (WDC) was formed by the Government to assist and guide departments in designing and developing their websites and for support in the following:

- In preparing the Government Website framework with Guidelines for Standardisation.
- To support departments in achieving the required transition/ building new sites
- Capacity Building of Department
- Monitor the implementation as per the agreed guidelines

6.3.2. Capability Building: Content Managers workshops

To build the capability within the Government at all levels specific to the user segment, the following methodology was adopted in every department for keeping the needs of the users, in content preparation, developing the capability and language of the websites.

- Orientation Workshops
- Content Managers Workshops
- Training of Master Trainers
- Certification of Master Trainers

Building the core competency of the department officials was needed for the overall sustainability of the project. The internal capability within the department for creating the right content based on the user needs and for uploading the content had to be built. In the earlier scenario, the vendors engaged in the development of the website also uploaded the content. When their term was over, the website content updating did not happen as there was no training and capacity building provided to the department officers. As the content on the website had to be representative of the information from all sections of the department, the content management had to be distributed throughout the department. This required a content management representative for each section. This ensured that the information of the entire department was considered. The content management representative or content manager had to be identified for each section of the department. A Series of Content Manager training sessions were organized for each department. Department Content Managers followed the activities outlined in the Tool kits 1, 2, and 3 in the workshops.

Fig 6.1: Content Managers workshops

6.3.3. Capability Building: Master Trainers

For continued capability building, a few department officers had to be equipped with the right skills. They had to be trained and retrained and in turn, they would be required to train the content managers. This set of trainers was termed as Master Trainers and every department had to designate their respective Master Trainers. Master Trainers are to be designated by the department based on their aptitude for training other officials in the department. Further, updating

the website was now the responsibility of the entire department. Capability building of a minimum of two Master Trainers within the department was done. These designated Master Trainers are then taken through the first level - Level 1 training program. After the completion of level 1, the Master Trainers are evaluated through assignments, online and written exams (details of the evaluation are provided in the Annexure of the toolkit). On successful completion of Level 1, the Master Trainers are certified as Government Website Certified Master Trainers. The certified Master trainers are eligible for Level2 –Advanced Training and Level 3-Specialised Training which is conducted by IIT Guwahati.

The training was provided by the Technology development team to the identified Master Trainers of each department. They were trained in the website framework, content development methodology, usability aspects, and website updating. The Master Trainers then had to organize training for the content managers of their respective departments.

Figure 6.2: Master Trainers training their respective department users

Evaluation for Certification as 'Certified Master Trainers'

To ensure the quality of 'Master Trainers', they underwent the certification program which required the successful qualifying of written and online exams.

Figure 6.3 Online and Written evaluation

Advanced Training at IIT Guwahati for Certified Master Trainers

The certified Master Trainers were further trained at IIT Guwahati. The advanced level \included topics on new and emerging trends in website design, audit, and management. This continuous training helped in building the confidence and motivation of the Master Trainers.

Figure 6.4: Master Trainers undergoing training at IIT Guwahati

- Creation of a core workbench within the Government of Certified Master Trainers.
- These Master Trainers will in turn train other officials of government departments.
- They will also be retrained after every six months to keep the workforce updated with new technologies.
- Building Capability within the Government and thereby ensuring the sustainability of the program.

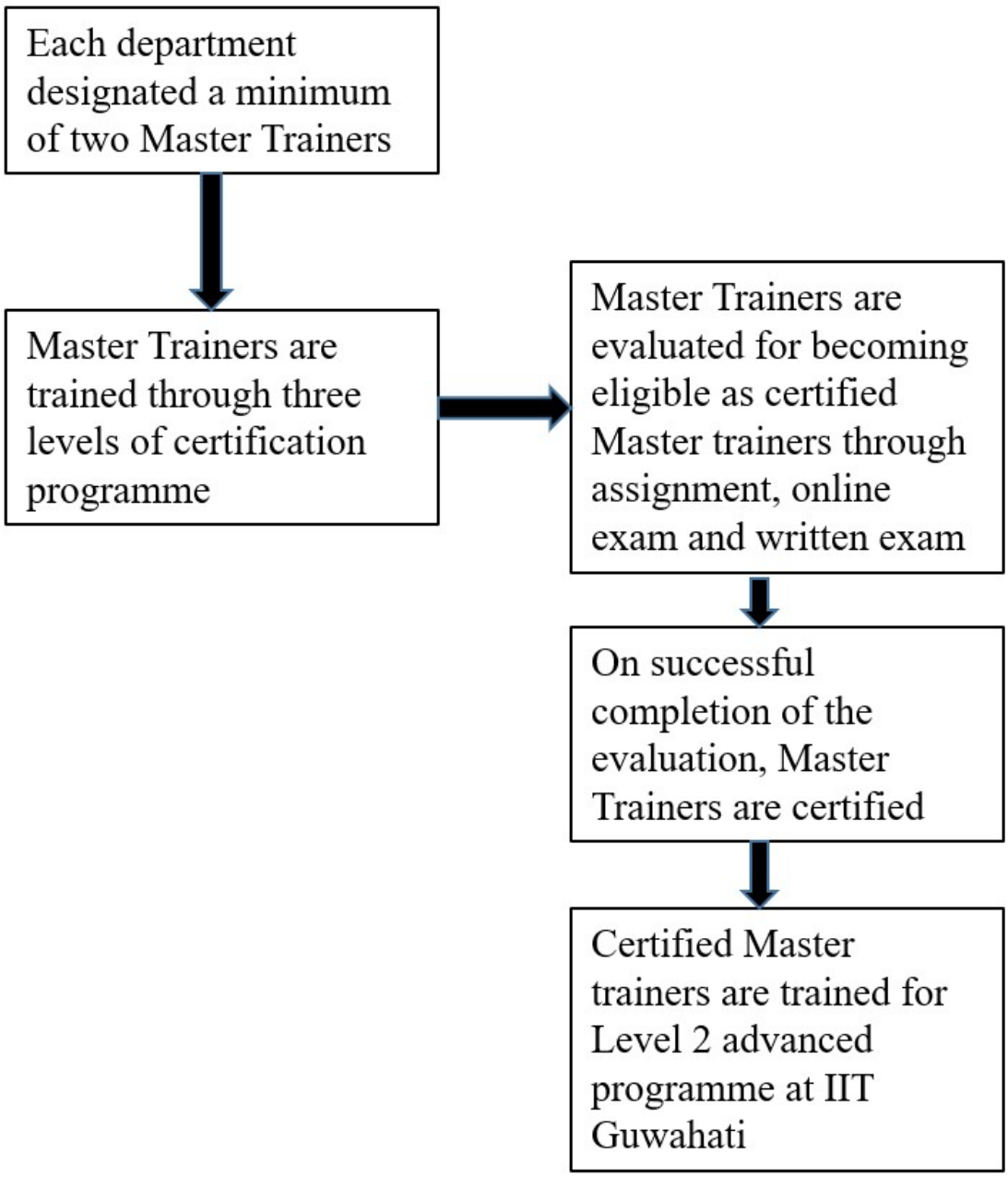


Figure 6.5: Process workflow for the Master Trainers Certification

CHAPTER 7 SUMMARY, VALIDATION, CONCLUSIONS, AND RECOMMENDATION

7.1 Summary of accomplishment of the Research Objectives

In this section, each of the seven objectives which were set at the beginning of this dissertation (Section 1.7) are taken up one by one and described how each objective was accomplished as a part of this research work.

(i) To identify the main factors that have resulted in the low usage of websites.

(ii) Study of literature review where similar research has been carried out on both the limiting and contributing factors in the usage of citizen-facing websites.

(iii) Study the global and national best practices adopted for citizen-facing websites

(iv) To leverage the findings to improve the quality of E-Government websites.

(v) Develop a standard guiding framework that can be implemented in the Government of Assam websites.

(vi) Development of usable and credible websites and make the usability of E-Government websites an integral part of the development lifecycle.

(vii) Develop a sustainability model for websites.

7.1.1. To identify the main factors that have resulted in the low usage of websites.

The assessment of the websites of GoA was able to provide the challenges that citizens faced in using the websites. The quantitative survey that was carried out among a cross-section of citizens helped to identify the issues related to the user experience and how useful the websites were in terms of the content. During the qualitative survey carried out, broader areas were covered. The sensitization workshop that was held with departments also resulted in brought forth some of the issues in the GoA websites (Table: Section 6.1).

The factors that resulted in the low usage were identified as issues in the over process adopted for the design, development, and implementation of websites. Section 3.1 describes the factors identified through the preliminary study and assessment of the GoA websites.

7.1.2. Study of literature review where similar research has been carried out on both the limiting and contributing factors in the usage of citizen-facing websites.

The study of the literature review in chapter 2 was mainly related to the areas that emerged from the study of GoA websites. The limiting factors identified through the study converged with the findings of previous research work carried out in E-Government systems. Research work is done on the factors that contributed to and limited the adoption of E-Government systems

(usability, user-centricity), designing intuitive interfaces, and specific challenges in citizen-centric systems, frameworks evolved and guidelines were studied.

7.1.3. Study the global and national best practices adopted for citizen-facing websites

Several national and global websites were studied to understand the best practices implemented concerning citizen centricity. Among the sites studied, several stood apart in terms of the attention to user-centricity, intuitive design, and content personalization. The best practices, design principles identified through the study of the global and national websites are described in Section 3.2. The literature review and study of websites helped to narrow down the main factors that have resulted in the low usage of websites.

7.1.4. To leverage the findings to improve the quality of E-Government websites

The analysis was done (Section 4.1) concerning the main findings that emerged from the study of websites, pilot implementation of six websites, and literature review. From the analysis carried out, steps and measures to be introduced in the design of websites were evolved to overcome the issues identified (Section 4.3).

7.1.5.Develop a standard guiding framework that can be implemented in the Government of Assam websites.

The Standardised Website Framework (SWF) was developed to address the issues in the websites of GoA. The framework extended the established frameworks of the D & M IS HCI design cycle, and proven usability guidelines. The framework described in Chapter 5 includes the guidelines, toolkits, standards, design life cycle methodology.

7.1.6. Development of usable and credible websites and make the usability of E-Government websites an integral part of the development lifecycle.

The design of interfaces is a fundamental aspect of E-Government websites. The existing stages of software development lifecycle followed by developers have been extended to include the techniques for design in Section 5.6: E-Government system development lifecycle.

7.1.7. Develop a sustainability model for websites.

The content of the earlier websites was not updated on account of two reasons:

(i) the department websites were developed by vendors who did the updating for the period of their engagement. The knowledge and capacity of department officials were not built for updating the content

(ii) The department was not fully involved in the content preparation and therefore the content in the websites represented only minimum information

(iii) There was no continuity in the website management when the officer of the

department coordinating the website was transferred.

The following methods adopted in every department ensured the sustainability of the websites:

- Website Governance Structure for the overall management of department websites. Ownership and commitment of the department were achieved through this structure. (Appendices -Toolkit 4)
- Content Managers and Assistant content managers representing every section of the department ensured that the content was representative of the entire department.
- Capacity building of the content managers enabled their skills for content creation and updating.
- Master trainers in every department provided continuity to the regular capacity building of content managers.

7.2 Validation

7.2.1 Improved interface with expert support

The design of the citizen interfaces of the websites was lacking in visual aspects, basic design principles, and usability, and user interaction. The GoA had taken the support of experts with specialized skill sets in user experience and usability design. The critical review and suggestions by the experts from the Department of Design, IIT Guwahati on Website usability, User experience, Visual aspects of the website resulted in greatly transforming the citizen interface. With the support from the experts, the design of a simple, visually appealing interface was possible for the websites. The design of the Standard website used common user design principles and build context-based designs after a complete understanding of the type of users, their needs, and requirements. The interface also addressed the diverse requirements of users, which was a key challenge during the development of the Standard Website Interface. At each phase of the development, the expert committee on design had reviewed the website design and structure. The initial prototype underwent several versions based on the review and suggestions of the expert committee.

Validation

- Interface designed with expert support resulted in building usable interfaces
- The role of human-computer-interaction in building the user interaction for citizen-facing websites

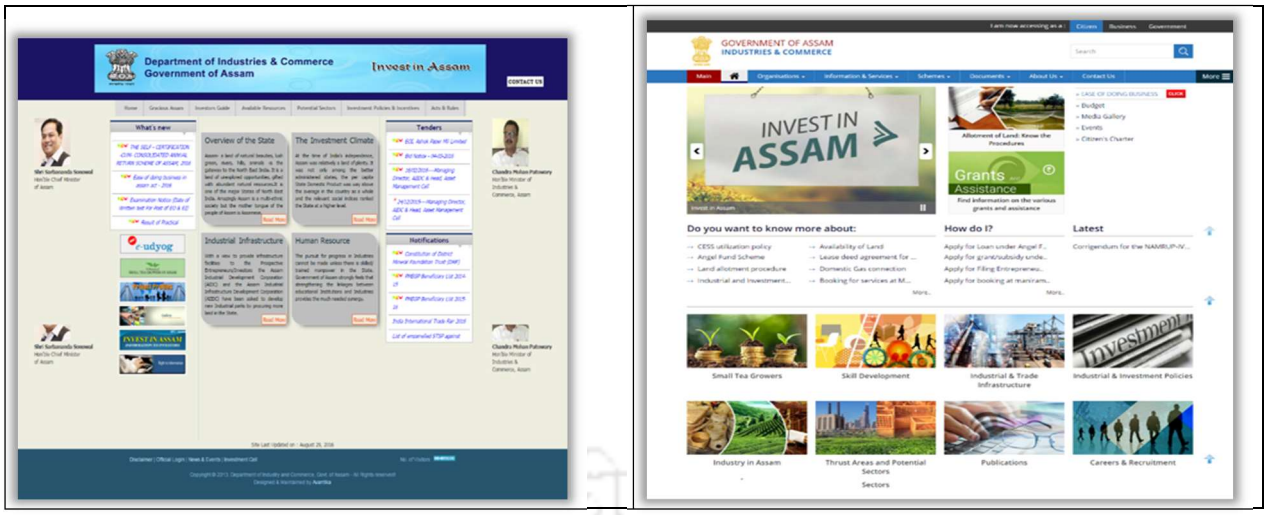


Figure 7.1 Website of Industries & Commerce (Before & After)

7.2.2 Increased hits in the Government websites

Almost all the Government websites saw a quantum jump in the terms of the visitor count. This also meant that the increased acceptance of websites by citizens. Visitor count as of 3rd November 2020 for Finance Department: 1473018

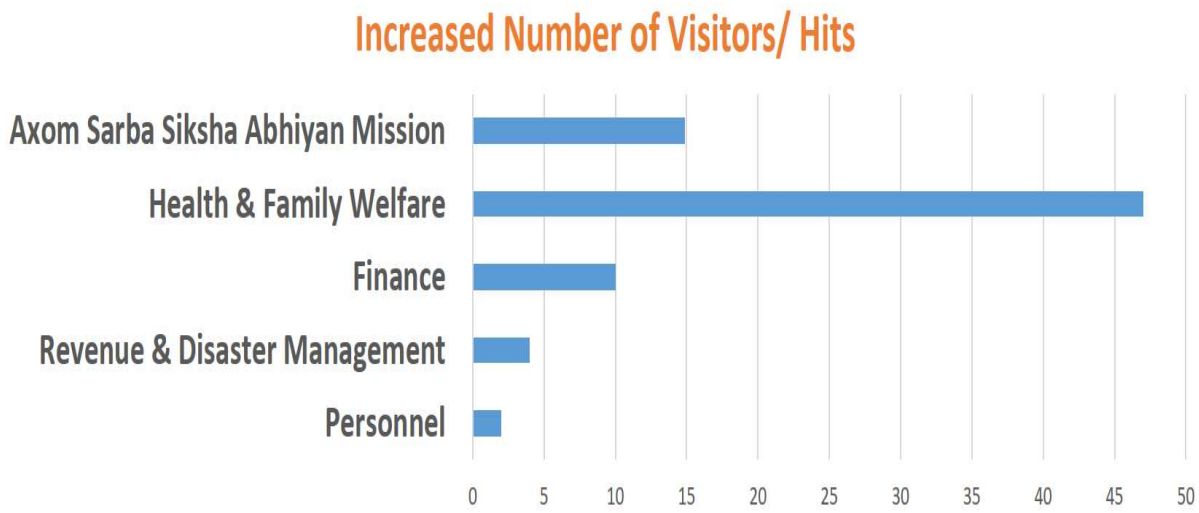


Figure 7.2 Increased hits in websites

Validation:

Improved user acceptance

Revisit to the sites indicated that citizen was obtaining the required information

7.2.3 Validation of User Interface principles

User interface design needs to consider the psychological and physical constraints of humans and how short-term and long-term memories work (Mandel, 1997).

Validation of consistent websites:

By making the user interface consistent, it has reduced the users' memory load and given users more control over the website and the need for external support.

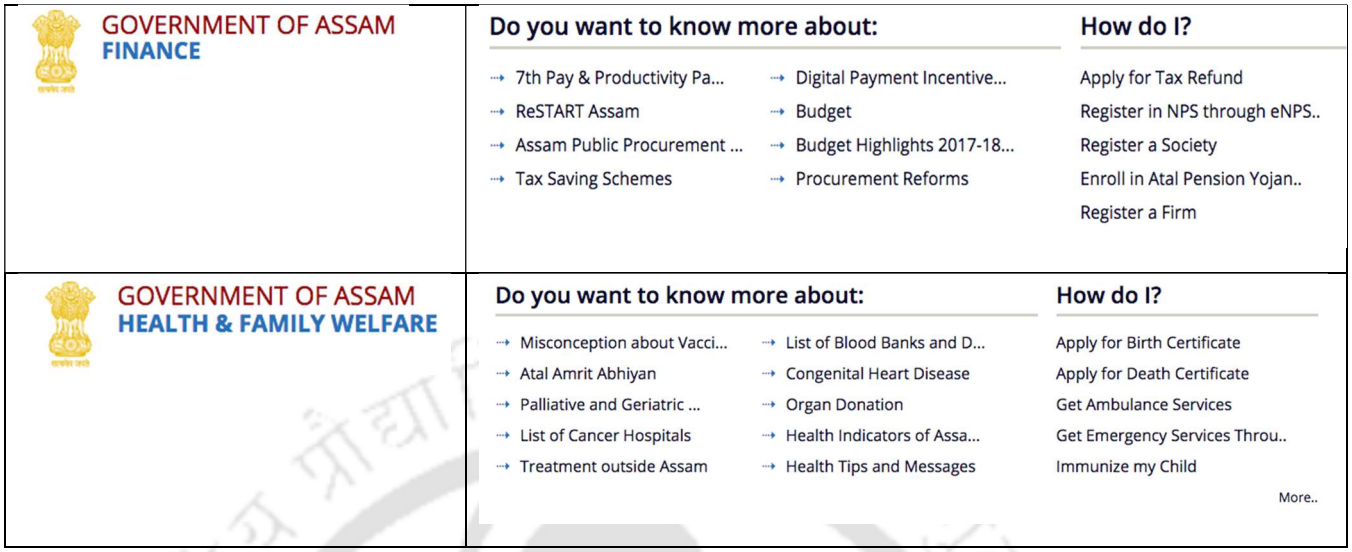


Figure 7.3 Consistency in websites

7.2.4 User-Centered and Participatory approach

From the initial study made of the websites of Government of Assam website, it was concluded that the websites had been developed based on the requirements provided by the government department officials, without considering the user and user needs. Identifying the end-user of the Government of Assam Websites and then understanding their needs was undertaken in the early stage of the website development.

Validation:

User participation is found to result in a more accurate definition of requirements, improved user interfaces, greater buy-in from the users, and decreased resistance to change. It validated the importance of aligning the website to the requirements of the users.

7.2.5 Sustainability

Stakeholders in E-Government Systems refer to the Government (departments), Citizens (who will use the system), and Technologists (who will build the system). All the stakeholders were brought to a single platform for achieving the common objectives. The capability and skillsets required from each stakeholder which was specific to their role in the overall cycle of systems design and development were thus achieved. To build the capability within the Government at all levels specific to the user segment, training was conducted for content managers to identify the needs of the website users, in content preparation, developing the capability and language of the websites.

Validation:

The active involvement of all stakeholders resulted in

(v) Greater acceptance of the websites by the citizens

(vi) Commitment and ownership of the department

(vii) Department content was updated regularly

(viii) No dependence on the external agency for updating

7. 3 Research outcomes

Research outcome 1:

The methodology mentioned in section 1.9, Chapter 1 was adopted while developing every Govt. of Assam's departmental website. This ensured that the needs of the users were considered, content attuned to the target users in content preparation, developing the capability and language of the websites. The websites had specific sections and content targeted for the end-users.

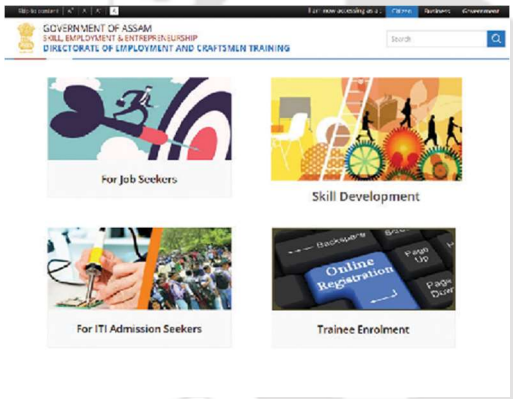


Figure 7.4 Target users: Job seekers, ITI Admission seekers

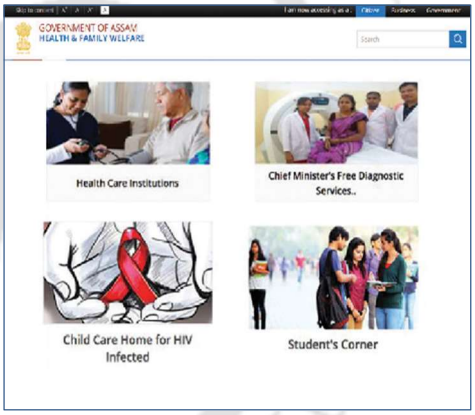


Figure 7.5 Target users: Health care, Students

There was a fundamental change in the description and language of the website. The content was made very intuitive: predicting the mind of the user, what queries the user comes to the website for, what actions will be performed by the user.

Research Outcome 2:

Usability testing practices were adopted for improving the user experience of the websites. With the support from experts of IIT Guwahati, design standards for usability and user interaction were applied to the websites. Websites had more focus on the user interface and user interaction.

Research Outcome 3:

The capability of the departments for managing their respective websites was ensured by building the core workbench of 'Master Trainers'.

Research outcome 4:

A Standard Website Framework was established which has guidelines for process, information and technology areas for website development. The process ensured the institutional mechanism for website development, ownership and commitment, and sustainability.

Major research outcomes

- The importance of user interface design in websites emerged as the major outcome.
- Making design an integral part of the website development lifecycle.
- Design thinking in the Government;
- Need for specialized skills and expertise in website development;

Main Research contributions

- Branding of all the websites under a unique visual identifier helped the users to identify with the GoA websites.
- All Government of Assam's departmental websites has been built in a Standardised manner.
- The website development process has been simplified.
- The development of a single website that earlier took 6 -12 months can now be built within 30 days.
- Better content creation that drives informative websites attuned to the user needs.
- The capability of the department to build, maintain and update its website without dependency on vendors for management of the websites.
- Estimated that significant cost savings will be there on account of:
  Decreased efforts in development and maintenance
  Shared infrastructure
  No licensing cost as technology is based on Open Standards

The above outcomes and contribution are in line with the main aims of the research:

- *to make usability and credibility of E-Government websites an integral part of the development lifecycle*
- *to develop a standard guiding framework that can be implemented in the Government of Assam websites.*

7.4 Recommendation and Conclusions

Based on the outcome of the research, it can be concluded that the Methodology adopted for the design of websites of the Government of Assam and its various departments was successful and all research objectives were accomplished.

It can be recommended that this methodology along with various Toolkits developed during the research can be used for developing websites in other state languages that were beyond the scope of this research. This will fulfill the long-felt need of various communities and tribes of the state to derive benefits of e-governance.

The government of Assam has the plan to create district-specific websites for the benefits of its citizens and plans to extend the same to Block level so that very contextual information can be available to the citizens. In this endeavor too, the methodology evolved and Toolkits can be very valuable and recommended for implementation.

REFERENCES

Abu Addous, Hayfa & Zalisham, Mohd & Basir, Nurlida. (2016). Web Accessibility Challenges. International Journal of Advanced Computer Science and Applications. 7. 10.14569/IJACSA.2016.071023.

Akman, I., Yazici, A., Mishra, A., & Arifoglu, A. (2005). E-Government: A global view and an empirical evaluation of some attributes of citizens. *Government Information Quarterly*, *22*(2), 239-257.

Ali, Liaqat and Salahat, Mohammed. 2019. E-Accessibility Evaluation of UAE Governmental Websites: Findings and Implications. In Proceedings of the 2019 3rd International Conference on E-commerce, E-Business and E-Government (ICEEG 2019). Association for Computing Machinery, New York, NY, USA, 34–39. DOI:https://doi.org/10.1145/3340017.3340035

AlAwadhi, S., & Morris, A. (2009). Factors influencing the adoption of e-government services. *Journal of Software*, *4*(6), 584-590.

Alshehri, M., & Drew, S. (2010). E-government fundamentals. In *IADIS international conference ICT, society and human beings*.

Bargas-Avila, J. A., Orsini, S., de Vito, M., & Opwis, K. (2010). ZeGo: development and validation of a short questionnaire to measure user satisfaction with e-government portals. *Advances in human-computer interaction*, *2010*, 6.

Bertot, J. C., Jaeger, P. T., & McClure, C. R. (2008). Citizen-centered e-government services: benefits, costs, and research needs. In *Proceedings of the 2008 international conference on Digital government research* (pp. 137-142). Digital Government Society of North America.

Campoverde-Molina, M., S. Luján-Mora and L. V. García, "Empirical Studies on Web Accessibility of Educational Websites: A Systematic Literature Review," in IEEE Access, vol. 8, pp. 91676-91700, 2020, doi: 10.1109/ACCESS.2020.2994288.

Clemmensen, T., & Katre, D. (2012). Adapting e-gov Usability: Evaluation to Cultural Contexts. In *Usability in government systems* (pp. 331-344). Elsevier.

de Róiste, M. (2013). Bringing in the users: The role for usability evaluation in eGovernment. *Government Information Quarterly*, *30*(4), 441-449.

Field, T. (Ed.). (2003). *OECD e-government studies the e-government imperative*. OECD Publishing.

Fisher, J., Bentley, J., Turner, R., & Craig, A. (2005, January). SME myths: if we put up a website customers will come to us-why usability is important. In *eIntegration in action: 18th Bled eConference, Bled, Slovenia, June 6-8, 2005; conference proceedings*. The University of Maribor.

Garrett, J. J. (2010). Elements of user experience, the: user-centered design for the web and beyond. Pearson Education.

Gonzalez, P., Adenso-Díaz, B., & Gemoets, L. A. (2010). A Cross-National Comparison E-government Success Measures: A Theory-Based Empirical Research. In *AMCIS* (p. 354).

Heeks, R. (1999). The tyranny of participation in information systems: Learning from development projects.

Hewett, T. T., Baecker, R., Card, S., Carey, T., Gasen, J., Mantei, M., ... & Verplank, W. (1992). *ACM SIGCHI curricula for human-computer interaction*. ACM.

Holgersson, J., & Karlsson, F. (2014). Public e-service development: Understanding citizens' conditions for participation. *Government Information Quarterly*, *31*(3), 396-410.

Huang, Z., & Benyoucef, M. (2014). Usability and credibility of e-government websites. *Government Information Quarterly*, *31*(4), 584-595.

Karlsson, F., Holgersson, J., Söderström, E., & Hedström, K. (2012). Exploring user participation approaches in public e-service development. *Government Information Quarterly*, *29*(2), 158-168.

Katre, D., & Clemmensen, T. (2011). Special Issue on Human Work Interaction Design for E-Government and Public Information Systems. *International Journal of Public Information Systems*, *7*(3).

Kossak, F., Essmayr, W., & Winiwarter, W. (2001). Applicability of HCI Research to eGovernment Applications. *ECIS 2001 Proceedings*, 63.

Kotamraju, N. P., & van der Geest, T. M. (2012). The tension between user-centered design and e-government services. *Behaviour & Information Technology*, *31*(3), 261-273.

Kujala, S. (2003). User involvement: a review of the benefits and challenges. *Behaviour & information technology*, *22*(1), 1-16.

Kujala 1, S. (2008). Effective user involvement in product development by improving the analysis of user needs. *Behaviour & Information Technology*, *27*(6), 457-473.

Kujala, S., & Kauppinen, M. (2004, October). Identifying and selecting users for user-centered design. In *Proceedings of the third Nordic conference on Human-computer interaction*(pp. 297-303). AC

Kumar, V., Mukerji, B., Butt, I., & Persaud, A. (2007). Factors for successful e-government adoption: A conceptual framework. *Electronic Journal of E-government*, *5*(1).

Lai, C. S. K., & Pires, G. (2010). Testing of a model evaluating e-government portal acceptance and satisfaction. *Electronic Journal of Information Systems Evaluation*, *13*(1), 35.

Maguire, M. (2001). Methods to support human-centered design. *International journal of human-computer studies*, *55*(4), 587-634.

Mandel, T. (1997). Elements of user interface design. In *Elements of user interface design*. New York: John Wiley.

Marchese, M., Jacucci, G., Martin, M., Wessels, B., Dittrich, Y., & Eriksén, S. (2002). *A participatory design approach for the development of supportive environments in eGovernment services to citizens*. The University of Trento.

Mumford, E. (1981). Participative Systems Design: Structure and Method. *SYS. OBJECTIVES, SOLUTIONS.*, *1*(1), 5-19.

Nagaraju, Mamillapally & Chawla, Priyanka & Rana, Ajay. (2019). A Practitioner's Approach to Assess the WCAG 2.0 Website Accessibility Challenges. 958-966. 10.1109/AICAI.2019.8701320.

Noyes, J., & Baber, C. (1999). *User-centered design of systems*. Springer Science & Business Media.

Patel, H., & Jacobson, D. (2008, June). Factors Influencing Citizen Adoption of E-Government: A Review and Critical Assessment. In *ECIS* (pp. 1058-1069).

Preece, J., Rogers, Y., Sharp, H., Benyon, D., Holland, S., & Carey, T. (1994). *Human-computer interaction*. Addison-Wesley Longman Ltd.

Olphert, W., & Damodaran, L. (2007). Citizen participation and engagement in the design of e-

government services: The missing link in effective ICT design and delivery. *Journal of the Association for Information Systems*, *8*(9), 27.

Shareef, M. A., Kumar, V., Kumar, U., & Dwivedi, Y. K. (2011). e-Government Adoption Model (GAM): Differing service maturity levels. *Government information quarterly*, *28*(1), 17-35.

Shneiderman, B., & Plaisant, C. (2010). *Designing the user interface: strategies for effective human-computer interaction*. Pearson Education India.

Soufi, B., & Maguire, M. (2007, July). Achieving usability within e-government web sites illustrated by a case study evaluation. In *Symposium on Human Interface and the Management of Information* (pp. 777-784). Springer, Berlin, Heidelberg.

Tambouris, E., Loutas, N., Peristeras, V., & Tarabanis, K. (2009). The Role of Interoperability in eGovernment Applications: An Investigation of Critical Factors. *Journal of Digital Information Management*, *7*(4).

van Velsen, L., van der Geest, T., ter Hedde, M., & Derks, W. (2009). Requirements engineering for e-Government services: A citizen-centric approach and case study. *Government Information Quarterly*, *26*(3), 477-486.

Vanderdonckt, J., & Beirekdar, A. (2005). Automated Web Evaluation by Guideline Review. J. Web Eng., 4(2), 102-117.

Verdegem, P., & Verleye, G. (2009). User-centered E-Government in practice: A comprehensive model for measuring user satisfaction. *Government information quarterly*, *26*(3), 487-497.

Wang, Y. S., & Liao, Y. W. (2008). Assessing eGovernment systems success: A validation of the DeLone and McLean model of information systems success. *Government information quarterly*, *25*(4), 717-733.

Wathen, C. N., & Burkell, J. (2002). Believe it or not: Factors influencing credibility on the Web. *Journal of the American Society for information science and technology*, *53*(2), 134-144

Youngblood, N. E., & Mackiewicz, J. (2012). A usability analysis of municipal government website home pages in Alabama. *Government Information Quarterly*, *29*(4), 582-588.

Yuan, L., Xi, C., & Xiaoyi, W. (2012). Evaluating the readiness of government portal websites in China to adopt contemporary public administration principles. *Government Information Quarterly*, *29*(3), 403-412.

Zaied, A. N. H. (2012). An integrated success model for evaluating information systems in public sectors. Journal of Emerging Trends in Computing and Information Sciences, 3(6), 814-825.

Web references

National e-Governance Plan (NeGP) and Mission Mode Projects: https://meity.gov.in/divisions/national-e-governance-plan [Accessed on 17 April 2019]

Framework for Citizen Engagement for NeGP: Available at https://meity.gov.in/writereaddata/files/Framework%20for%20Citizen%20Engagement%20in%20NeGP.pdf [Accessed on 17 April 2019]

Electronic Service Delivery Bill (2011) Available at https://meity.gov.in/content/draft-electronic-delivery-services-bill-2011 [Accessed on 17 April 2019]

E-Governance Standards: Technology Standards http://egovstandards.gov.in/ [Accessed on 17 April 2019]

UN E-Governance Survey Report: https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2018 [Accessed on 17 April 2019]

https://www.nngroup.com/articles/ten-usability-heuristics/

W3C, "About W3C", available from: http://www.w3.org/Consortium [Accessed on 7 May 2021]

WAI,"WAI guidelines and techniques", available from: https://www.w3.org/WAI/ [Accessed on 7 May 2021]

WCAG 2.1, "Web content accessibility guidelines (wcag) overview", Available from: https://www.w3.org/TR/WCAG21/ [Accessed on 7 May 2021]

List of Publications

(i) Role of Human-Computer Interaction in Building the User Interaction Layer for Citizen Facing Government Websites

Suchitra Pyarelal, Amarendra K. Das ICoRD 17, Guwahati, India, 2017.

(ii) Evolving a specialized discipline in Human-Computer Interaction (HCI) Design education for Indian E-Government Systems

Suchitra Pyarelal, Amarendra K. Das, HWWE 2017, Aligarh Muslim University.

(iii) Automating the Design of Citizen-Centric User Interfaces using Artificial Intelligence

Suchitra Pyarelal, Amarendra K. Das, NordDesign 2018 (August 14 – 17, 2018)

Submitted for publication:

(i) Design & Implementation of Intuitive and User-Friendly Citizen-Centric Websites for Government of Assam for Sustainable eGovernance.

Suchitra Pyarelal, Amarendra K. Das, 23rd International Conference on Engineering Design (ICED) in August 2021

APPENDIX 1 - TOOL KIT 1

UNDERSTANDING THE END USERS OF THE WEBSITE AND THEIR NEEDS

The toolkit was prepared to guide the departments to develop their websites in a manner that the content is attuned to the needs of the end-users of the websites.

Activity 1: Identifying the End Users who are going to be the Target Audience of the Website

In this, the department is taken through an activity-based exercise and was required to write down the likely users of their websites. End-users of Government websites generally fall into the following categories:

- *Citizens who form the largest base of Government Websites*
- *Business Community*
- *Government*
- *NGOs*

Step 1: Categorising the end-users further based on their area of work and also by general parameters.

The categorization based on the area of work generally fell under the following:

a. Farmers
b. Students
c. Job Seekers
d. Skilled workers
e. Professionals
f. Labour community

The categorization was also done based on age, gender, digital literacy, language, culture, geographic profile, network, and Internet access.

Step 2: Prioritisation of the end-users

The end-users were prioritized based on their expected level of usage of the website. The users were identified as Primary and Secondary set of users.

Primary users were the set of users who will form the majority in the usage of the website. The design will focus first on the primary users. Secondary users are those users who will use the website but are not large in number.

Activity 2: Understanding user needs

From Activity 1, the end-users are identified. Activity 2 was to gain a deeper understanding of the needs and expectations of the users identified through Activity 1.

As the Content managers knew the end-users of the websites, the needs against each category of users were drawn by them while doing activity 2.

The outcome of Toolkit 1 in the workshop conducted for the Department of Animal Husbandry & Veterinary Department, Govt. of Assam is outlined below:

Users identified:

1. Citizens
2. Farmers-Small, Marginal, Big
3. Students-College, University
4. Researcher
5. Employees-Present, Retired
6. Govt. Depts.
7. NGOs
8. Unemployed youth/ Jobseekers
9. Business Community-Suppliers, Contractor

Needs of users identified (Category of user wise):

USER	NEEDS
Farmers	Contact details of the officials
	Name & location of the Veterinary Institution/farms
	Artificial Insemination Service Artificial Insemination and its advantages. List of Hospital/ Dispensary/ A.I. Centre. List of Vets and Para vets working under the above institution. Available Breeds of Semen and the price
	Vaccination schedule Vaccine availability & Price
	A scientific method of Housing A scientific method of Feeding A scientific method of Rearing A scientific method of Breeding of Cattle, Buffalo, Piggery, Goat, Rabbit, and poultry (Broiler, Layer, Quail, Emu, Turkey, Poultry farming, Duck) and also Availability of different high yielding breeds
	Training on livestock & poultry farming
	Different ongoing schemes on Dairy, Goatery, Piggery, Poultry, Duckery, Fodder BANKABLE MODEL SCHEME: - Dairy, Goatery, Piggery, Poultry, Duckery, Fodder, Rabbit, Turkey, Quail, Guinea Fowl, Emu
	Animal Trade Policy
	Commonly prevalent diseases of animals and birds Prevention
	Feeds & Fodder Types of Fodder (Season wise) Cultivation of Fodder Availability of Seeds & Roots Treatment & Preservation of Fodder List of feed and fodder farms
	Different Application format
	Information on Hatchery unit & Feed Mill
	Success Story on Fodder Cultivation, Dairy Farming, Goatery farming, Piggery Farming, Poultry farming, Duckery farming
	Livestock Insurance
	Package & Practices for Livestock & Poultry Rearing
	List of Progressive Farmers

Citizens, Students, Researcher, Govt. Depts., NGOs, Unemployed youth/ Jobseekers	About the Departments
	Profile
	Administration
	History
	Vision
	Zoo & Wildlife
	Acts
	Different ongoing schemes on Dairy, Goatery, Piggery, Poultry, Duckery, Fodder BANKABLE MODEL SCHEME: - Dairy, Goatery, Piggery, Poultry, Duckery, Fodder, Rabbit, Turkey, Quail, Guinea Fowl, Emu
	Animal Trade Policy
	Ongoing Scheme/ Projects
	Photo Gallery
	Video Gallery
Employee	Departmental Guidelines Notifications Office orders Concept note on govt. schemes Beneficiary database Transfer and posting Gradation List Minutes of meetings Pension status
Business Community	Notification Tender notice Office order Advertisements related to supply

APPENDIX 2 - TOOLKIT 2

IDENTIFYING AND GROUPING THE WEBSITE CONTENT

The toolkit was developed in line with the need for identifying the contents that needed to be provided on the website. From the studies done, it was found that the department had paid very little attention to the content on the website. Given the importance of website content, this toolkit was prepared as a guiding methodology that can be adopted by every department. It included a step-by-step approach for identifying and grouping content. Each step provides detailed actions.

Step 1: Basic details and Area of work as per the Job Chart

Each Content Manager was required to enter the basic details and the area(s)of their respective work allocation as per the Job Chart defined. A few examples of areas of work in the Education Department are RTI, Admission Counselling, and Schemes Monitoring.

Step 2: Listing the different functions performed against each area of work.

The content managers had to list the various functions performed under each area of work as listed in step1. If the areas of work are more than one, the functions performed under each had to be listed.

Eg: Under the RTI (Area of Work), the different functions are:

(i) Disposal of RTI
(ii) Transferring of RTI Petitions
(iii) Placing to the Appellate Authority

Step 3: Listing the content (Information and Services) from each function performed.

The content here is either of information type or service type. From the listing done, the content is grouped as “Information” or “Services”. The list of functions under RTI was listed as follows:

(i) Status of RTI Petitions
(ii) Disposal Status
(iii) Figures and Statistics
(iv) Number of RTI Petitions received/disposed of/sent for the second appeal within one
(v) year
(vi) Proactive disclosure
(vii) Details of SPIO
(viii) Online RTI application

(ix) Online submission of petitions

Step 4: Mapping the content as either 'Information' or as 'Service'

(i) Status of RTI Petitions- Information

(ii) Disposal Status - Information

(iii) Figures and Statistics- Information

(iv) Number of RTI Petitions received/disposed of/sent for the second appeal within one year - Information

(v) Proactive disclosure- Information

(vi) Details of SPIO - Information

(vii) Online RTI application -Service

(viii) Online submission of petitions –Service

Step 5: Decide the Intended Target End User for each Content-Type

The content that has been categorized as Information and Services are then grouped under the appropriate target end-users of the services.

Sl. No.	Functions under the Area of Work "RTI"	Information/Service	Target end users for the Information/Service
1	Status of RTI Petitions	Information	G2C
2	Disposal Status	Information	G2C
3	Figures and Statistics	Information	G2C and G2G
4	Number of RTI Petitions received/disposed of/sent for the second appeal within one year	Information	G2C and G2G
5	Proactive disclosure	Information	G2C and G2G
6	Details of SPIO	Information	G2C
7	Online RTI application	Service	G2C
8	Online submission of petitions	Service	G2C

Step 6: Grouping of Content -Target End User Wise

Target End User	Information	Services
G2C	Status of RTI Petitions	Online RTI application
	Disposal Status	Online submission of petitions
	Figures and Statistics	
	Number of RTI Petitions received/ disposed of/ sent for the second appeal within one year	
	Proactive disclosure	
	Details of SPIO	
G2G	Figures and Statistics	
	Number of RTI Petitions received/ disposed of/ sent for the second appeal within one year	
	Proactive disclosure	
	Details of SPIO	
	Figures and Statistics	
	Number of RTI Petitions received/ disposed of/ sent for the second appeal within one year	

Step 7: Rank the Grouped Content in order of its importance

Target End users	Information	P	Services	P
G2C	Status of RTI Petitions	1	Online RTI application	2
	Disposal Status	2	Online submission of petitions	1
	Figures and Statistics	4		
	Number of RTI Petitions received/disposed of/sent for the second appeal within one year	5		
	Proactive disclosure	3		
	Details of SPIO	6		
G2G	Figures and Statistics			
	Number of RTI Petitions received/disposed of/ sent for the second appeal within one year			
	Proactive disclosure			
	Details of SPIO			
	Figures and Statistics			
	Number of RTI Petitions received/disposed of/sent for the second appeal within one year			

The key outcome of the activities of Toolkit 2 was that all Content (Information and Services) generated within the department (and its associated organizations) as per Job Structure and Functions were identified and grouped as per the *Target users* of the website.

APPENDIX 3 - TOOLKIT 3

STANDARD GOVERNMENT WEBSITE INFORMATION ARCHITECTURE (SGIA)

The SGIA was designed for adoption by all Government departments keeping the following factors.

(i) Categorization and Grouping of Standard Content Areas

(ii) Uniform Placement of the Standard Content

(iii) Standard labeling allows a user to find information quickly

(iv) Meaningful and intuitive naming conventions

(v) Maintenance of consistency in the page layout

Step 1: Header Standardization

- Government Logo and the Name of the Department. When the subordinate organization is selected, then the name of the sub-organization also appears.
- Search: Given its importance and requirement across all pages and sub-pages, this can be placed on the Header.
- Target Audience (G2C/G2G/G2B/G2N/G2E): The Website will present the view and information based on the role of the user who is accessing the site. The Primary Audience Group is placed first. For locating the selection, this is placed on the top portion of the header.

A sample header for SGIA is depicted in Figure below:

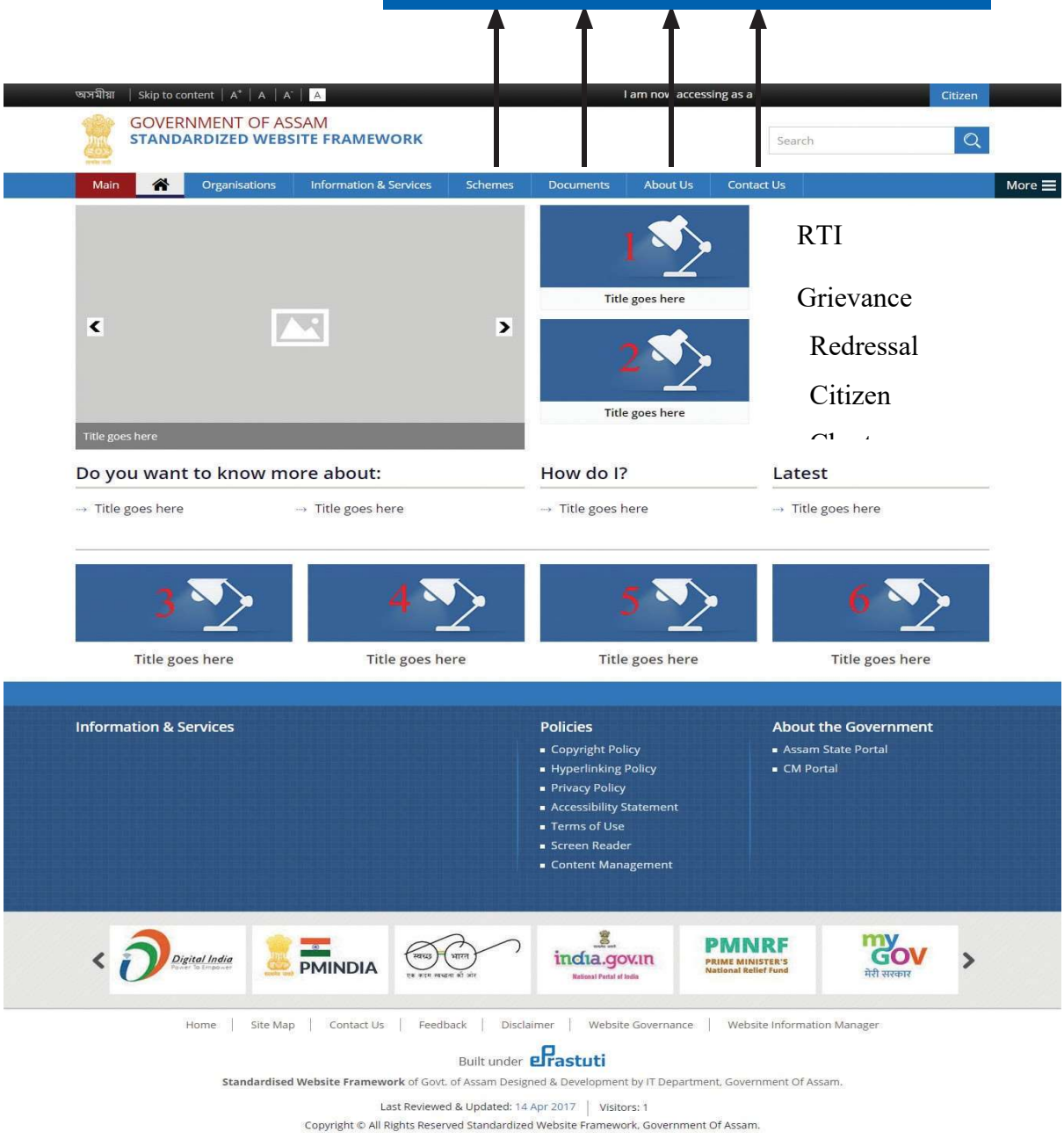
Step 2: Standard content

The Content that all Government Websites need to mandatorily have on their home page was identified. The placement and Layout of these Standard content areas should be uniform across all the websites so that the end-users find it easy to locate them.

- About Us
- Sub-ordinate organizations in the department
- Divisions within the department / and its sub-organizations
- Right to Information(RTI)
- Grievance Redressal
- System for meeting Audit Objections

- System for delivery of Services to the Public
- Citizen Charter
- Schemes
- Documents
- Frequently Asked Questions (FAQs)
- Events
- Tenders
- Feedback
- Media Gallery
- Documents

Common Content that will be present in the Home Page of all Government Websites



Step 3: Prioritise the end target audience

The audience of the website is to be identified as Primary, Secondary, and Tertiary.

Primary: The audiences that will be the site's main focus. The site will be designed and optimized for this set of audience.

Secondary and Tertiary: Audience in the order of importance.

Each member dives more into the specific details of the target end-user: Say, if the Target User Group was identified as Citizens, then more specific information on the user group:

- Gender
- Age group
- Work profile (Student community/Professionals/Labour Force.
- Access

Step 4: Define the expectations of each type of user community

The ultimate objective of the Standardisation of the IA of a website is to have an effective design that anticipates the user needs and expectations. Most often the site is designed by department officials or by external agencies without a consultative approach. The target user needs are seldom kept in the forefront while the site is organized or designed. The approach should be to look at the site design from the end user's point of view. The site should be structured and arranged the way your target audience expects to see it. Department will need to understand the expectations of each of the above user groups and identify their goals and expectations. This will help to ascertain what needs to go on the website and will drive the final IA of the website.

- What type of specific content they are looking for?

Access the existing content identified and filter out what is required to be placed on the website for each type of user community.

- What is the language they use? Knowing this may help to tailor the content.
- How do they normally search for the content they want?
- How are they likely to access the content?

Step 5: Organise the content under proper menu structure in a meaningful manner

Content on the website can further be organized logically after a deeper understanding of the user.

- Classify the content in terms of its importance
- All similar types of content to be clubbed together

Many factors are to be kept in mind while organizing the website structure and positioning of the content. Users have to find the most sought after information fast and in a predictable manner. So now the next main activity is to arrive at the best IA for the website to ensure that all items that the target user might need to find are arranged in the best possible manner. For example, a user may want to be able to find a particular service. So, instead of having the website page describe all the functions of the department, it is more appropriate to have all the services offered by the department placed together under the heading 'Services'.

Step 6: Describe the content in an intuitive and meaningful manner.

Understanding how the audience would describe the content while they search the site will help in having a similar pattern on the website. A few scenarios are given below:

Scenario 1: Giving specific information to a user based on who they are.

One area of the website could be focused on providing information to a different category of users. For this, it is important to know what category of user community will be accessing.

Information for

- Students
- Job Seekers
- Educators

Scenario 2: Know what type of questions users normally ask and appropriately frame the content area headers.

I am looking for ----------

What are my entitlements?

When is the exam scheduled for ……...?

Step 7: Draw up the wireframe for placing the content

- Organize the placement of the content
- Most important to be in the Main Page
- Placement to be consistent and predictable
- Providing clues to help use the site efficiently

The content of your site that was identified and categorized by determining the end-users' goals

will now need to be placed in the most appropriate position on the website.

This activity is best done with a section of target users but if it is not possible, then form a group within the department. Make sure that the group represents the different functions or areas of work in the department. They now need to put themselves in the role of the target user. Each one participating in this activity must record their points in a separate information sheet.

Frame the questions that the user asks or has in mind while coming to the site

- What the end-user expects when they come to the website.
- What specific type of content do they look for?

Access the existing content identified and filter out what is required to be placed on the website for each type of user community.

- What is the language they use as the content can be written tailored to this?
- How do they normally search for the content they want?
- How are they likely to access the content?
- Organize the content based on the importance under a meaningful group or structure and give the structure a simple and predictable name (label)
- Finally, draw up the wireframe for the website Home Page and Inner Pages based on the Standard Government Information Architecture(SGIA).

APPENDIX 4 - TOOLKIT 4

INSTITUTIONAL MECHANISM

For sustainability and ownership of websites, it was considered important to put in place the required mechanism to bring in the ownership and commitment for the government websites. An institutional mechanism with required structures was established in each department. The overall website project was driven under the leadership of the Chief Secretary to the Government of Assam who was designated as the Chief Responsible Officer. The senior-most functionary of the department was made responsible for the website and designated as the Responsible Officer. The following structures were established in each department for effective implementation and sustainability of the websites.

(i) Department Project Steering Committee

(ii) Department Support Structures

Department Project Steering Committee

Department Project Steering Committee was constituted in every department for steering the overall implementation and management of the department websites. The senior-most secretary in the department was the chairman of the committee. The committee included the heads of the subordinate organizations of the main department to achieve an integrated website in terms of content and information of the main administrative department and its subordinate organizations. The main role and responsibilities of the committee are as follows:

1. Provide project oversight, direction, and guidance
2. Develop Sustainability Plan
3. Budget allocation and approvals
4. Finalize the Website structure of the Main Administrative Department and ensure its integration with the websites of its subordinate organizations
5. Ensure compliance of the website to the Standardisation Framework Guidelines
6. Identify the Site Administrator/Content Manager/ Master trainers in the department and designate new officers as and when there is a transfer.
7. Establish the Content Management Responsibility Matrix
8. Promote a participative strategy in the implementation for ownership and sustainability of the website
9. Regular review of the Website

Department Support Structures

(i) Website Information Manager was to be made responsible for ensuring that the website content was regularly updated.

(ii) Content Managers identified in the department were that personnel who are directly dealing with the subject matters and can identify the content of their respective work allocated. The objective of designating content managers from all sections of the department was to ensure that the content from all areas of work within the department is covered. Website Content has to be continuously updated and maintained. The designated Content Managers were made responsible for the accuracy, timeliness, and quality of the content that they upload on the website. Content managers had to convert the content into a format for uploading onto the website.

(iii) Master Trainers were identified in every department and these were the officials having an aptitude for training the content managers on website content management. The Master Trainers were made responsible for building the capability of department Content Managers by providing regular training to the Content managers. Master Trainers would initially be trained by the Website Development Cell (WDC) for website management and they, in turn, would provide training to other department personnel. There were made to undergo the Master Trainers Certification Programme. Master Trainers is an important structure that provided sustainability for website content management.

APPENDIX 5 - TOOLKIT 5
WORKSHOPS AND CERTIFICATION PROGRAMMES

Workshops for Content Managers

The content in a department is representative of the content generated from each section in the department. Therefore each section in the department will need to be represented through their Content Mangers. The Content managers are sensitized and trained through the content managers Workshops. In these workshops, they are made to carry out the activities in Toolkits 1, 2, and 3 as follows:

- To identify the users and user needs as per Toolkit 1: Identifying users and user needs
- To identify and group content in the department by following Toolkit 2: Identifying and Grouping Content as per the Target Audience
- To prepare the Information Structure for their department website. Toolkit 3: Developing the Website Information Architecture

The outcome from the workshops

(i) Identifying the target users of the department websites and their specific needs
(ii) Content from each section of the department will be identified and grouped
(iii) Content will be categorized as per the target user group
(iv) The Website Information Manager of the department will consolidate the final content categorized through the workshops.
(v) The website information architecture will finally be drawn up as based on Toolkit 3

Certification of Master Trainers

Every department needs to build its core competencies through its Master Trainers. Master Trainers are designated by the department based on their aptitude for training other officials in the department. These designated Master Trainers are then taken through the first level - Level 1 training program. After the completion of level 1, the Master Trainers are evaluated through assignments, online and written examinations. On successful completion of Level 1, the Master Trainers are certified as Certified Master Trainers. The certified Master trainers are eligible for Level 2 –Advanced Training Programme which is conducted by the Department of Design, IIT Guwahati.

Level 1 - Master Trainers Certification

The first level of training was structured as of four days duration. It was conducted in collaboration with the Assam Administrative Staff College, Assam. The following areas are covered in level 1:

- User Interaction, Usability, and User Experience
- Introduction, Standardisation need, and methodologies
- Standardized Website Framework, Website Management, Content Management, Content Publishing, Access Management, and Archiving
- Web Authoring and Best Practices
- Information Architecture, Grouping, and placement of contents
- Guidelines and best practices for Scanning and Information Management
- Image and Photo editing

Level 2- Advanced Training program

The level 2 training for Master Trainers of the departments is conducted by IIT Guwahati. It is a three days residential program. The structure of the program was specially designed after several deliberations and covered the following broad areas:

- Design Thinking as a 21st-century skill
- User experience for the Service sector
- Information architecture for web design
- Typography for web design
- Colour for web design
- Web Authoring
- Heuristic evaluation
- Photography and Image editing for Web design
- Visual Ergonomics for Web design

The outcome of training Master Trainers

(i) Creation of a core workbench of Certified Master Trainers within the Government.

(ii) These Master Trainers will ensure sustainability by training other officials of government departments.

(iii) They will also be retrained after every six months to keep the workforce updated with new technologies.

(iv) Building Capability within the Government and thereby ensuring the sustainability of the program.

APPENDIX 6 - TOOLKIT 6

GUIDELINES

General guidelines

The general guidelines were established for the design, development, and implementation of government websites of the Government of Assam. The set of guiding principles that are described below:

(i) The Guidelines for Indian Government Websites (GIGW) shall be adhered to by all governments of Assam. See Annexure for GIGW Compliance Matrix

(ii) Government of Assam websites will need to be developed around the Standard Website Framework (SWF).

(iii) Websites will need to adhere to the basic principles of Openness and Transparency concerning the information. This will require that all information and data of the department that is required to be made public should be made available on the website.

(iv) Ensure the accuracy and authenticity of the information made available on the website at all times.

(v) The capability building of department officials concerning Website Management needs to be carried out periodically.

(vi) Main Administrative Department and its subordinate organizations to have a single integrated website.

(vii) Minimize the redundancy of information on the websites.

(viii) Website and Website Content to be fully owned by the department.

(ix) Department will need to develop its plan in terms of sustainability of the website concerning content updating, management of the website, obtain periodic feedback of website from its users and ensure continuous updates to the website.

(x) Due permissions need to be obtained for publishing any content protected by copyright.

(xi) Every Website should have the Website Copyright policy, Terms & Conditions, Hyperlinking Policy.

Website Initiating Process

Institutional Mechanism

The department will need to have the Website Governance Structure established with roles and responsibilities clearly defined as per the toolkit 4. The Governance Structure with roles and responsibilities will need to be made available on the respective department websites.

Website Technology

(i) Website Technology should comply with Open Standards that have been prescribed for e-Governance (http://egovstandards.gov.in)

(ii) The website should be developed using responsive design techniques.

(iii) The website should render seamlessly across devices and must be technology-neutral.

(iv) Website Technology Architecture must be based on the SWF.

Website Deployment

(i) Hosting of the Websites will be in the Common Secure Infrastructure established by the government for deployment and hosting of the Government Websites.

(ii) All websites shall be under the standard domain "assam.gov.in".

Website Information Architecture

(i) The Standard Government Website Information Architecture (IA) developed under the SWF is to be adopted by all departments.

(ii) The Standard IA will prescribe the standardization concerning the following:

- Common Minimum Information
- Placement
- Navigation
- Layout and Appearance
- Uniform wording and labeling

(iii) All Websites shall have a Standardised header with the Government Emblem / Logo, on the homepage.

Website Information Quality

(i) Providing a date last modified on the bottom of every page

(ii) Reviewing pages as per the periodicity of the review that has been laid down.

(iii) Providing access to documents using open, industry-standard web formats

(iv) Making online information and services fully available to individuals with disabilities

(v) Measuring user satisfaction and usability through feedback and usability testing

(vi) Organizing content by audience group and by subject based on feedback from citizens.

(vii) Using consistent navigation. Most of the navigational items to be in the same place and work the same way on every page.

(viii) Using the same layout, appearance, and wording for pages that are related

(ix) Using basic common content like contact information, organizational information, frequently asked questions and regulations

(x) Using simple and plain language

Website Information Management

(i) There would be a Single Website for the department and its subordinate organizations.

(ii) The Websites will need to publish the details of the Content Managers and WebMaster.

(iii) Websites to provide the date last modified on the bottom of every page

(iv) Online information and services to be made fully available to individuals with disabilities

(v) The content on the website should be organized by the target audience group

(vi) Source of all documents, whether reproduced in part or full are to be mentioned.

(vii) A clear indication is to be given when a link from the website points to a non-government website.

Website Content

(i) The department will need to finalize and notify the responsibility matrix for content management in the website(s).

(ii) Content accuracy will be the sole responsibility of the department. Regular review is to be undertaken by the Department Website Information Manager.

(iii) The designated Content Managers in the department will be responsible for creating, updating, and publishing content on the website.

Website Content Design

(i) Language to be kept simple

(ii) Content on a page is kept to a minimum.

(iii) The most important matter is first presented and supplementing content is made viewable under a ‘ More.. ‘ option

(iv) Depending on the user needs:

- reduce the amount of content

- reduce the characters per line
- remove unused content from the site

(v) Make it differently-abled friendly

Document Types

The standard categories of documents to be published on all government websites are:

1. Acts
2. Budget
3. Booklets
4. Case Studies
5. Circulars
6. Compendium
7. Forms
8. Guidelines
9. Notifications
10. Office Memorandums
11. Office Orders
12. Procedures
13. Regulations
14. Reports
15. Rules
16. Tenders
17. White Papers

Document Storage Format

The Scanned documents must be stored in Technology Open Standard Format prescribed by the Government for eGovernance (http://egovstandards.gov.in).

Document Metadata

At the time of uploading documents, the content managers will be required to add metadata to each uploaded document. Document category, Title, Description, and Keywords were the metadata

prescribed for documents. The Metadata enabled it to easily identify, authenticate, and categorize the documents. It also allowed users to search documents and enable topic-based references and retrieval of documents.

GOVERNMENT OF ASSAM
INFORMATION TECHNOLOGY DEPARTMENT
ASSAM SECRETARIAT, BLOCK -C, 2nd FLOOR
DISPUR, GUWAHATI-781006

No.: IT.66/2015/Pt/12 Dated Dispur, the 29th October, 2015

ORDER

A Standardised Website Framework (SWF) is being developed by the Govt. Of Assam which will be the base for development of all departmental websites. The framework will comprise of standard design templates, applications and reusable services. As the usability and user experience of the websites are considered the most important factors for the effectiveness of a website, an Expert Committee is hereby constituted to examine the SWF with respect to its User experience, Usability, Standardization and Human Interaction quotient. The Expert Committee will consist of the following members:

1. Prof. A.K. Das, Department of Design IIT Guwahati and Director-in-charge, IIIT Manipur.
2. Dr. Prasad Bokil, Assistant Professor, Department of Design IIT, Guwahati.
3. Sri Ashwani Kumar, Joint Secretary, IT Department, Government of Assam.
4. Smt Suchitra Pyarelal, Senior Technical Director, NIC and Member Web Development Cell (Govt of Assam) – Member-Secretary

The Terms of Reference of the Expert Committee are as follows:

1. Examine the Usability aspects of the Standardise Website Framework (SWF)
2. User experience and User Interaction factors of SWF
3. Success Factors for improving the effectiveness of Government Websites. (Particularly citizen centric)
4. Technical advice on SWF
5. Any other technical matter relating to the finalisation of design of Government Websites

The Expert Committee will submit its report to the Chief Secretary of Assam, who is also the Chief Responsible Officer for the 'Standardization of Websites' programme, in a period of three months.

Sd/-
(M.C. Sahu, IAS)
Commissioner and Secretary to the Government of Assam,
Information Technology Department

Memo No. IT.66/2015/Pt/12-A **Dated 29.10.2015**

Copy to:

1. All members concerned for information and necessary action.

By Order etc.

(I. R. Kalita, ACS)
Deputy Secretary to the Govt. Of Assam
Information Technology Department