CHAPTER I
INTRODUCTION

1.1. Background

The digitalization of governance at the village level constitutes a strategic initiative to improve the quality of public services that are effective, accurate, and secure. Bloro Village, located in Besuki District, still relies on manual administrative processes through physical recordkeeping and document preparation using word-processing applications. Such procedures result in service delays, potential data input errors, and limited transparency regarding the status of document submissions [9]. These issues emphasize the urgency of implementing a web-based information system to efficiently and securely integrate administrative data.

Administrative services that have not yet undergone digital transformation lead to queue accumulation, prolonged service completion times, and an increased likelihood of recording errors. Administrative staff are required to repeatedly input data for each letter application, manually search archived documents, and prepare reports separately from the recording process. These conditions reduce service accuracy and the quality of information provided to the public. A web-based information system can provide centralized data storage, structured digital archives, and real-time application status tracking features that enhance service transparency [10], [11].

Information systems at the village level also facilitate the preparation of daily, monthly, and annual service reports through automated calculations and data presentation. Such automation reduces administrative workload, improves recording accuracy, and simplifies the monitoring of service activities by village officials. Administrative digitalization has become an urgent necessity to establish public services that are efficient, precise, and accountable while supporting the implementation of good governance principles within village administration [6].

Village officials are confronted with challenges in determining the priority of letter services because each administrative document possesses different levels of urgency, such as Certificates of Financial Hardship (*Surat Keterangan Tidak Mampu/SKTM*), Certificates of Domicile, and Birth Certificates. Addressing this issue requires an objective and measurable decision-making method. The *Analytical*

Hierarchy Process (AHP) is a multicriteria decision-making technique capable of assigning priority weights through rational pairwise comparisons [12], [13]. Previous studies have demonstrated that AHP improves decision-making effectiveness in public services, including the determination of social assistance beneficiaries [5].

The *Technique for Order Preference by Similarity to Ideal Solution* (TOPSIS) serves as an alternative method; however, it does not provide decision consistency testing as offered by AHP. TOPSIS exhibits high sensitivity to extreme values and requires stable numerical data, making it less suitable for qualitative criteria such as service urgency and social impact. AHP is considered more appropriate in the context of village administrative services due to its intuitive nature, simplicity, and lack of requirement for complex data preprocessing [24], [25].

Village administrative information systems store sensitive data, including National Identification Numbers (*Nomor Induk Kependudukan/NIK*), addresses, telephone numbers, and residents' application documents. User authentication security is therefore a crucial aspect to ensure data confidentiality and integrity. The Bcrypt algorithm is an adaptive hashing algorithm equipped with a salt mechanism and an adjustable cost factor, thereby providing strong protection against brute-force attacks [14]. The implementation of Bcrypt has proven effective in safeguarding data security in academic systems and Laravel-based hash generation applications [1], [2]. Furthermore, the combination of AES–Bcrypt has been shown to reduce the risk of data leakage by up to 78% [3].

Comparisons with conventional hashing algorithms further demonstrate the advantages of Bcrypt. MD5 is considered insecure due to its vulnerability to collision attacks and rainbow table attacks [7], while SHA-1 has been proven insecure following the successful collision attack published by Google and CWI Amsterdam in 2017 [8]. Bcrypt possesses characteristics such as computational slowness, adaptability, the use of unique salts, and resistance to exploitation through massive GPU-based computations, making it more suitable for implementation in modern authentication systems [15].

The integration of AHP and Bcrypt within a single information system provides an innovative approach to village administrative services. AHP functions to determine service priorities objectively, while Bcrypt ensures secure user authentication. Although both approaches have been individually proven effective,

their combined implementation within the context of village service systems remains relatively uncommon. Therefore, this study entitled *"A Web-Based Village Administrative Service Information System in Bloro Village Using the Analytical Hierarchy Process (AHP) for Letter Prioritization and Bcrypt Security Authentication"* was designed to address three major issues in Bloro Village: low service efficiency, weak data security, and the absence of an objective letter prioritization mechanism. The implementation of this system is expected to improve the quality of administrative services, strengthen public transparency, accelerate service processes, and support digital transformation toward a *Smart Village* aligned with the agenda of the Ministry of Communication and Information Technology.

The implementation of a web-based information system integrated with the AHP method and the Bcrypt security algorithm not only provides operational benefits but also carries strategic implications for the development of technology-based governance. The utilization of information technology encourages the establishment of responsive public services and strengthens public trust in village governmental institutions through data accuracy, process transparency, and information security. This implementation has the potential to serve as a model for developing innovative administrative service systems in other villages with similar characteristics and needs, thereby contributing significantly to the sustainable improvement of public service quality at the grassroots level.

1.2. Problem Statement

Berdasarkan latar belakang yang telah diuraikan, maka rumusan masalah dalam penelitian ini adalah sebagai berikut:

1. How can a web-based village administrative service information system be designed and implemented to improve the efficiency of public services in Bloro Village?
2. How can the implementation of the Bcrypt algorithm enhance user authentication security in the village administrative service information system?
3. How can the implementation of the *Analytical Hierarchy Process* (AHP) method assist village officials in determining administrative service priorities in an objective and measurable manner?

1.3. Objectives

This study aims to develop a web-based administrative service information system for Bloro Village utilizing the *Analytical Hierarchy Process* (AHP) for letter prioritization and Bcrypt-based security authentication.

1.4. Research Benefits

This study is expected to provide benefits to several related parties, including the following:

Theoretical Benefits:

1. To contribute to the development of information systems studies, particularly regarding the implementation of Bcrypt authentication and the *Analytical Hierarchy Process* (AHP) method in developing web-based public service systems at the village level.
2. To serve as an additional reference for future researchers interested in the topic of village government information system development through the integration of data security and decision support systems.
3. To enrich the literature related to the implementation of *e-Government* in Indonesia, particularly at the village governance level through secure and adaptive modern software development approaches.

Practical Benefits:

1. For the Government of Bloro Village, this study is expected to improve the efficiency of administrative services, strengthen data security through the implementation of Bcrypt, and assist village officials in determining service priorities objectively and measurably using the AHP method.
2. For the residents of Bloro Village, this system provides convenience in accessing administrative services online in a faster, more transparent, and accessible manner without requiring direct visits to the village office.
3. For related institutions or agencies, the findings of this study may serve as an example of *best practices* in developing and implementing the digitalization of village administrative services in other regions, while also serving as a foundation for strengthening local government digital transformation policies.

1.5. Scope of Study

To ensure that the discussion remains focused and well-directed, this study establishes the following limitations:

1. This study focuses on the development of a village administrative service system for the submission, verification, and issuance of commonly used administrative certificates in Bloro Village. Services beyond routine administrative needs (such as special certificates or incidental village programs) are excluded from the scope of discussion.
2. The system is intended for village officials and residents of Bloro Village. Integration with external institutions, such as sub-district offices or population administration agencies, is beyond the scope of this study.
3. Security aspects are limited to authentication security and password storage using the Bcrypt algorithm, as well as basic security testing of the authentication process. Network and infrastructure security testing (such as firewalls, Distributed Denial-of-Service/DDoS protection, and advanced penetration testing) are not discussed.
4. The priority analysis results generated using AHP are intended as recommendations for determining the order of letter request handling within the system and are not intended to serve as a basis for village public policy decisions.
5. The system is developed as a responsive web application accessible through a browser. The development of native mobile or desktop applications is not included in this study.