# Web Affordability for Pakistani government websites

## Introduction

### Study context

E-governance is the integration of Information and Communication Technology (ICT) into the government system to make the working processes efficient, accessible, and convenient. [4] Pakistan has seen a rapid rise in the adoption and prevalence of e-government services in the past few years. To contextualize this development, Pakistan's E-Government Development Index (EGDI) has risen from 0.25 in 2003 to 0.42 in 2022. [3] While the index value is significantly smaller than the world's average of 0.61, it can be argued that Pakistan is a developing region faced with numerous hurdles, including the public's capacity to operate technical websites, infrastructural limitations, a lack of awareness, and high data privacy and trust issues with the government. [5] Despite these challenges, digital government development trends in Pakistan indicate steady growth and improvement.

### Web Affordability

Previous work in the space of digital governance in the Pakistani region has focused on the user adoption of e-government services [5], the challenges of implementing e-government services [6], and citizens' understanding and expectations of public e-government sites [7]. However, there has been no work that examines the web affordability of government public websites. A recent study by Qazi et al. highlighted the rising complexity of the Web, making affordability a big concern as it limits users' access to Internet services. The study collected the sizes of landing pages of the Alexa top 100 websites from 8 developing countries with different average broadband prices and presented a new fairness metric for affordability (PAW). [1]

### Our contributions

Our research is an extension of Qazi et al. [1] work on web affordability and inclusion. We aim to study and evaluate the affordability of 100 e-government websites and present design implications in the present e-services that could increase web affordability in the region. Our key contributions will be:

1. Exploring the complexity of non-landing pages of public websites.
2. Identifying a set of metrics to characterize the complexity of websites.
3. Finding out features that make public websites sub-optimal and recommending design implications that could optimize website performance and user experience.
4. Comparing and contrasting the affordability of Pakistani public sites against the global dataset of public sites through an affordability metric.

## Related Work

The present study expands on the work of Qazi et al. [1] on web affordability and inclusion. In this related work section, we present the work of relevant studies in this field and highlight their limitations.

*Rethinking Web for Affordability and Inclusion* proposes a framework and a fairness metric for web affordability and inclusion. It provides systemic guidelines for adapting web complexity based on the geographic variations in broadband packages and income levels and presents a fairness metric, PAW, and an affordability framework, AW4A. However, the paper only collects the sizes of landing pages of Alexa's top 100 websites. In addition, it examines the affordability of developing regions, slightly touching on the Pakistani affordability landscape. [1]

*On landing and internal WebPages* demonstrates that there is a significant difference between the structure and content of landing pages and internal pages of a website. For instance, landing pages load faster than internal pages. The paper provides a list of 100,000 pages updated weekly with information on landing and internal pages. Studies related to measuring different aspects of webpages in the past have been concentrated on landing pages of websites. However, the web measurement of internal pages also needs to be explored. [2]

Understanding Website Complexity: Measurements, Metrics, and Implications show that websites' excessive complexities cause users' grievances. The study shows that complexity in webpages increases packet sizes and, consequently, load times. They define some metrics to measure the complexity of websites, such as requests to non-origin sources and the number of requests, etc. The paper concludes that the most important factor in optimizing the size and load times of websites is the number of requests. [8]

# Approach

### Data Collection

We will list down important government websites in Pakistan and define metrics to measure their affordability. This will include their landing pages as well as their internal pages. We will extract relevant data from the chosen websites, such as loading times, number of requests per page, average packet sizes, type of data being fetched in each request, requests made to remote servers, existence of mobile versions of the website, etc. The data will then be converted into a comprehensive format, such as graphs, that could assist us in evaluating their affordability.

### Data Analysis

We plan to analyze the affordability of chosen websites based on their geographic variations in broadband packages in different regions of Pakistan. We may also explore the affordability of these websites on lower-end or outdated devices/ programs. These websites would be grouped into different categories depending on the type of service they provide. This approach will help us compare similar websites and highlight common inefficiencies in the websites.

### Data evaluation + Design implication

Based on our insights from the previous phases, we will suggest ways to optimize the website and reduce website complexity to make it more affordable for people living in Pakistan. We plan on proposing a common solution/ framework along with guidelines that could reduce web complexity without compromising the functionality of the websites or proposing guidelines that can become industrial standards while deploying government projects.

# Timeline and Division of Tasks

| **Task** | **Deadline** | **Members** |
|---|---|---|
| Literature Review + Tools Familiarization | 17 Feb 2023 | All |
| Data Collection | 3 March 2023 | Mukeet, Saad,Taha and Shehryar |
| Data Analysis | 24 March 2023 | Shehryar Shahzaib and Saad |
| Mid Report | 31 March 2023 | All |
| Data Evaluation + Design Implications | 15 April 2023 | Shahzaib Taha and Mukeet |
| Final report | 27 April 2023 | All |

# GitHub link

https://github.com/teckMUk/CS678-Web-affordability

# Reference

[1] Ihsan Ayyub Qazi, Zafar Ayyub Qazi, Ayesha Ali, Muhammad Abdullah, and Rumaisa Habib. 2021. Rethinking Web for Affordability and Inclusion. In Proceedings of the Twentieth ACM Workshop on Hot Topics in Networks (HotNets '21). Association for Computing Machinery, New York, NY, USA, 9–15. https://doi.org/10.1145/3484266.3487376
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[8] Butkiewicz, Michael, et al. "Understanding Website Complexity." Proceedings of the 2011 ACM SIGCOMM Conference on Internet Measurement Conference, ACM, Nov. 2011, https://doi.org/10.1145/2068816.2068846.

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