Evaluation of Diversity and Novelty of Recommendation System on Digital Learning Platform Based on User Usability and Satisfaction

1st Elsam Rafi Saputra
School of Computing
Telkom University
Bandung, Indonesia
elsamrafis@student.telkomuniversity.ac.id

2nd Dana Sulistiyo Kusumo
School of Computing
Telkom University
Bandung, Indonesia
danakusumo@telkomuniversity.ac.id

***Abstract*—Digital learning platforms, such as Duolingo and Udemy, offer a large amount of content, making it difficult for users to find materials that suit their learning needs. Due to this, recommendation systems were implemented to improve user satisfaction. Although traditional systems focus on accuracy, this research highlights the importance of diversity and novelty by offering diverse and novel recommendations that introduce users to unfamiliar or surprising recommendations. Using k-means clustering, Intra-List Diversity (ILD), and Mean Self-Information (MSI) metrics, this research evaluates the effectiveness of the system. The results show an ILD of 0.616044328 and an MSI of 0.628135613, which indicates diverse and novel recommendations. User feedback on the user satisfaction questionnaire survey further confirmed satisfaction and usability in highlighting the value of integrating diversity and novelty into the recommendation system on the e-learning platform.**

***Index Terms*—recommendation system, digital learning platform, diversity, novelty, e-learning, user satisfaction.**

I. Introduction

Digital learning platforms, such as Duolingo, Udemy, and Ruangguru, have seen rapid growth in usage, with global users rising from 746.3 million in 2022 to 807.5 million in 2023 [1]. These platforms offer flexibility and convenience, but the vast amount of available content often overwhelms users, making it challenging to find materials that match their learning goals [2]. For example, users may encounter hundreds of similar courses with indistinguishable descriptions, complicating the selection process.

To address this issue, many platforms implement recommender systems, which act as intermediaries between users' information retrieval tasks and recommendation algorithms. These systems enhance user performance and knowledge by tailoring recommendations to individual preferences [2] [3]. However, traditional recommendation systems primarily focus on accuracy, often neglecting other crucial aspects like diversity and novelty, which significantly influence user satisfaction [4].

Diversity ensures a broad range of recommendations by presenting varied options that align with user preferences and platform content [5]. This not only mitigates overfitting but also enriches the user experience. Novelty, on the other hand, introduces users to new or unexpected items, adding an element of surprise that enhances satisfaction [6] [7].

This study aims to evaluate the impact of diversity and novelty on user satisfaction and usability in digital learning platforms [7] [8]. Specifically, it explores the relationship between diversity, novelty, user satisfaction, and recommendation quality. To assess the effectiveness of the recommendation system, metrics such as Intra-List Diversity (ILD) and Mean Self-Information (MSI) are used. In addition, this study involves user feedback through a questionnaire survey, which is then analyzed based on Research Questions (RQ1 and RQ2). With clear thresholds and measurable justifications, this research focuses on evaluating the usability and user satisfaction of recommendation systems that prioritize diversity and novelty. The results are expected to build a stronger theoretical foundation and show how these aspects improve overall user satisfaction and usability of recommendation systems in digital learning platforms (e-learning).

II. Literature Review

A. Human-Recommender Interaction (HRI)

Traditional recommender systems prioritize accuracy, assuming precise matches are most beneficial to users. However, users may prefer recommendations that are less accurate but more relevant to their goals [3]. Human-recommender interaction (HRI) provides a framework to enhance recommendations by analyzing user tasks and system algorithms, focusing on three key categories:

1) Recommendation dialogue emphasizes recommendations that are clear, unexpected, and stand out, aligning with novelty and diversity principles. These attributes can positively or negatively influence user experiences [3].
2) The recommender personality highlights the system's adaptability in delivering personalized and diverse rec-