Development of a Web-Based Learning System for New Member Training in Multi-Level Marketing Organizations

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Abstract— **This study developed a web-based learning system to support new-member onboarding in a multi-level marketing organization. The previous workflow used videos and business documents from separate services, allowed members to select content in an order that might not match the organization's intended sequence, and required managers to follow up on progress manually. The implemented scope covers 13 feature areas, including role-based access control, ordered learning paths, sequential completion rules, progress tracking, business-file access with download logging, team reports, leaderboards, and manager-member feedback. These functions connect content preparation, registration, learning activities, team monitoring, and guidance within one workflow. Development followed ISO/IEC 29110 and included requirements analysis, prototyping, software design, iterative implementation, testing, and traceability verification. All 23 unit-test groups passed; 256 of 260 system-test cases passed (98.46%); and all 31 cases in the second user-acceptance round passed. The mean satisfaction scores were 4.51 out of 5 for managers and 4.71 out of 5 for members. The results indicate that the system supports a more structured onboarding process by organizing learning content into ordered learning paths with completion rules, recording learning and file-access activities, and presenting progress information through personal dashboards and team reports.**

Keywords—web-based learning, learning path, progress tracking, role-based access control, team reporting

I. INTRODUCTION

Web-based learning provides access to learning resources through networked applications and supports learning regardless of place and time [1], [2]. In direct-selling organizations, training is closely connected to team-based guidance and organizational relationships [3]. In the case-study organization, videos were distributed through YouTube and Amway Academy, whereas business documents were stored in Google Drive. Members could select learning content independently; however, the selected order might not follow the sequence intended by the organization or their managers. Moreover, learning progress and file access were not recorded in one place, so managers relied on direct communication to follow up with individual members.

The study aimed to design and develop a web-based learning system for new-member training. The implemented scope comprises 13 feature areas: authentication, role-based access control, learning content, an embedded video player, learning paths, sequential completion rules, business-file access, download-history logging, individual progress tracking, dashboards and reports, team-level progress monitoring, a leaderboard, and feedback communication. The system also uses an ABO ID to associate each new member with the responsible manager and team during registration.

The principal contribution is the integration of these capabilities into a team-oriented onboarding workflow. Administrators prepare shared content, members learn through the intended sequence, and recorded viewing and file-access activities are summarized for managers through team reports and leaderboards. Consequently, the system provides members with a clearer and more consistent learning process, reduces reliance on repeated manual progress checks, and gives managers traceable information for providing guidance. User acceptance testing and satisfaction evaluation were used to assess whether the system supported the intended operational workflow.

II. RELATED WORK

A. Web-Based Learning and Supporting Concepts

Web-based learning combines content delivery, interaction, and progress records. A learning path defines an ordered set of activities and can control access to subsequent items after the required completion condition is met [4]. Role-based access control assigns permissions through user roles [10], while dashboards summarize selected information for interpretation [11]. These concepts were selected because the system had to support different responsibilities for administrators, managers, and members.

B. Related Systems

The reviewed systems supported different combinations of authentication, learning content, video delivery, learning paths, progress tracking, assessment, and feedback [5]–[9]. Commercial platforms such as FutureSkill for Business and SkillLane for Business provided organizational course management and reporting [12], [13]. For a concise comparison, Table I focuses on the five systems with the closest overlap in the selected feature set. It shows that the developed system supports all 13 compared feature areas. Download-history logging and the leaderboard were not clearly supported by the other systems and there are also no alternative combined sequential completion rules, team-level progress monitoring, activity logging, and feedback in the same workflow. This integration of 13 features addresses the organization's traditional process more directly which members are guided through the intended sequence, viewing and file-access activities become traceable, and then managers

can review team progress without depending only on repeated individual follow-up. Therefore, the comparison highlights a contribution tailored to the organization's specific context.

TABLE I. FEATURE COMPARISON OF RELATED SYSTEMS

Feature	WBL	SL	FS	MEUS	MW	KD
1. Authentication	✓	✓	✓	✓	✓	✓
2. Role-based access control	✓	✓	✓	✓	✓	✓
3. Learning content	✓	✓	✓	✓	✓	✓
4. Embedded video player	✓	✓	✓	—	—	—
5. Learning paths / playlists	✓	✓	✓	✓	✓	—
6. Business-file access	✓	✓	✓	✓	✓	—
7. Individual progress tracking	✓	✓	✓	✓	✓	✓
8. Dashboards and reports	✓	✓	✓	—	—	✓
9. Team-level progress monitoring	✓	✓	✓	—	—	—
10. Leaderboard	✓	—	—	—	—	—
11. Feedback / discussion	✓	✓	—	✓	—	✓

ABBREVIATIONS: WBL, DEVELOPED SYSTEM; SL, SKILLLANE FOR BUSINESS; FS, FUTURESKILL FOR BUSINESS; MEUS, MOBILE E-LEARNING PLATFORM FOR ULTRASOUND; MW, MAUNAWIKA; KD, KUMALADEWI. SUPPORTED FEATURE AREAS IN TABLE I (COUNT): WBL=11, SL=10, FS=9, MEUS=7, MW=6, AND KD=6.

Note: ✓ indicates that clear evidence of full support was found; — indicates that clear evidence was not found or that support was incomplete.

III. METHODOLOGY AND SYSTEM DEVELOPMENT

A. Study and Development Process

The study applied the ISO/IEC 29110 Basic Profile as a process framework for project management and software implementation in a very small software project. Within this framework, the work proceeded through the following iterative stages:

1) Requirements analysis: Stakeholder interviews covered organizational, manager, and member perspectives. The study also reviewed existing learning materials and documents and examined the onboarding workflow that used YouTube, Amway Academy, Google Drive, and direct manager follow-up. The findings were documented in the Software Requirement Specification (SRS).

2) Prototyping: Wireframes were prepared for registration, dashboards, learning paths, the embedded video player, business-file access, team reports, and feedback. These artifacts were used to confirm the information structure and role-specific workflows before full implementation.

3) Architecture and data design: The Software Design Document (SDD) defined the client-server architecture, entity relationships, application programming interfaces, class structures, sequence interactions, and role-specific interfaces. The design explicitly represented ABO ID registration, manager-member relationships, viewing events, progress records, download logs, and feedback threads.

4) Construction: The frontend, backend, database, and file-storage components were implemented in iterations. The work was organized into authentication and user management, ABO ID and team management, learning content and paths, progress tracking, business-file access, dashboards and reports, leaderboards, and feedback so that each functional group could be reviewed and tested before integration.

5) Verification and evaluation: Unit testing was used for isolated frontend and backend logic, system testing covered end-to-end workflows, and user acceptance testing was conducted with representative managers and members. Satisfaction questionnaires were administered after UAT to evaluate the system from each role's perspective.

6) Delivery and traceability: The completed system and supporting documents were prepared for delivery. In parallel, the Traceability Record linked use cases and requirements to design artifacts, implementation components, unit tests, system tests, and user-acceptance cases to confirm coverage of the principal requirements.

B. Requirements and Design Artifacts

The requirements and design activities produced three coordinated artifacts: the Software Requirement Specification, the Software Design Document, and the Traceability Record. Each artifact served a different purpose while maintaining continuity from the identified user needs to system implementation and testing.

*1) Software Requirement Specification (*SRS): defined the system scope and requirements in three main groups.

a) User characteristics: defined three user roles: administrator, manager, and member. For each role, it specified the main responsibilities, permitted functions, and access boundaries required to control system data and team-related information.

b) Functional requirements: covered authentication and role-based access control, member registration, user and team management, ABO ID management, video and category management, learning-path management, progress tracking, business-file management, download-history recording, dashboards, team reports, leaderboards, and feedback communication.

c) Use cases: contained a use-case identifier and name, actor, description, trigger, preconditions, input specifications, postconditions, normal flow, alternative flow, exception flow, and assumptions. This structure clarified both successful and unsuccessful workflows and provided a basis for system and user-acceptance test cases.

*2) Software Design Document (*SDD): translated the requirements into implementable software structures through four principal design areas.

a) System architecture: defined the relationships among the frontend, backend, relational database, object storage, and external video service. It also described how requests and data were exchanged among these components.

b) Data design: design included the entity-relationship diagram and data dictionary. These artifacts defined the entities, attributes, and relationships required for users, manager-member relationships, learning content, learning paths, progress records, business files, download logs, and feedback.

c) Detailed software design: described the structure and responsibilities of software modules, while sequence diagrams illustrated interactions among users, user-interface components, backend services, and the database for the principal workflows.

d) Interface design: design covered the application programming interface and the role-specific user interfaces.

The API design specified endpoints, input and output data, status codes, and related processing conditions, whereas the user-interface design defined the pages and interactions available to administrators, managers, and members.

3) Traceability Record: verified the requirements, implementation, and testing evidence.

Together, the SRS, SDD, and Traceability Record established a structured path from stakeholder needs to software design and test evidence. Consequently, these artifacts reduced inconsistencies between the specified requirements, the implemented functions, and the verification activities.

C. Functional Scope and User Roles

The system supports three user roles: administrator, manager, and member. Their functions are connected through shared learning content, activity records, and manager-member relationships. Fig. 1 summarizes the principal functions available to each user role and illustrates how the roles participate in the overall system workflow.

1) Administrator: Administrators maintain the system-wide data used by the other roles, including user accounts, videos, learning paths, and business files.

2) Manager: Managers create and manage business owner identifiers (ABO IDs) for new-member registration, supervise members assigned to their teams, review team reports and leaderboards, and respond to feedback. An ABO ID is prepared by a manager before registration; when a member uses it, the system links the new account to the responsible manager and team.

3) Member: Members register with a valid ABO ID, view embedded videos, follow ordered learning paths, monitor their own progress, download permitted business files, and submit feedback to their assigned manager.

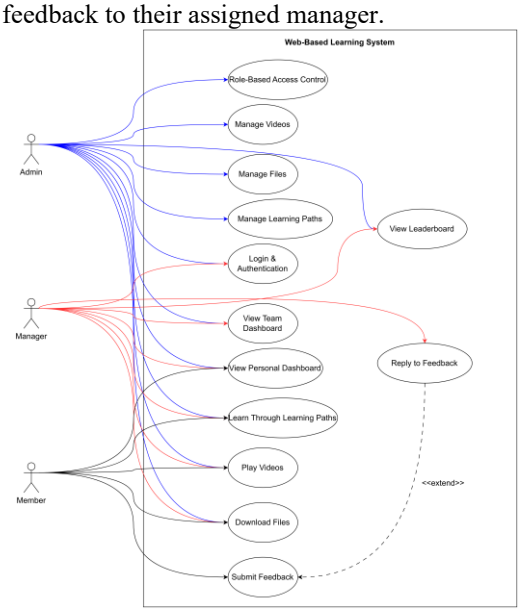

Fig. 1. Overview of system functions classified by user groups.

These role-specific functions operate on the same underlying records. Learning paths store videos in a defined order, while viewing events update each member's completion status. Once the configured viewing threshold is reached, the next item becomes available. The resulting progress appears on the member dashboard and is aggregated in the manager's team report. Similarly, each authorized file download records the user, file, and access time, while feedback messages remain associated with both the member and the assigned manager.

D. Architecture

The system uses a client–server web architecture that separates the frontend, backend, database, file storage, and external video service. This structure supports role-based access control and allows each component to be developed, deployed, and maintained independently. Fig. 2 presents the main components and their interactions.

1) Frontend: The frontend was developed with Next.js, React, TypeScript, and Tailwind CSS and deployed on Vercel. These technologies were selected to support role-specific pages, reusable interface components, consistent data structures, and a uniform design across administrator, manager, and member screens.

2) Backend: The backend was developed with Node.js, Express, and TypeScript and deployed on Render. This combination provides a flexible structure for API development, validation, authentication, and role-based authorization. Before processing a request, the backend verifies the user session, role, and access scope.

3) Database and file storage: Prisma connects the backend to PostgreSQL on Supabase. PostgreSQL stores related data such as users, learning paths, progress records, files, download logs, and feedback. Business-file metadata is stored in the database, while the actual files are maintained in Supabase Storage and accessed through controlled links.

4) External video service: Learning videos are referenced from YouTube and embedded in the learning interface. This approach avoids duplicating large media files while allowing the system to organize videos into learning paths and record viewing progress.

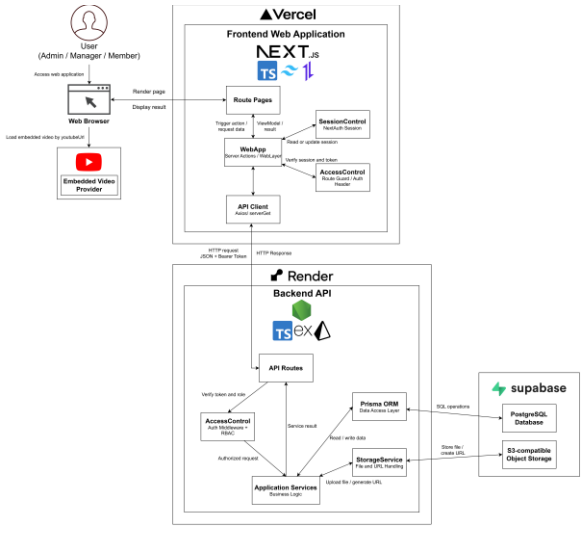

Fig. 2. System architecture and interactions among the frontend, backend, database, storage, and external video service.

E. Data Model

The data model translates the learning, organizational, file-access, and communication workflows into related entities. Fig. 3 presents the entity-relationship diagram. The model is divided into two panels so that the entity names, keys,

and relationships remain readable. Its principal relationships are as follows:

1) Learning content and paths: A VideoCategory can classify multiple Video records. LearningPathVideo acts as an associative entity between Video and LearningPath, enabling a video to be reused in different paths while storing its order and required completion percentage within each path.

2) Learning progress: Each User may have multiple ViewingEvent records, which store viewing duration, completion percentage, and completion status for individual videos. LearningPathProgress summarizes the user's current video position, number of completed videos, and overall status for each learning path.

3) Organization and registration: User is the central entity for administrator, manager, and member accounts. ManagerToMembers stores the ABO ID created by a manager for new-member registration. When a member registers with that identifier, the record establishes the manager-member relationship used to restrict access to team data, reports, and feedback.

4) Files and feedback: A BusinessFileCategory can contain multiple BusinessFile records. FileDownloadLog connects a user to an accessed file and records the access time. Feedback links a member to the assigned manager, while FeedbackMessage stores each message and identifies its sender within the feedback topic.

Together, these relationships allow the same underlying records to support the member dashboard, manager team reports, leaderboards, download history, and feedback communication without duplicating operational data.

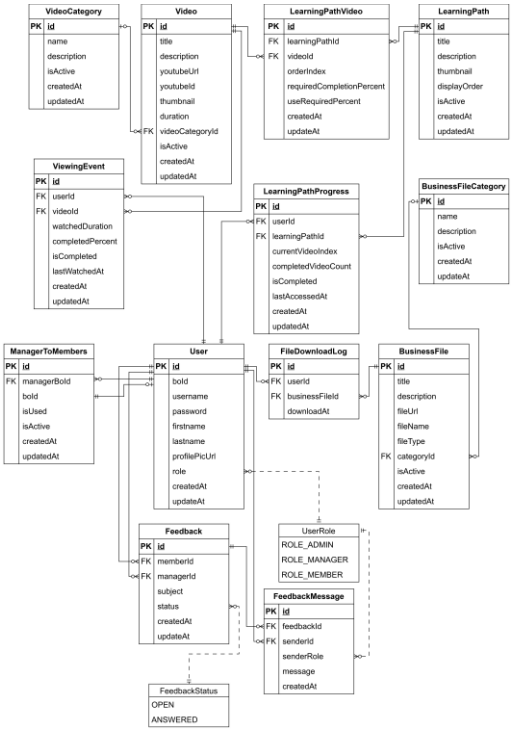

Fig. 3. Entity-relationship diagram and principal data entities of the system.

F. User Interface

The user interface is organized by role so that users can access the functions required for their responsibilities. The following descriptions cover the complete functional scope of each role, while Figs. 4–6 present one representative interface for each role to illustrate a principal responsibility.

- Administrator role: Administrators manage user accounts and roles, videos, learning paths, business files, and system-level data. The system contains 15 ordered learning paths: Paths 1–3 establish foundational knowledge for new members, whereas Paths 4–15 progressively develop understanding from initial business practice to leadership-level knowledge. Fig. 4 presents the learning-path management page, where administrators organize the sequence of content used by managers and members.

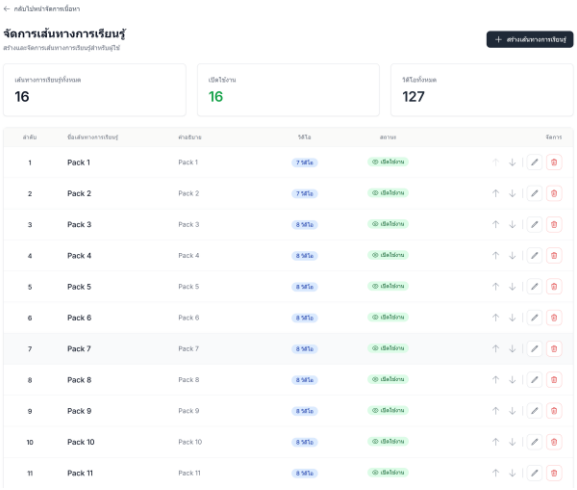

Fig. 4. Administrator interface for managing ordered learning paths.

- Manager role: Managers create and manage ABO IDs, monitor members assigned to their teams, access learning paths and business files, review personal and team dashboards, examine member progress and leaderboard results, and respond to member feedback. The manager-member relationship created through the ABO ID limits access to the appropriate team data. Fig. 5 presents the team-report overview as the representative manager interface, consolidating the learning progress and activities of the manager's team members.

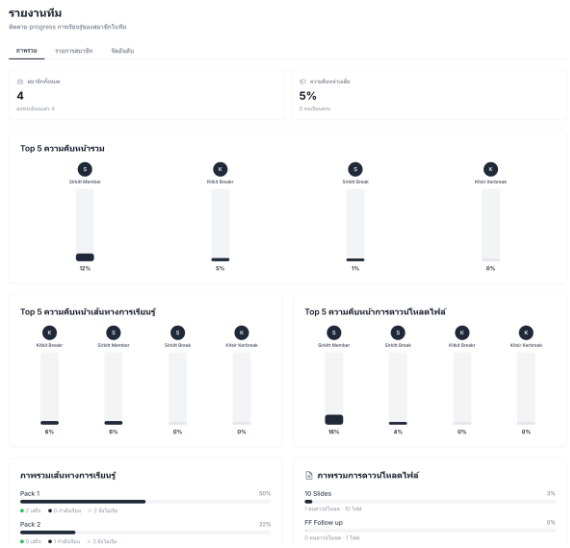

Fig. 5. Manager interface for monitoring team progress and activity.

- Member role: Members register with a valid ABO ID, sign in to their personal dashboard, follow learning paths in the defined sequence, view embedded videos, monitor completion status, download permitted business files, and submit feedback to their assigned manager. Their viewing and download activities update the records used by personal dashboards and manager reports. Fig. 6 presents the learning-path detail page and embedded video player as the representative member interface, illustrating the primary learning workflow and the progress information generated during use.

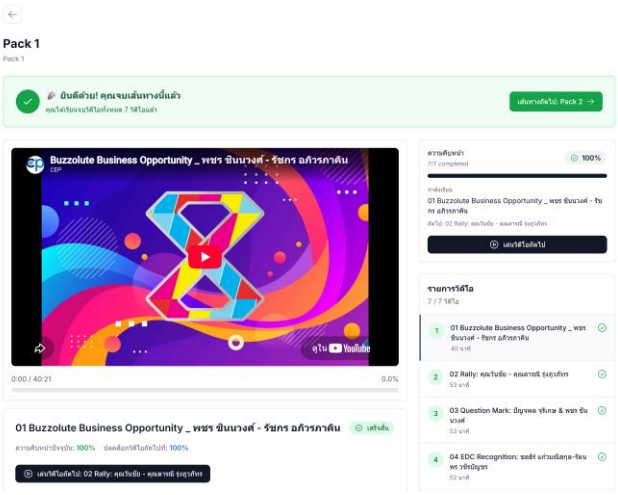

Fig. 6. Member interface for learning through an ordered path and embedded video player.

Together, these interfaces form a connected workflow. Administrators prepare users and learning resources, members perform learning and file-access activities, and managers use the resulting team information to provide supervision and feedback.

G. Testing and Evaluation

Following the completion of the system architecture, data model, and role-based user interfaces, the implemented functions were evaluated to determine whether they operated correctly, satisfied the specified requirements, and were suitable for practical use. The evaluation therefore progressed from isolated software components to integrated system workflows and, finally, to direct assessment by representative users. Verification and evaluation consisted of four activities:

1) Unit testing: Isolated frontend and backend logic was tested using Vitest with mocked repositories, databases, external APIs, and storage dependencies.

2) System testing: End-to-end workflows were exercised through the web interface, backend API, database, and file services. The cases covered successful workflows, validation conditions, and authorization restrictions.

3) User acceptance testing: The principal member and manager workflows were tested in an environment close to actual use. The first round involved two managers and two members, whereas the second round involved three managers and three members after the identified download defect had been corrected.

4) Satisfaction evaluation: After UAT, role-specific questionnaires were administered to evaluate perceived usability, usefulness, learning support, document access, reporting, and communication.

IV. RESULTS AND DISCUSSION

A. Verification Results

Verification outcomes were summarized using the numbers of executed, passed, and failed cases, together with the resulting pass rate at each test level:

1) Unit testing: The 13 backend and 10 frontend test groups comprised 382 subcases, and all subcases passed.

2) System testing: A total of 260 system test cases were executed. Of these, 256 passed, producing a pass rate of 98.46%, and no critical defect remained open.

3) UAT round 1: The first round passed 29 of 30 cases. The one failed case involved opening or downloading a business file through Safari on an iPhone.

4) UAT round 2: Following correction and retesting of the download behavior, 31 cases were executed: 2 common cases, 13 member cases, and 16 manager cases. All cases passed.

The overall verification and evaluation results are summarized in Table II.

TABLE II. SUMMARY OF VERIFICATION AND EVALUATION RESULTS

Evaluation	Observed result	Outcome
1. Unit testing	382 of 382 subcases	100%
2. System testing	256 of 260 cases	98.46%
3. UAT round 1	29 of 30 cases	96.67%
4. UAT round 2	31 of 31 cases	100%
5. Manager satisfaction	4.51 ± 0.58	Highest
6. Member satisfaction	4.71 ± 0.21	Highest

Together, the results indicate that the principal workflows operated correctly after the identified download defect was corrected, although four non-critical input-validation defects remained documented for future improvement.

B. Satisfaction Evaluation

The satisfaction evaluation used the following design:

1) Participants: Eight participants responded to the questionnaires: three managers and five members.

2) Questionnaire design: The manager questionnaire contained 15 questionnaire items in five dimensions: access and ease of use (2 items), onboarding and ABO ID (2 items), team monitoring and reports (6 items), feedback communication (2 items), and usefulness and intention (3 items). The member questionnaire contained 13 questionnaire items in five dimensions: access and ease of use (2 items), learning content and paths (5 items), documents and downloads (2 items), feedback communication (2 items), and satisfaction and intention (2 items).

3) Scoring and interpretation: Each statement used a five-point Likert scale, in which 1 represented the lowest rating and 5 represented the highest rating. Mean scores were interpreted as follows: 4.21–5.00, highest; 3.41–4.20, high; 2.61–3.40, moderate; 1.81–2.60, low; and 1.00–1.80, lowest.

4) Mean and dispersion: For each respondent, a dimension score was first calculated by averaging the ratings of the statements assigned to that dimension. The dimension mean and sample standard deviation (SD) were then calculated across the respondent-level dimension scores. Similarly, each respondent's overall score was calculated by averaging all scored statements in the role-specific questionnaire, after which the overall role mean and sample SD were calculated across respondents.

a) Manager results: The overall score was 4.51 ± 0.58 (mean ± SD), which was classified at the highest satisfaction level. As shown in Fig. 7, access and ease of use received the highest dimension score (M = 4.67, SD = 0.58). Onboarding and ABO ID (M = 4.50, SD = 0.87), team monitoring and reports (M = 4.50, SD = 0.50), and feedback communication (M = 4.50, SD = 0.50) had equal means, while usefulness and intention had the lowest mean (M = 4.44, SD = 0.69). All dimensions remained within the highest category.

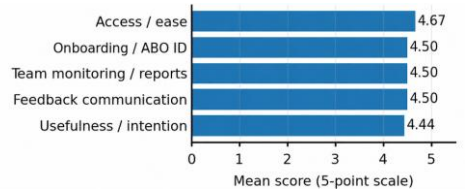

Fig. 7. Manager satisfaction by evaluation dimension.

b) Member results: The overall score was 4.71 ± 0.21 (mean ± SD), which was classified at the highest satisfaction level. As shown in Fig. 8, learning content and paths received the highest dimension score (M = 4.80, SD = 0.35), followed by access and ease of use (M = 4.70, SD = 0.45) and satisfaction and intention (M = 4.70, SD = 0.27). Documents and downloads (M = 4.60, SD = 0.65) and feedback communication (M = 4.60, SD = 0.55) had the lowest means, although both remained within the highest category.

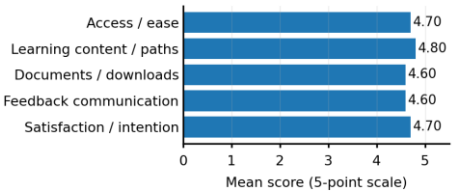

Fig. 8. Member satisfaction by evaluation dimension.

Although all dimension means were classified at the highest level, none reached the maximum. Open-ended responses suggested improvements to interface aesthetics, file search, and notifications for prolonged member inactivity. In addition, the UAT download defect highlighted the need to strengthen cross-device and browser compatibility.

C. Benefits and Limitations

The system centralized the onboarding workflow by connecting registration, ordered learning, activity recording, team monitoring, and feedback. Members gained a clearer learning sequence, progress tracking, and access to relevant videos and business files. Managers gained a consolidated view of team progress, recent activities, and file-access records, reducing repeated individual follow-up. However, the scope excluded post-learning assessments, automated notifications, and real-time communication. The evaluation involved a small number of users, while reliance on external video and file services may introduce variations in availability and access across devices and browsers.

V. CONCLUSION AND FUTURE WORK

The study produced a web-based learning system aligned with the identified onboarding workflow. Its main contribution is a coordination layer connecting existing learning resources with ABO ID-based team assignment, sequential learning, activity records, team reports, leaderboards, and manager-member feedback. Unit, system, and user-acceptance testing confirmed the principal workflows after the download defect was corrected. Manager and member satisfaction scores were 4.51 and 4.71 out of 5, respectively. Limitations include the small evaluation sample and reliance on external services whose availability and cross-device behavior are partly outside the system's control. Future work should improve file search, cross-device compatibility, notifications, and interface usability, expand evaluation, and consider post-learning assessments.

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