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Impact of Adaptive Learning, LMS, and Personalized Skill Development on Industry Recruitment Alignment

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Abstract

This paper discusses the impact of adaptive learning on the development of skill and self-learning, and it portrays a methodology framework to design an adaptive learning system that works with industry recruitment objectives. The paper distinguishes different approaches to learning, namely teacher-centric and student-centric, rigid and adaptive, competitive and collaborative, and explains that each learner has their own learning style, preference, and level of knowledge and skill acquisition. The paper will emphasize the importance of adaptive learning for providing personalized and efficient learning experiences suited to the learner's needs. It will further emphasize social aspects in improving learning, and this includes collaborative learning. It finds that the methods of learning remain teacher-centric; hence, this paper aims at strategies that promote a more student-centric and adaptive model of learning. Several adaptive learning models are discussed: Visual, Auditory, Reading/Writing, Kinesthetic (VARK), Dreyfus Model of Skill Acquisition (Dreyfus & Dreyfus), and Adult High-Order Learning Model (AHAM). The paper explores how the learning path can be aligned with industry training processes to ensure the learning is relevant to industry standards and recruitment requirements. In conclusion, this paper proposes an all-inclusive Learning Management System (LMS), which will include learning paths well-defined, real-time tracking of the progress, and adaptive learning, with collaborative tools to make the learning process effective and industry-aligned.

Keywords: Learning management systems, adaptivity, VARK model, Dreyfus model, AHAM model, cognitive development

INTRODUCTION

Learners have different learning styles and levels. The preferences, knowledge, and skill set of each learner differ significantly. Adaptive learning systems can be developed to personalize learning for each learner. This is a more student-centered approach to education. Traditional education is more of a "one-size-fits-all" approach that usually does not meet the needs of learners. Adaptive learning, on the other hand, seeks to make instruction customized for each learner's level, pace, and abilities. Having made the necessary customization of learning, the final step is that the system aligns with industrial skill requirements to ensure learners' ability to apply their knowledge and skills in actual industrial settings [1]. This study first starts by reviewing a number of models on student-centered learning before venturing into the industrial training process and assimilating the elements into the process for learners' better exposure to the industrial setting [2].

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PERSONALIZED LEARNING

Personalized learning involves leveraging the learner's existing knowledge, individual characteristics, and experiences to shape a learning format personalized to learners' needs aligned to their capabilities and personalities [3]. Traditional learning methods do not adapt according to learning personalities and share common methods and resources ignoring individual learner's needs. A personalized learning system is designed to adapt to unique learning needs providing tailored educational experiences. Traditional education systems are more teacher-oriented, considering the teacher's session-delivering capacities. Personalized management systems however are more student-oriented. For example, an online learning system provides easy access to the resources according to learners' needs [4]. The requirements of a personalized learning system include adaptivity and adaptability, assessments, robust data collection, and recommendations. Delivering content and knowledge aligning to individual learners comes under adaptivity. As the learning progresses, continuous adaptivity to each stage of learning is adaptability. After the learning is complete, the learner's understanding and learning outcome are calculated by assessments. All the features of a personalized learning system involve extensive data collection which requires a robust data collection architecture. The data collected is then used to provide recommendations to the learner according to their needs to make the process and progress smooth and provide a better experience. Learner's knowledge and skills can be enhanced significantly by efficiently imparting personalized learning [5]. This can be done primarily by reducing the flaws that might become prevalent in the learning process. Following are the five main theories to improve personalized learning:

1. *Behaviorism:* Analyzing human behavior. It is mainly based on stimuli and response observations. Example: task-based learning.
2. *Cognitivism:* It involves providing exercise to cognition. It is mainly achieved through reasoning and problem solving.
3. *Constructivism:* Building on previous knowledge and experience to construct new knowledge. It involves learning through experimentation and open-ended approaches [6].
4. *Connectivism:* Identifying and addressing knowledge gaps – having up-to-date and diverse knowledge resources.
5. *Humanism:* Considering the learner's goals, passions, and interests and developing intrinsic motivation among learners.

LEARNING MODELS

Adaptive Learning Model

Adaptive learning models have been observed to cater to learners' comprehensive levels and skills. They have been proven to be more effective than traditional methods. Adaptivity, in its essence, refers to delivering content according to learners' comprehension levels [7]. Adaptive learning can be classified into five levels:

1. *Knowledge tracing methods:* Keeping track of and tracing learner knowledge and comprehension over time.
2. *Item response theory:* Used in the evaluation process. Dissimilar assessments are given to learners but evaluated through the same scale.
3. *Learner factor analysis:* Used to enhance knowledge tracing methods by providing analysis and better algorithmic approaches.
4. *Classifying learner levels:* Classification methods are used to determine the learner level. It helps improve adaptability and effectively set difficulty levels.
5. *Clustering learning levels:* Learners clustered together based on learner levels. Helps in improving recommendations.

VARK Model

Learning style is implemented by organizing processes, representing, and then combining the gained information to store it in the cognitive source. Whenever required, the learner is able to retrieve the information and experiences.

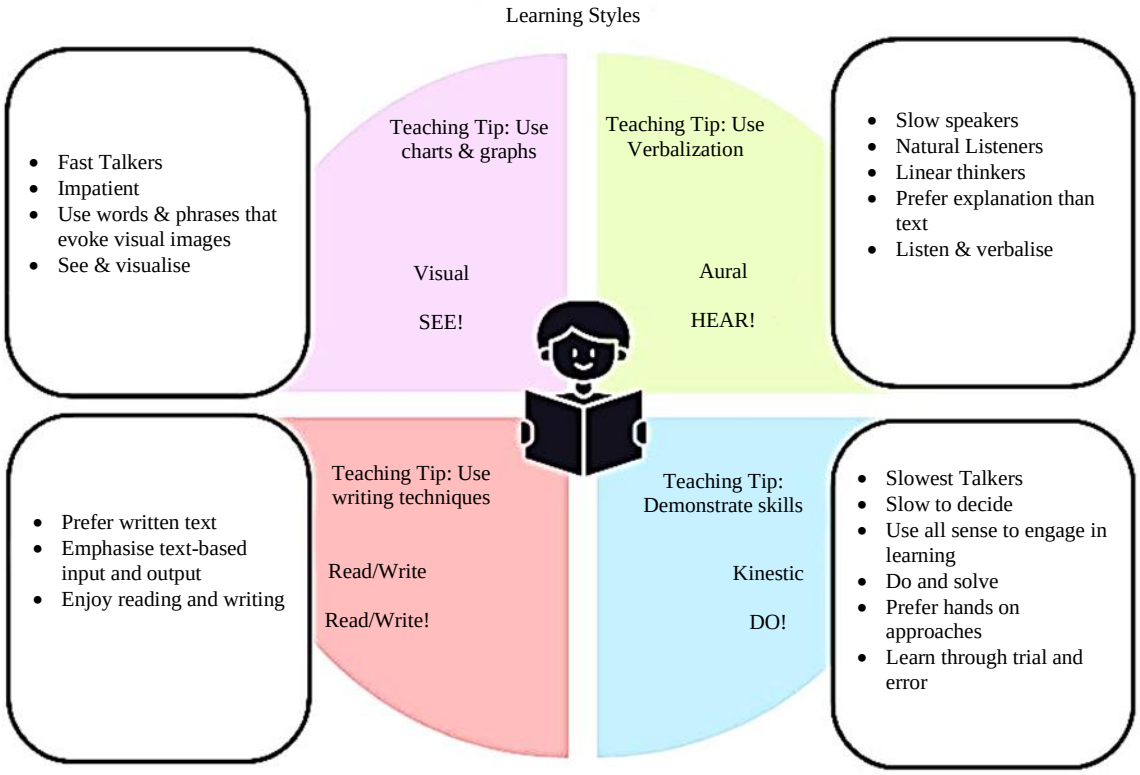


Figure 1. VARK (visual, auditory, read/write, kinesthetic) model.

Learner also needs to have a strong communication to effectively put forth the gained intel. Students vary in receptivity, learning styles, and thought. To help them recognize their full potential various learning styles were derived. Adaptive learning is one such methodology [8]. There are many models of learning styles. One of the most well-known models is the VARK model. Fleming and Baume developed the VARK model (Figure 1). VARK tries to summarize various student learning types into four types: V = visual style, A = auditory style, R = R/W, that is, read or write style, and K = kinesthetic, that is, practical style. The learner's inclination needs to be identified before learning starts. A test of 16 or more multiple-choice questionaries is conducted [9]. A minimum of 16 multiple-choice questions are used throughout the test. Each of the four options in the multiple-choice format favors one of the four forms of VARK. The feedback is fed deriving the best possible sources according to learner inclination. Visual learner content and assignments contain graphs, images, and symbols. Written texts, handouts, and glossaries are provided to participants inclining to read. Integration of spoken materials and dialogs is provided to aural learners. Customized frameworks and hands-on labs are provided for kinesthetic enthusiasts [10].

The Dreyfus and Dreyfus Model

Stuart and Hubert Dreyfus developed the Dreyfus and Dreyfus model in the 1980s. Although it was derived many decades ago, it is still very prevalent and used in various fields such as identifying skill levels and roles in clinical practices (Figure 2). It identifies five levels of skill acquisition that a learner experiences as he progresses on the learning roadmap.

1. *Novice:* In this stage, the learner follows clear rule-based instructions. The learner is very rigid, inflexible, and lacks a broader view.
2. *Advanced beginner:* The individual starts recognizing situational elements beyond just rule-based application as he gains experience. Even though the identification of situational elements has started, it still heavily relies on instructions.
3. *Competent:* Can handle multiple elements at once. The learner starts making conscious decisions and taking responsibility for their actions.

4. *Proficient:* At this stage, the learner has a deep understanding of the domain. They can now easily identify the patterns and can solve problems intuitively. They can anticipate outcomes based on their experience.
5. *Expert:* Reliance on rules becomes almost zero. Actions are intuitive, relying on experience and deep, tacit knowledge. Understanding these levels is essential to provide learners with an optimal experience to the learner.

Adaptive Hypermedia Applications Model

One of the most effective early models designed for an adaptive learning system was the AHAM model, which stands for Adaptive Hypermedia Applications Model. It was designed to provide content based on the learner's personality, knowledge state, and learning style. It has the following five components:

1. *Media space:* The function of media space is to store all kinds of instructional resources such as teaching material, texts, pictures, audio, etc. It includes a description of instructional resources and a database.
2. *Domain space:* Domain space is dedicated to structuring and storing the content in their respective domains. For example, a particular course will have content for that course itself.
3. *Learner model:* It is the model that incorporates the adaptive learning aspect. It holds learners' information such as learning paths, styles, and degree of knowledge mastery and accordingly devises learnings for the learner.
4. *Instruction model:* A teacher's teaching strategies are simulated using this model. Processes include the theme of teaching and determine teaching content through domain space.
5. *Adaptive model:* It stores the adaption rules and adaptive navigation support rules. Adaptive navigation rules address the adaptability at the links level. It then delivers adaptive learning content to the user interface (Figure 3).

IMPORTANCE OF COLLABORATION IN LEARNING

Through the zone of proximal development (ZPD), Vygotsky identified learning as a social process. There is an informal relationship between social interaction and cognitive development. Vygotsky noted that a child learns from observations from the environment and later the learnings are internalized on an individual level. Another level of social learning is when capable individuals provide mentorship to the less experienced ones. The capable individuals need not necessarily come in the form of teachers. As we saw before, there are different levels of knowledge and skill experiences. Levels vary from individual to individual and this factors in collaborative learning. Learners work as peers and contribute to each other's learning in a collaborative learning model. The goals are achieved collaboratively i.e. learner achieves their goal when peers do theirs. Collaborative learning is more student-centric than traditional methods.

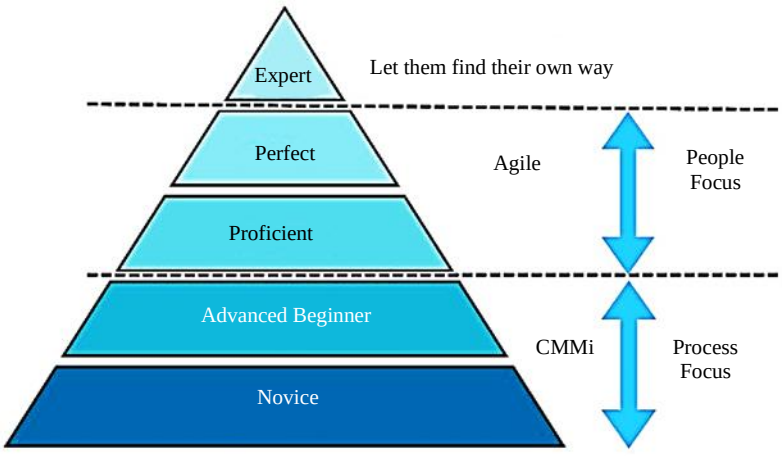


Figure 2. The Dreyfus and Dreyfus model.

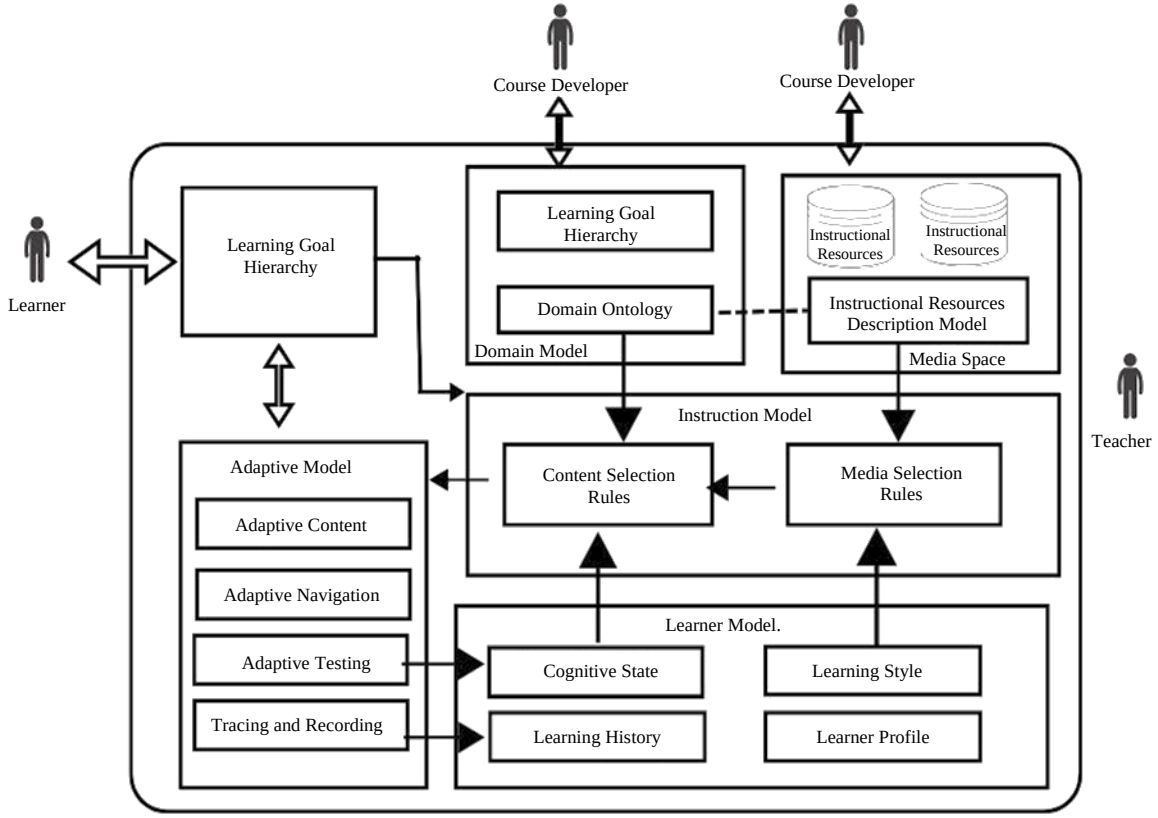


Figure 3. AHAM (adaptive hypermedia applications model).

The work is better done in collaboration than in competition. More than dependency it creates accountability which drives and motivates learners especially when it comes to self-learning. It creates a positive learning environment. Learners discuss, share ideas, and take feedback increasing the scope of perspectives. Alongside it develops social interaction and communication skills. Thus, learning systems should implement collaborative learning features which will tremendously benefit the learners.

INDUSTRY TRAINING PROCESS

An industry training process should have the following elements (Figure 4a and b.

Knowledge Parameters

Access to digital libraries, and semantic-based search capabilities.

Skills Parameters

Cognitive behavioral theory (CBT) tools and simulation environments.

Competence

Study of best practices, collaboration, and decision-making scenarios.

Attitude

Case study demonstrations, success stories. analyzing the economic, societal and environmental impact of technologies.

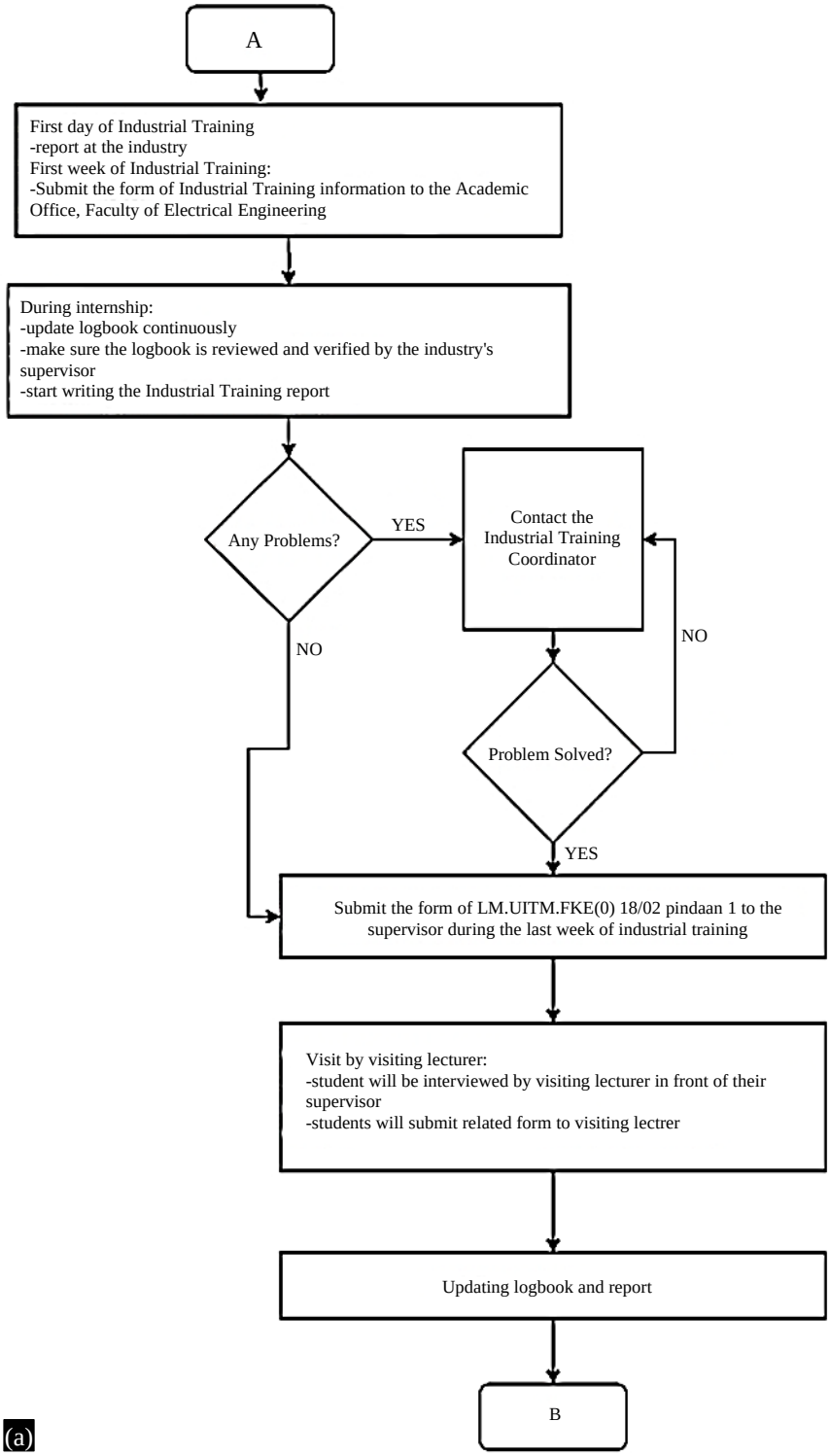
METHODOLOGY

Based on the following research, we can implement a learning management system that incorporates the following features:

Adaptive Learning Features

Personalized Learning Paths

- *Skill Development Pathways:* The system will offer personalized learning paths for candidates based on the skills they need for a specific job or career path (e.g., DevOps, full-stack development).
- These learning paths will include courses, projects, and skill assessments, allowing candidates to upskill and become eligible for their desired roles.



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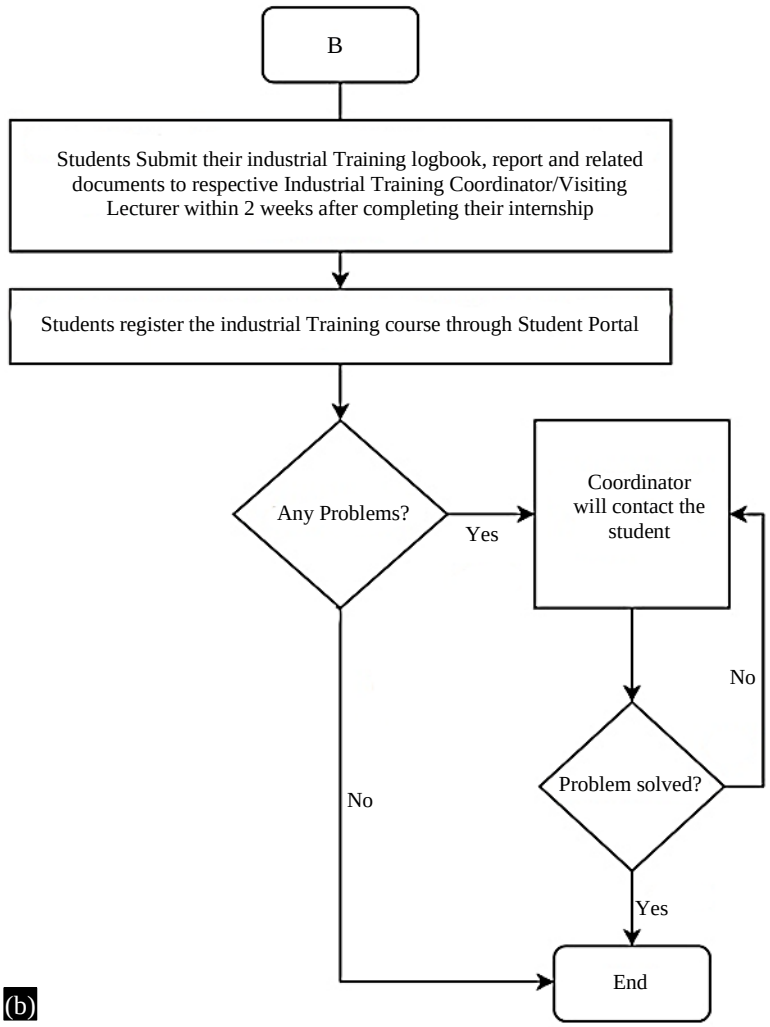


Figure 4. (a) Steps involved when students perform their internship. (b) Steps involved after the students have performed their internship.

Real-time Status Updates

- Once a user completes the assigned learning path, the system will automatically notify the relevant companies of the candidate's completion, allowing them to review and potentially hire the candidate.

Progress Monitoring for Candidates

- Job seekers will have a dashboard to track their learning progress towards completing the required tech stack.
- Recommendation Engine to suggest additional skills, courses, or certifications based on job market trends and the candidate’s current profile.

Integrated Messaging System

- A communication channel that allows companies and candidates to interact directly through the platform to discuss interviews, projects, or clarifications.

Collaborative Learning Features

Collaborative Study Platform

- Integrating features such as study streaming online meeting features. Finding peers with similar interests to study collaboratively.

- Features such as assigning projects and working in teams remotely will benefit learners immensely (Figure 5).

Note Taking System

- To create solo/group study and project notes, enhancing collaborative learning.

Industry Recruitment Support

Job Portal (for Both Job Seekers and Companies)

- A comprehensive job portal where job seekers can apply for jobs and companies can post job openings.
- Each job listing will include the required tech stack (skills and tools) for the role.
- Automated tech stack recommendation: When a job seeker applies, the system will provide the required tech stack (skills/tools needed) for that role, creating a personalized learning path based on their current skill set and the role requirements.

Automated Resume Parsing and Role Assignment (Using Natural Language Processing)

- Resume Parsing: Automatically extract relevant information (skills, experiences, qualifications) from the candidate's uploaded resume using natural language processing (NLP) techniques.
- Dynamic Role Matching: The system will automatically match candidates to job roles or project roles based on their skills, experience, and work style preferences, optimizing role assignments.
- Dynamic Role Optimization: In real time, the system ensures that candidates are assigned to roles/projects that fit their skill profile and company needs, minimizing manual effort.
- Admin Dashboards for Companies
- Company-Specific Dashboards: Each company will have its own admin dashboard where they can:
  1. Communicate with candidates and assign them to specific roles/projects
  2. Post job listings.
  3. Track candidate applications.
  4. View detailed information about candidate skills and match scores.

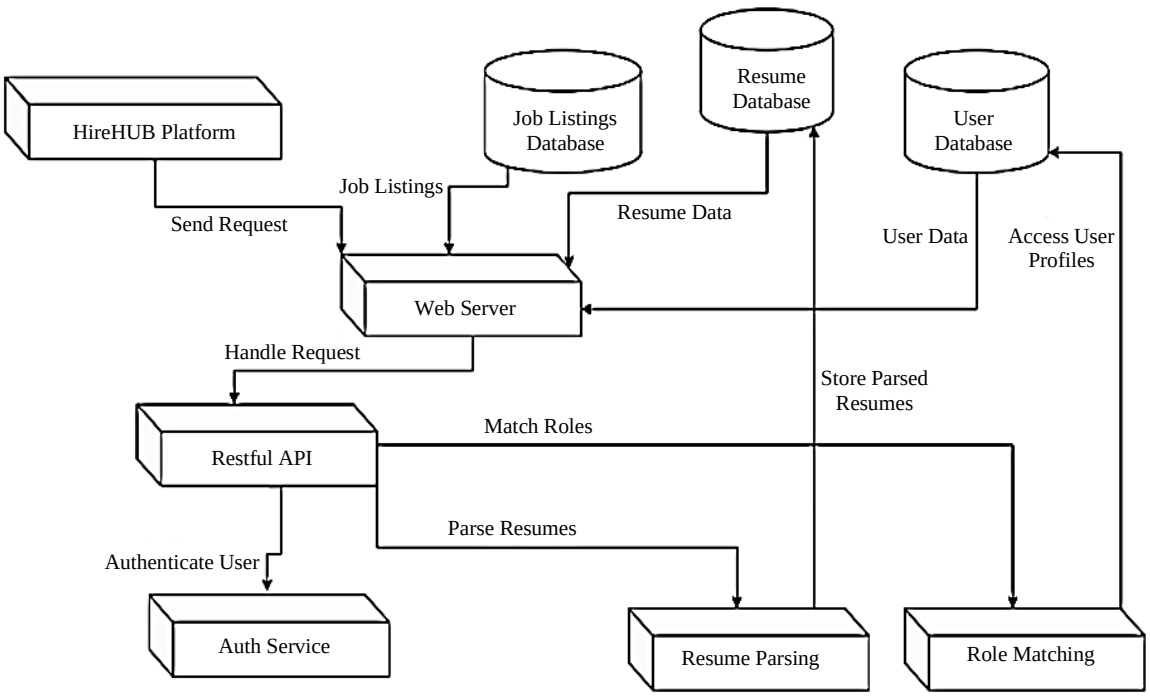


Figure 5. System architecture.

RESULTS

The study points out the potential capability of adaptive learning systems in filling the gap between education and industry recruitment requirements (Figure 6a–e. The results can be summarized as follows:

Improved Personalization

Adaptive learning models such as VARK and Dreyfus models have shown great features in terms of personalizing education experiences by considering one's learning style. It enables the learners to learn at their own pace and adapt learning to their strengths and weaknesses.

The personalized learning path and interactive content enhance the learning capabilities improving skills.

Better Skill Mapping with Industry Competencies

Integration of industry-specific training modules, practical case studies, and adaptive assessments is only possible better through knowing user preferences through adaptive learning. This helps in the development of skills relevant to real-world job roles.

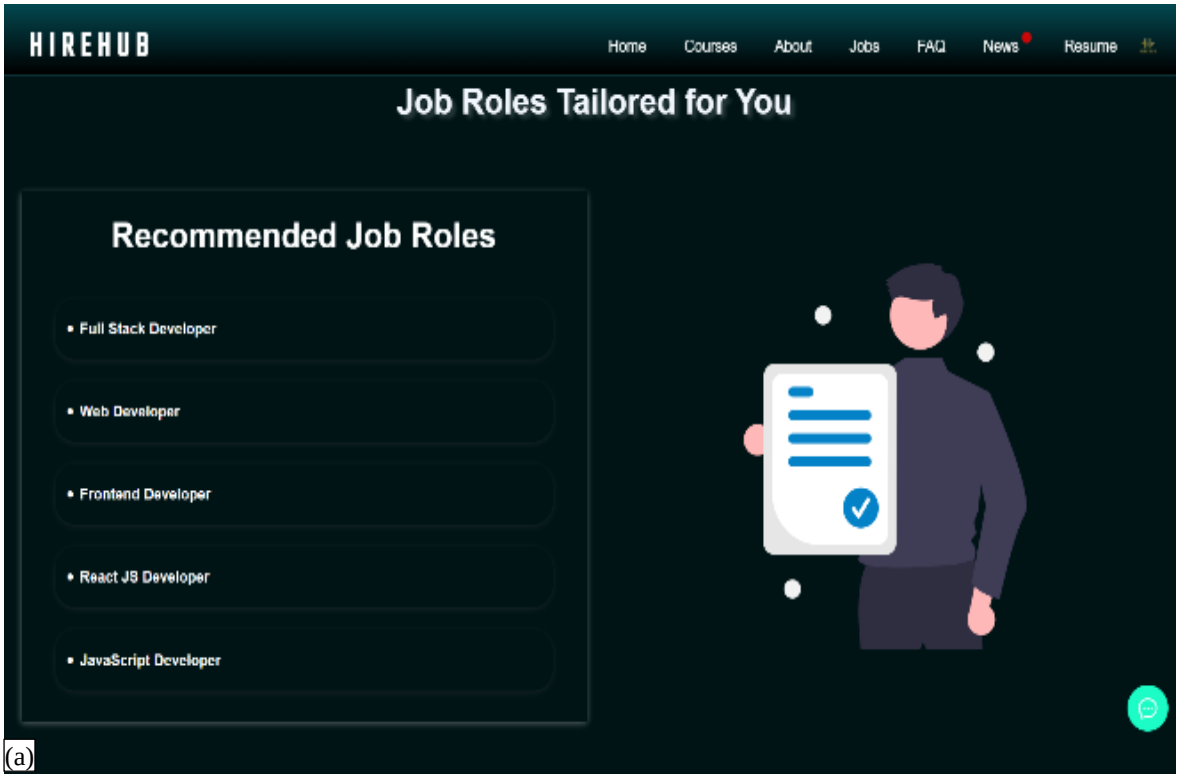
Efficient Recruitment and Hiring

Including real-time progress tracking of learners helps employers to access candidate skill assessments and learning records. This saves time on the evaluation and gives a holistic impression of learners' capabilities making hiring processes efficient.

Scalability and Future Adaptability

Adaptive learning models can be scaled efficiently to accommodate diverse learners across various disciplines. It will be able to cater many learners with improvements and adaptability.

The value of adaptive learning in modern education systems shows its effectiveness in skill development, learner engagement, and industry recruitment alignment.



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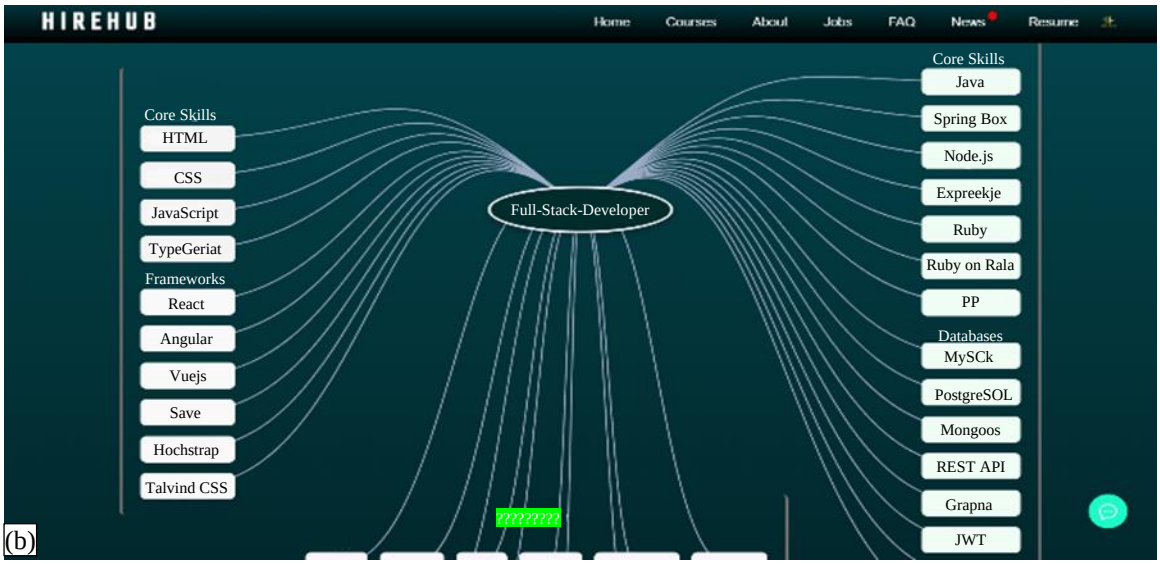

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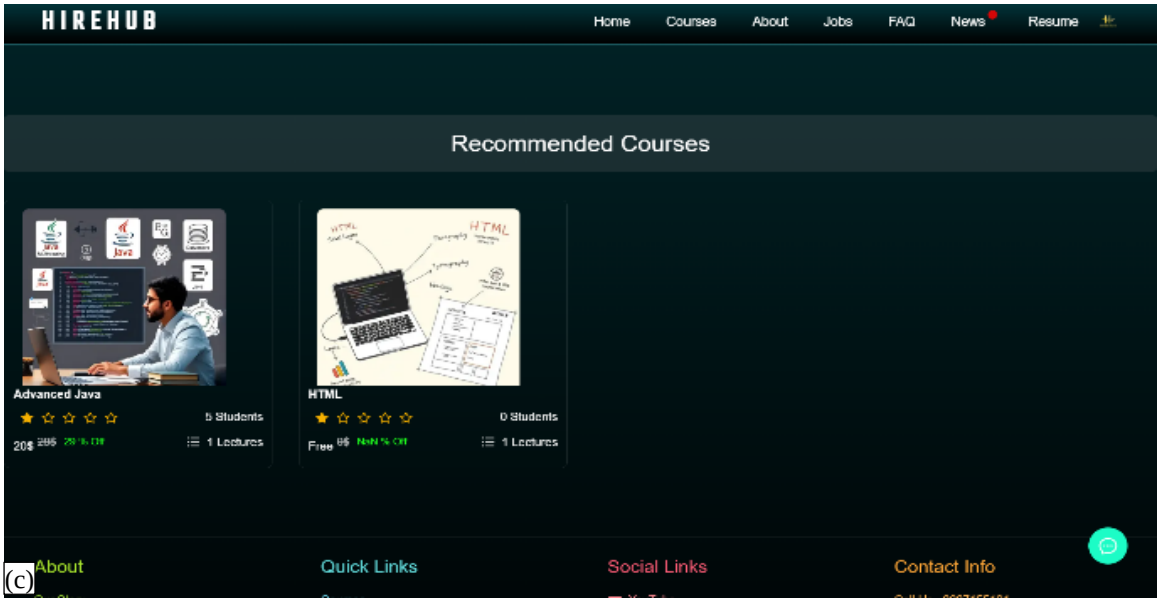

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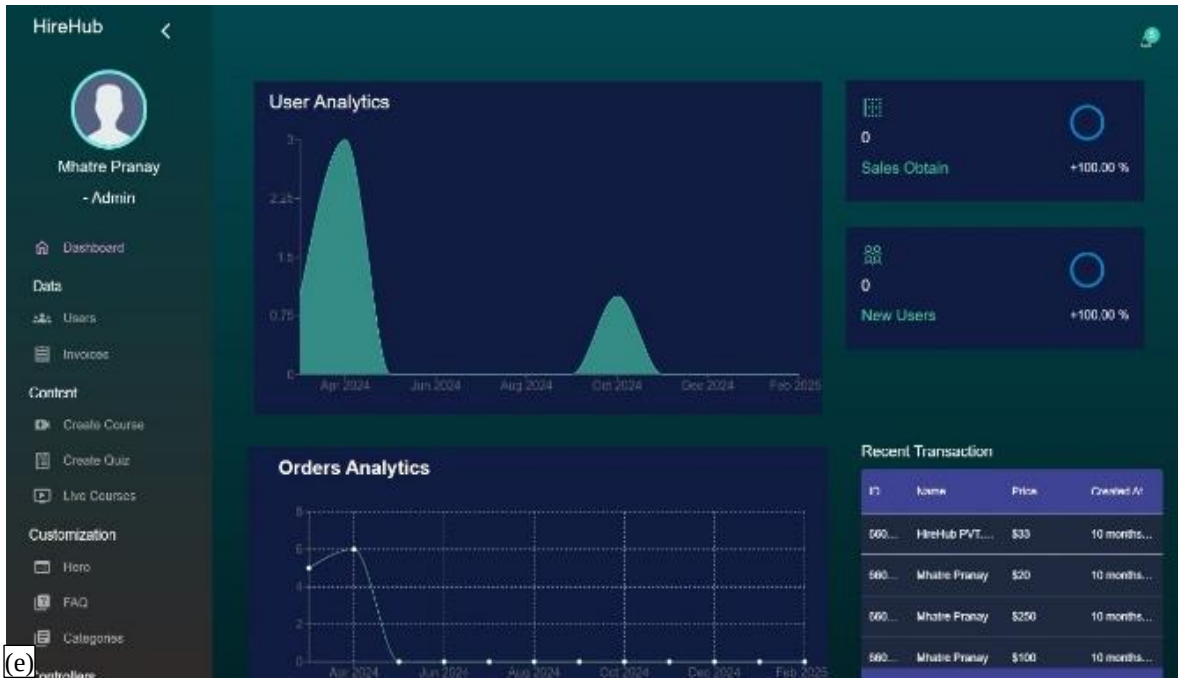

(e)

Figure 6. (a) Job roles tailored for you. (b) Roadmap for specific job roles. (c) Recommended courses. (d) Skills gap overview. (e) User analysis.

CONCLUSION

Adaptive learning has become a crucial link that bridges the gap between traditional education and industry demands. This will best be achieved when such adaptive learning leverages personalized learning pathways, assesses real-time progress, and introduces collaboration tools to enhance engagement, skills development, and employability among its users. It improves with the inclusion of models like VARK, Dreyfus, and AHAM in a way that helps build tailored experiences that cater to individual styles and competencies.

In addition, it shows that the adaptive learning system enhances recruitment effectiveness by aligning learner skills with industry needs. With the learner's progress being recorded in real time and employers getting a holistic overview of the learner, hiring becomes an efficient process.

Adaptive learning models have much room to grow. With research and technologies developing further, adaptive learning models will cater to different learning methodologies and play a significant role in improving learning.

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