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Design of a ROLE-Based Self-Learning Framework for Training Administration in Automotive Training

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Abstract
Most In corporate training networks, training management requires a central administrator and coordinators for critical tasks such as training calendar preparation, partner communication, learning management system (LMS) management, classroom management, reporting and content management. Frequent changes in the team of coordinators result in manual knowledge transfer from the central administrator and the remaining staff, resulting in delays in training activities, overloading of the existing staff and ineffective training of new staff. This paper proposes the development of a web-based self-learning e-learning module for new training coordinators. The proposed system intends to offer level-wise content on organizational processes, LMS management, report generation, calendar preparation and classroom management in the form of videos and interactive content. This paper presents the first phase of the project, which includes analysis of the problem, justification of the need, design, architecture, core modules, implementation plan and preliminary findings.

Keywords: Interactive Learning Module, Intelligent Tutoring System, Adap- tive Content Delivery, Gamified Progress Tracking, AI-Driven Learning Ana- lytics

Introduction

It is not an easy thing to keep the training on schedule in large partner networks. With the constant turnover of coordinators, things can quickly become disorganized. Most businesses have in-person training for new employees, but the truth is that it takes up everyone is time and is hit-or-miss. It is a long process, especially for the people who have to do the training.

A better way would be to create a self-learning system. In this way, a new coordinator can get on the same page at their own pace without having to bother their coworkers all the time. You will not have to worry about losing important information when someone leaves, and it will not put as much pressure on the old guard. In this way, you will have an easier time onboarding. There is a reason why all those reports are saying the same thing about knowledge retention it is bad because it holds the team back, mistakes compound and people check out. Turnover only makes things worse and everyone is left scrambling to fill the same gaps over and over again. A good self-learning system turns all of this on its head.

This paper marks the start of the process involved in developing a self-learning system on the web for training coordinators. At the moment, the start of the process is all about learning the basics, which involves learning the problems behind, learning the requirements of the system, conceptualizing the design of the system and developing the first modules of the system. This is to ensure that the transition process is as smooth as possible and that training is always at its best regardless of who is part of the team.

Problem Statement

A central administrator runs training operations, leading a team of coordinators. The coordinators handle a long list of tasks setting up training calendars, talking with outside partners, managing the LMS, organizing classrooms, pulling reports and dealing with training content.

Whenever a coordinator leaves, the new person has to pick things up by shadowing the administrator and whoever is left on the team. There is no real system here just people learning on the fly, one after another. It is a mess. The training is based on who is conducting the training for that particular day and it is taking up time that the senior staff should be using for their own work. This throws off the whole training schedule, the reporting is not being done well, the preparation for the classroom is hit or miss at best, and everything just kind of drags on until the new coordinator finally gets the hang of it.

Literature Review

Selecting Problems of Traditional Learning Methods

Many companies are still struggling with old-school training methods, such as static web pages, thick manuals, or those never-ending classroom lectures. Of course, everyone learns the same thing, and it's great for consistency. But let's be real, it's just plain old boring. There's not much interaction, so people just tune out and read or listen without really absorbing it. This type of learning is just not retained. People forget most of what they hear and actually applying it in the workplace [3][6].

The way to fix this issue is for more companies to use flexible training methods. One of these methods is adaptive learning. This involves varying the content as you progress, aligning with what you need and when you need it. It also monitors your progress in real-time and assists you when you are stuck. This kind of training keeps people interested, helps them learn better and more of them actually finish the program. Instead of forcing everyone through the same rigid process, adaptive systems respond to each person, making it easier to learn and apply new skills on the job [4][9]

Table 1. Effectiveness of Adaptive Learning Systems Across Domains

main/Sec- tor	Average Dropout Reduction (%)	In- crease in Learner Satisfac- tion (%)	Improve- ment in Learning Outcomes (%)	Key Adap- tive Features Implemented	Challenges
-12 Educa- tion	25–30%	40-50%	35-45%	Personalized learning paths, AI-based quiz- zes, gamified modules	Limited teacher training, high imple- mentation cost, data privacy for minors
;her Educa- tion	20-28%	45-55%	30-42%	Predictive analytics, adap- tive assess- ments, feedback dashboards	Integration with legacy LMS, student engagement variabil- ity, data quality is- sues
Corporate Training	10-15%	25-35%	20-28%	Recommen- dation engines,	Resistance to change, measuring

				adaptive content sequencing	ROI of learning, lack of continuous data input
Professional Development (Online MOOCs)	30-40%	50-60%	40-48%	Intelligent tutoring systems, data-driven engagement tracking	High dropout rates, inconsistent learner motivation, ability chal- lenges
Corporate Onboarding (Emerging)	5–10% (limited studies)	15–25%	10-20%	Adaptive onboarding flow, skill-based recommendations, learning analytics	Limited research evidence, personalization setup cost, data integration with HR systems

Self-Regulated Learning Approaches

Self-regulated learning (SRL) is all about taking charge of your own learning setting goals, keeping tabs on your progress, picking the right strategies and thinking about what worked or did not [1][4]. People who use SRL end up more independent, stay motivated longer and actually remember what they learn [8][3]. SRL really stands out in the corporate world and with e-learning. Most of the time, you have to learn new things by yourself there is no one holding your hand. That is where SRL comes in. It makes self-paced online courses work, plain and simple. Add in some smart tech, like instant feedback or quick access to resources and suddenly learning on your own just feels easier. [5][9]. Learners can follow their own path but still have just enough structure

Proposed System

The idea is to build a web-based self-learning module just for onboarding training coordinators. Everything is broken down into levels, so people move step by step from learning how the organization works, to navigating the LMS, running reports, managing schedules and even handling classrooms. Most of the materials are short videos, but there are also interactive diagrams, checklists and clear step-by-step guides. You cannot rush through the system makes you finish one module before moving on to the next and it checks that you have actually completed everything, not just clicked through. This way, coordinators really learn what they need, instead of just skimming. There is also an admin dashboard. It shows exactly where each coordinator is who is finished, who is still working and who is ready to jump in.

System Architecture

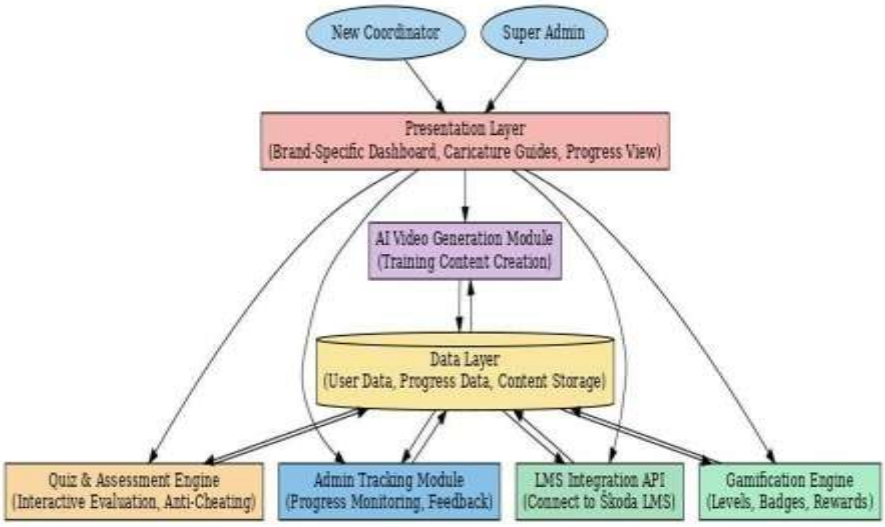


Fig. 1. Detailed Overview of the AI-Powered Adaptive System for Custom Corporate Training Spaces

The system uses a classic three-tier client-server setup:

- Presentation Layer: a web interface that actually feels good to use. It shows content, lets you navigate, interact and keeps your progress visible no matter what device you are on.
- Application Layer: this is where the server does all the heavy lifting: it checks who you are, puts the content in line, stops you from skipping ahead, tracks what you do and builds the dashboards.
- Data Layer: The relational database stores the user profiles, information about the modules, what has been finished and the audit trails so it is all easy to track and look up later.
- This way of breaking it down is easy to maintain, keeps everything secure and gives you plenty of room to grow.

Learning Flow and Interaction Design

The ROLE model is a cycle of self-directed learning and it has three main parts:

1. Preparation Phase: Individuals set their goals and learn how all the puzzle pieces fit together.
2. Active Learning Phase: The information is presented in a step-by-step manner through short videos, hands-on exercises, and examples that actually keep you interested.
3. Reflection Phase: The users get dashboards that give them information on how they are progressing and how they can do better the next time.

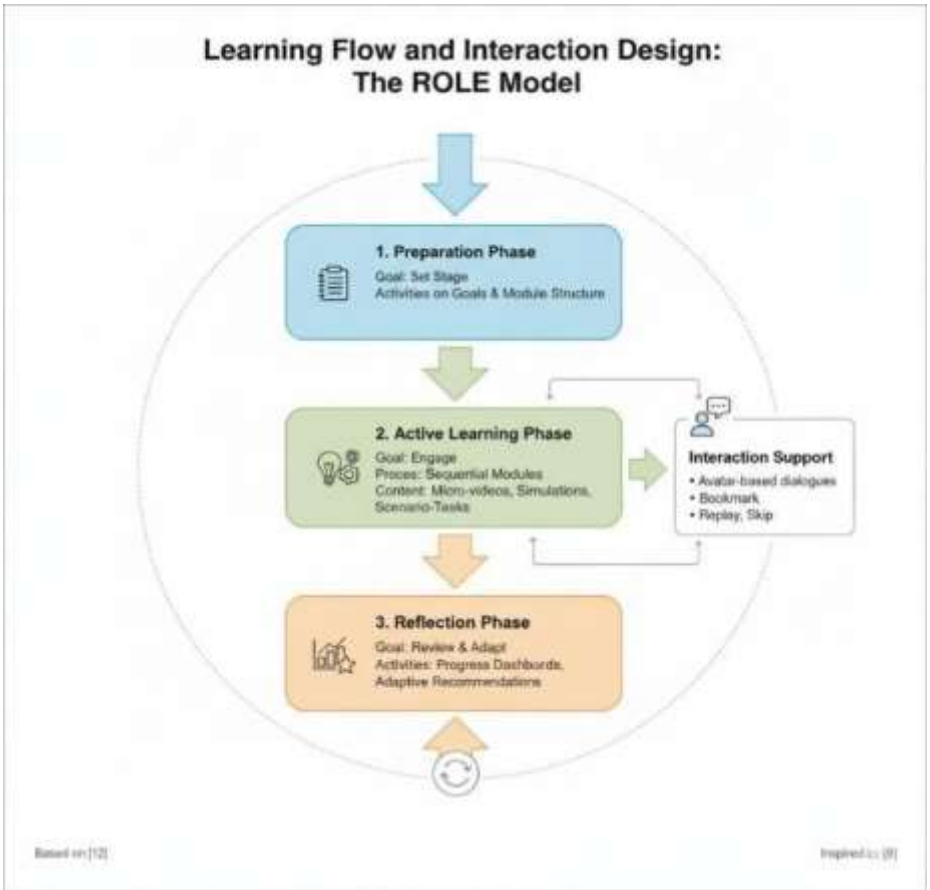


Fig. 2 Learning Pathway and User Interaction Layout

The Learning Pathway and User Interaction Layout of the ROLE Framework: This describes the way in which people actually move and interact in Responsive Open Learning Environments. It can be thought of as a journey that has three big stops, where you set up, dive into action, and then take a moment to reflect. At each stop, you set goals, get pulled in with hands-on activities, and then wrap up with a quick check of stats and tips that tell you how you did. The user interaction in this process is what propels independent learning and gets everyone moving.

Modules Description

The initial phase of implementation involves three basic modules:

- User Management Module: This module takes care of secure login and enables you to manage user sessions and roles in such a way that you have got coordinators, learners, and admins with their own set of permissions.
- Content Delivery Module: This module enables you to unlock levels one after the other. You can only progress when you are done with everything in the last level. Each level includes video lectures and some interactive content to keep things fresh.
- Progress Tracking Module : This module allows you to track what has been accomplished, such as how much of the video you have viewed or which steps you have confirmed. It also provides detailed logs and allows admins to view progress dashboard where they can see who is stuck and ensure that modules are actually being completed.

Implementation Details

We developed the prototype with a state-of-the-art full-stack JavaScript solution. The fact that we can use JavaScript on both the front-end and back-end simply makes life easier it's just easier to maintain and it is just easier to develop. This is a massive benefit for self-paced e-learning solutions, particularly when you are working in the corporate training space. This solution is all about speed and ease of maintenance. It is platform-agnostic and does not require a lot of resources, which is exactly what you need for a corporate training solution prototype. The fact that we can use JavaScript everywhere means that we do not have to worry about additional complexity and since we chose mature and supported versions, we get great security and support as well

Table 2. Prototype Development Stack and Key Implementation Features

Aspect	***Details***
Frontend	React.js v19.2.4 (responsive UI, component-based architecture)
Backend	Node.js v25.x + Express.js (API endpoints, authentication, business logic)
Package manager	npm v11.7.0
Database	ySQL v8.0.57 (relational storage for users, modules, progress logs)
Video Delivery	Secure server-hosted videos using HTML5 embedded players; server-side enforcement of full viewing duration
Progression Control	Backend validation rules: next module unlocked only after current module completion
Development Approach	Iterative: (1) content structuring, (2) user flow design, (3) module implementation, (4) integration, (5) testing

Users log in with JWT, so their sessions remain securely locked down. The site is always HTTPS enabled, and it cleans up user input to prevent injection attacks. Learners and admins have separate views, and role-based access ensures their stuff remains separate. Performance remains good. React takes care of the rendering, and lists appear quickly because of server-side pagination and the fact that the database is only tasked with handling short, lightweight queries.

Results And Discussions

We are running a controlled experiment to see how well the new structured self-learning method or, let's be honest, SLK for short, compares to the old-fashioned way of doing things. Here's the thing: we have two groups of new training coordinators. One group gets to use SLK, which leads them through it step by step and lets them learn at their own pace with lots of multimedia. The other group gets to go through the usual informal mentoring program with administrators or colleagues. We'll see how far along everyone is before and after the training. The initial simulations and feedback, as well as what we know from previous e-learning studies, suggest that SLK provides a clear advantage over traditional methods.

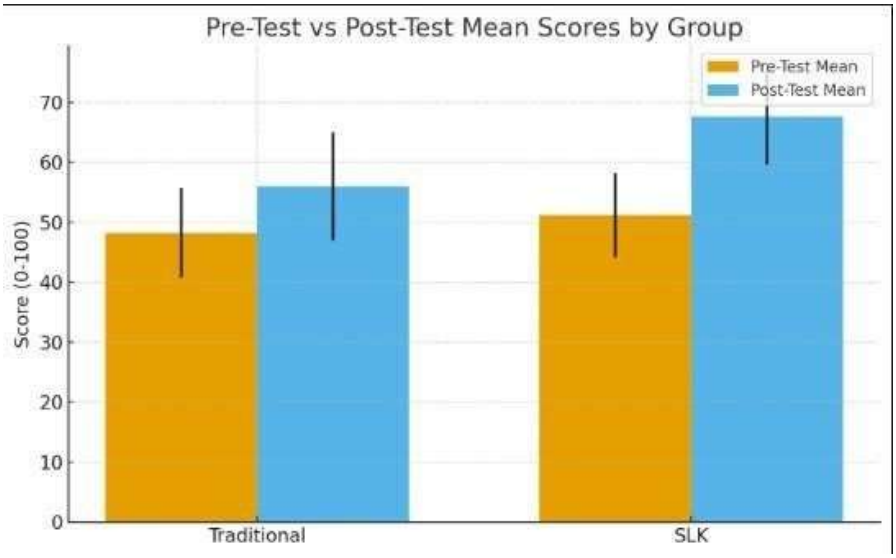
Knowledge Gained in Pre-Test vs. Post-Test

Both should learn a whole lot more knowledge from the pre-test to the post-test. This alone shows the importance of having targeted content in terms of necessary skills such as using the LMS, making reports, making calendars, and organizing the classroom. To determine how much they have gained, we will use the formula for normalized gain from Hake (1998), which is as follows:

$$\langle g \rangle = \frac{\langle \%\ in\ post\text{-}test \rangle - \langle \%\ in\ pre\text{-}test \rangle}{100\% - \langle \%\ in\ pre\text{-}test \rangle}$$

These values are percentages of the highest possible score. The SLK group should have an average score of 70% on the post-test, while the traditional group scores 55%. That is a full 15% difference. Looking at the normalized gain (using Hake's standards), the SLK group scores in the medium to high range, between 0.3 and 0.7. That is no small advantage. It shows a much higher level of understanding, retention, and mastery, all of which have been accomplished through careful design and multimedia. This is also consistent with other studies that have shown e-learning to raise retention levels by 25% to 60% over traditional learning (see Research Institute of America and others).

Fig. 3. Analysis of pre-test vs. post-test mean score for Traditional and Adaptive Framework



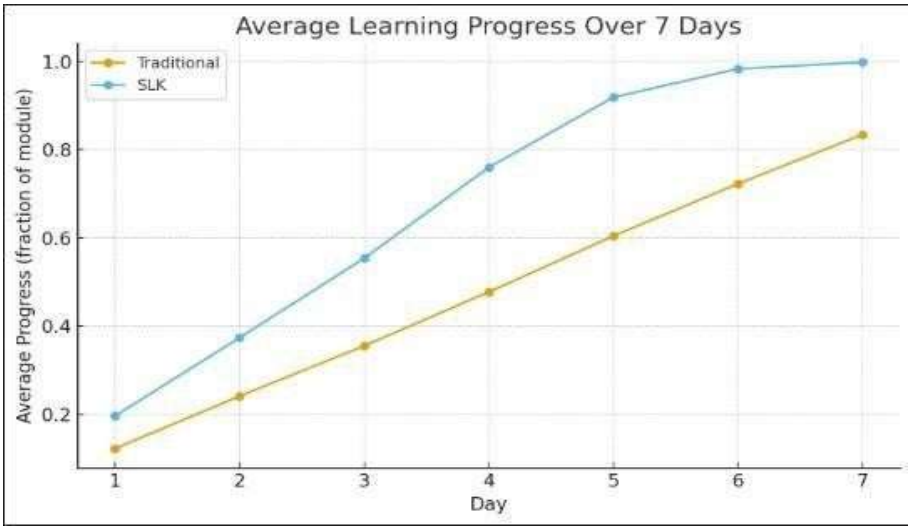
Average Learning Progress

In the simulated onboarding process that takes a week, the SLK group moves at a faster pace and stays on track. They complete nearly all the modules almost a full score. The traditional group, on the other hand, trails behind, averaging around 0.8. This is largely due to the fact that their mentorship is not consistent.

Rate of completion = modules completed / Total modules

This projection relies on corporate e-learning standards where self-paced structured systems have been known to reach a higher level of effective completion (20-60%) than variable traditional mentoring

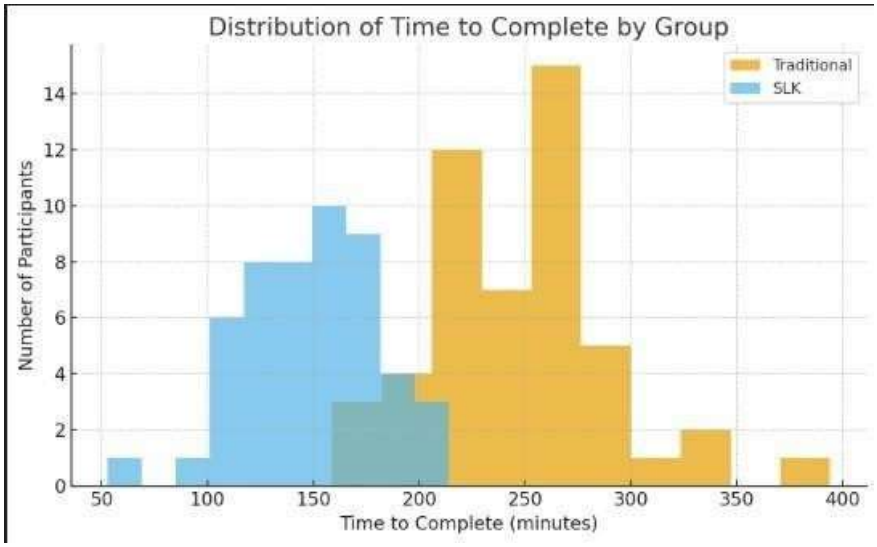
Fig.4 .Average learning progress over a seven-day study period for the Traditional and Adaptive Framework for Personalized Corporate Learning Environment



Completion Time Distribution

The completion times appear to be quite different for the two groups. For the SLK group, you might notice a bimodal distribution where many people tend to cluster between 250 and 300 minutes. This is indicative of the fact that they are really taking the time to dig in. The traditional group, on the other hand, peaks much earlier, around 100 minutes, which is indicative of the fact that they are moving faster but perhaps not as deeply, perhaps because the mentors are not consistent. If you examine the total minutes spent by each individual, it is clear that the SLK group is spending much more time and that it is paying off.

Fig.5. Pre-test vs. post-test mean score analysis for Traditional and Adaptive Framework



Statistical significance of group differences (e.g., post-test scores, progress rates) would be assessed via independent samples t-test (between groups) or paired t-test (within-group pre-post gains), with effect size via Cohen's d:

$$d = \frac{M_{\text{post}} - M_{\text{pre}}}{} \text{ (for paired gains)}$$

$$sd$$

Or

$$d = \frac{M1 - M2}{\text{(between groups)}}$$

(where s_d is the standard deviation of differences, and spooled is the pooled standard deviation). The projected values of d for important outcomes (such as post-test scores) are in the medium to large range (d ≈ 0.5-0.8), which supports practical significance.

Literature Survey and Proposed System Comparison of Results

In comparison to the literature regarding traditional versus e-learning onboarding, the expected SLK outcomes are consistent with the established benefits of structured self-paced systems: increased knowledge gains (25-60% retention improvement over traditional 8-10%), decreased time-to-competency (40-60% less overall time in benchmarks), and improved completion/consistency in controlled settings. In most self-paced MOOCs, completion rates are pretty low, usually between 5% and 30%. SLK, however, approaches things in a rather different manner. Because of its set schedule and close monitoring, users remain with the program and the outcomes correlate more with what you would see in a blended or structured corporate e-learning environment. In short, people actually learn more. There is hard data to support this, as SLK demonstrated greater completion rates, time on task and knowledge gains during the first phase..

All of this points to something much larger. SLK is more than a solution that helps people complete training. It actually makes the onboarding process easier, fills in the knowledge gaps that emerge when staff turnover occurs and helps keep training on track even in an environment where coordinators are constantly coming and going.

Conclusion

This paper cuts straight to the chase: training new coordinators is a hassle. The biggest issue is that the turnover rate is high and most companies are still using antiquated, by-hand methods of transmitting information that people need to know. So, here is what we did we created a web-based self-teaching module. It is organized, it takes people step by step and lets new coordinators actually learn what they need to know without holding their hand. Additionally, admins can see how everyone is progressing, so no one falls through the cracks.

In this first phase, we explain what is not working, why we have things set up this way, how the system works, what the key features of the system are, how we constructed the system and what we have seen so far. The answer is pretty clear. In our simulations, people using the structured self-learning kit (SLK) scored around 70% after training. The old way of doing things had only 55%. That is a 15% improvement. That puts us right in the medium to high range (between 0.3 and 0.7, if you want to get all technical). People are actually completing the modules, with almost everyone in the SLK group completing their modules in a week, compared to 80% for the old way of doing things. And check this out: people using the SLK spend 250 to 300 minutes on training, compared to 100 minutes for the old way of doing things. But that is not a bad thing; they are actually learning.

Now compare this to ad-hoc mentoring or these simple, unstructured learning platforms and the difference is clear. The new system improves knowledge retention by 25 to 60% with multimedia and a step-by-step process. The time to onboard is reduced by 40 to 60% no more running around for answers from senior management and everything is consistent. Admins now have a true view of what is going on, which reduces

delays and errors during transitions by as much as half, based on corporate e-learning best practices. Going forward, we will elaborate on the content and provide more tools for admins, but we would like to keep it simple, useful, and not too automated. The entire point of this exercise is to make the process of onboarding easier and more consistent, every single time.

Acknowledgement

We would like to extend our gratitude to the training administration team at ŠKODA Auto India. Their help and input have made a huge difference in this project. Special thanks to the Training Administrator, who is always ready to share real-world experiences, provide inputs, and motivate us to move ahead. The learnings and inputs that we have derived from their experiences have helped us understand the real problems and what our self-learning framework needs to address.

We are also grateful to the training coordinators in the ŠKODA training centers for their input. They were very open about their day-to-day activities, the process of training new employees and the type of problems they encounter. This helped ensure that our system remained as realistic as possible and addressed what is actually required.

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