Final Paper

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***Abstract*—** As a first-time homebuyer passionate about DIY projects, I encountered significant challenges in identifying effective methods to acquire the practical skills required for home improvement. Despite the abundance of educational technology resources, there remains a gap in providing hands-on, skill-based learning tailored to DIY enthusiasts. This project combines my interests in investment real estate, project-based learning, and computer science to explore how modern educational technologies can enhance DIY learning. The goal is to develop a comprehensive, AI-powered platform that integrates multimedia content, personalized feedback, and adaptive learning techniques to guide homeowners through DIY projects. By merging educational tools with practical, real-world applications, this project empowers users to gain confidence and proficiency in home improvement, enabling them to tackle projects successfully and independently.

1 INTRODUCTION

1.1 Background & Problem Statement

As a first-time homebuyer with a passion for DIY projects, I quickly realized that although many resources exist for home improvement, there is a significant gap in practical, hands-on, and personalized learning tools. Homeowners and DIY enthusiasts often struggle with fragmented resources, such as YouTube tutorials, Pinterest inspiration boards, and instructional books, which lack interactivity and real-time feedback. While some platforms provide project guides, they often fail to incorporate effective learning methods, like project-based learning and adaptive feedback. These methods, which engage learners in hands-on activities, have been shown to improve retention and proficiency (Merriam & Bierema, 2014). However, very few resources offer this in a structured, scalable, and personalized way.

1.2 Motivation & Inspiration

The motivation for creating MKRHome came from personal experience and the challenges I faced with fragmented resources. As a DIY enthusiast, I struggled to find resources that offered the hands-on, interactive learning I needed. Inspired by my experience with my girlfriend's father, Roger—who was always available to provide expert advice on home improvement—I wanted to create a platform that offers accessible, expert guidance. MKRHome combines AI-driven feedback with step-by-step DIY tutorials to provide a more personalized and engaging learning experience, making it easier for homeowners to successfully complete projects.

1.3 Significance of the Project

This project is significant not only for creating an innovative learning tool but also for reshaping how homeowners approach DIY tasks. MKRHome offers a more personalized, engaging alternative to traditional DIY resources by integrating adaptive learning and project-based techniques. By demonstrating how AI and multimedia can enhance hands-on learning, MKRHome contributes to the growing field of educational technology and has the potential to redefine how people learn and master practical DIY skills.

2 RELEVANT WORK & MARKET COMPARISON

MKRHome is inspired by existing educational technologies and DIY resources that use AI and multimedia for interactive learning. This section highlights how these tools work, identifies gaps in current DIY resources, and explains how MKRHome fills these gaps.

2.1 Educational Technologies

Educational technologies increasingly use AI, multimedia, and project-based learning to create personalized and engaging experiences. AI helps tailor learning paths and provide real-time feedback, as seen in platforms like Duolingo and Khan Academy. Research shows that combining AI with multimedia improves engagement and retention (Bergman & McMullen, 2020; Mayer, 2019). MKRHome applies these principles by offering instructional

videos, interactive tutorials, and AI-driven feedback, along with hands-on project-based learning.

2.2 DIY Learning

Although educational tech has advanced in many areas, DIY learning still has gaps. Platforms like Pinterest offer project ideas but lack interactivity. Wisniewski et al. (2020) and Chu & Fowler (2020) highlight that active engagement and personalized feedback improve learning. MKRHome addresses these gaps with interactive tutorials, real-time feedback from the AI assistant "Roger," and step-by-step guidance that engages users more effectively than video-only platforms like Skillshare or Udemy.

2.3 Technological Tools for DIY Learning

AI, adaptive learning, and multimedia content are essential for improving DIY learning. Adaptive learning systems can personalize content, while AI offers real-time feedback tailored to users' progress (Pliakos et al., 2019; Malik & Agarwal, 2012). MKRHome uses these technologies by offering multimedia content and tracking progress, making it a more complete learning tool than other platforms.

2.4 Competitor Analysis

Several platforms provide educational content for DIY enthusiasts, but few use project-based learning and adaptive feedback effectively. Pinterest offers ideas but lacks guidance, while platforms like Skillshare and Udemy rely on passive video content without real-time support. MKRHome stands out by combining AI, adaptive feedback, and project tracking to provide personalized, interactive learning and hands-on support, helping users learn at their own pace.

3 AGILE METHODOLOGY AND PROJECT PROGRESS

For the development of MKRHome, I employed Agile methodology, breaking the project into five two-week sprints. This iterative approach allowed for continuous progress, regular user feedback, and adjustments based on real-time insights. The Agile process helped me remain flexible in refining the platform's features and addressing technical challenges as they arose.

3.1 Sprint 1: Initial Setup and Planning

In the first sprint, I focused on the foundational work, such as starting the LinkedIn Learning Full Stack Web Developer Path for training in React.js and Node.js, setting up the GitHub repository, and creating initial wireframes to define the core features of the application. The iterative design process began with low-fidelity prototypes to visualize the user interface (UI) and user experience (UX). Feedback from peers, including fellow students in the Educational Technology course, was integral to refining the platform's design, especially to ensure it met the needs of the target demographic—primarily first time homeowners in their 20s to 30s.

Figure 1 — LinkedIn Learning Full Stack Web Developer certificate of completion

3.2 Sprint 2: Front-End Development and Early Prototypes

The second sprint I concentrated on the front-end development. I used the designs from the Figma prototype and implemented the UI using React.js, integrating Google Material Design components for a responsive layout. This sprint involved creating the homepage, project tutorial pages, and basic navigation elements. Early feedback from classmates was crucial for refining the design, leading to an interface that was user-friendly and aligned with the needs of the target audience.

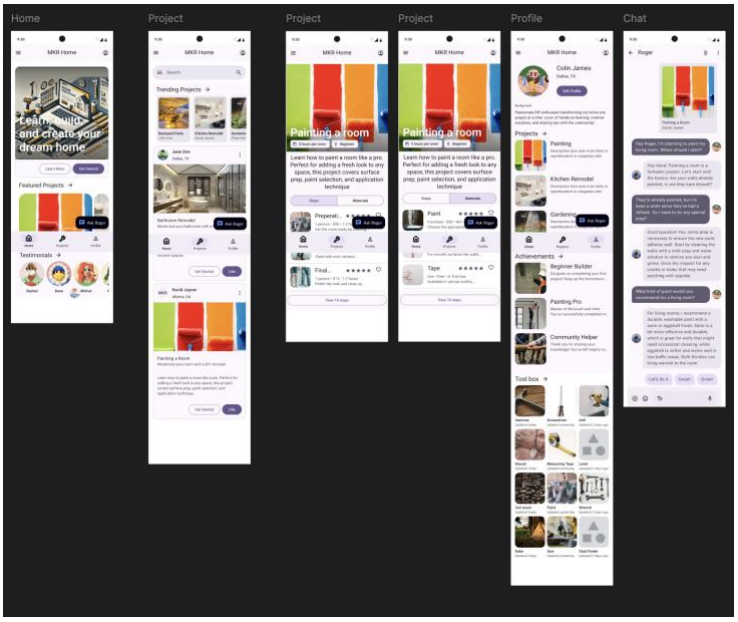

Figure 1— Figma Prototype

3.3 Sprint 3: AI Integration and Platform Refinements

During the third sprint, I pivoted from the original plan of using Azure AI to integrating OpenAI's ChatGPT model as the backend for the AI assistant, Roger. This shift allowed me to harness the advanced natural language processing capabilities of OpenAI for real-time feedback. During this sprint, I focused on integrating AI-driven feedback and refining interactive project tutorials based on user feedback. This ensured that the AI assistant could offer personalized guidance and support to users as they worked through DIY tasks.

3.4 Sprint 4: Mobile Accessibility and Gamification

The fourth sprint prioritized mobile accessibility and gamification features. Ensuring that MKRHome was mobile-responsive was critical for allowing users to engage with the platform seamlessly across devices. The design was optimized for various screen sizes, and AWS cloud hosting was used to guarantee seamless performance. I also integrated gamification elements, such as badges to enhance user engagement and motivation. The sprint concluded with refinements to the platform's overall UI based on additional user feedback.

3.5 Sprint 5: Final Adjustments

The fifth sprint involved final adjustments, including completing essential features like the project tracking system and profile pages. Despite delays in setting up the database due to AWS hosting challenges, I was able to finalize most of the platform's key features, ensuring the application was functional, scalable, and ready for deployment on http://mkrhome.com.

4 DEVELOPMENT PROCESS AND DESIGN

The development of MKRHome was built upon a highly iterative design process, informed by Agile methodologies and focused on rapid prototyping, continuous refinement, and leveraging the latest technologies to ensure an engaging and interactive learning platform. This section highlights the core technologies and user experience principles that shaped the final platform.

4.1 Technology Stack

The technology stack for MKRHome was carefully chosen to support scalability, interactivity, and efficient deployment. The platform is built using React.js and Node.js, providing a dynamic, real-time experience for users. React.js was selected for its ability to update the user interface efficiently without needing a full page reload, essential for interactive applications like MKRHome. The backend is powered by Node.js, allowing for effective management of requests, real-time interactions, and data handling. For the AI-driven features, OpenAI's ChatGPT model was integrated, providing context-aware, adaptive feedback via the AI assistant Roger. This integration was pivotal in offering real-time, personalized guidance to users.

4.2 User Experience (UX)

The user experience (UX) design was central to the platform's success. The application adopts principles from Google Material Design, focusing on simplicity, clarity, and intuitive navigation. The UI was designed to ensure ease of use, particularly for first-time homebuyers with limited DIY experience. Additionally, interactive multimedia content, including instructional videos and project guides, enhances the learning experience, ensuring that users remain engaged and motivated.

4.3 Learning theories and Methodology

The platform's design was influenced by adult learning theories, such as project-based learning and adaptive learning systems. Drawing from research by Merriam & Bierema (2014) and Quratulain et al. (2021), MKRHome emphasizes active, hands-on learning where users engage directly with real-world DIY tasks and receive immediate feedback. This active learning process has been shown to improve skill retention and user engagement, making MKRHome a more effective tool for mastering DIY projects compared to traditional passive learning methods.

4.4 Target Demographic and Branding

The primary target demographic for MKRHome is first-time homeowners in their 20s to 30s who are eager to learn how to tackle DIY projects. Traditionally, DIY home improvement content has been largely targeted towards older men, leaving a gap in the market for educational tools that speak directly to to this demographic who are interested in learning to build things themselves. MKRHome aims to fill this gap by providing a platform that is not only educational but also designed to appeal to this market, with a light green color scheme and a simple, relatable logo featuring a hammer, a widely recognized symbol of home improvement.

The application's branding and design choices were made to ensure the platform feels welcoming and engaging. The lively, approachable aesthetic encourages users to feel confident in taking on home improvement tasks, with a focus on building skills through a combination of structured guidance and personalized support.

4.5 Marketing Strategy

To reach the target demographic, MKRHome has been marketed through Instagram, YouTube, and TikTok, leveraging the popularity of short, informative videos. This format appeals to users who consume educational content in quick, digestible segments. The application's videos are designed to be engaging and informative, offering a 1-minute breakdown of DIY tips and tutorials. By staying current with social media trends, MKRHome's content aims to connect with a broader audience, encouraging more people to engage with the platform and learn new skills.

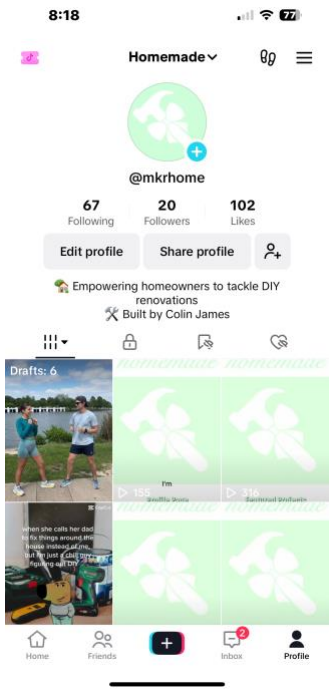

Figure 2 — Tik Tok Account.

5 APPLICATION FEATURES

The MKRHome platform was designed to provide a comprehensive, interactive, and engaging learning experience for DIY enthusiasts. The core features of the application include step-by-step project tutorials, AI-driven feedback, gamification elements, and mobile accessibility, all of which are intended to enhance the user's ability to learn new skills and complete DIY projects with confidence. Below, I'll discuss each core feature in detail.

5.1 Project Tutorials

The heart of MKRHome is its project tutorials, which provide users with clear, structured, and easy-to-follow guides to complete various home improvement tasks. These tutorials break down complex projects into manageable steps, offering text, images, and instructional videos to help users at every stage. The tutorials are designed to be hands-on, ensuring that users actively engage with the content rather than passively watching videos or reading instructions. This step-by-step approach mirrors the principles of

project-based learning, as users are guided through real-world scenarios, which has been shown to enhance retention and practical skill development (Wisniewski et al., 2020). Additionally, the platform includes an infinite scroll feature on the Featured Project Section, where users can easily explore a variety of projects, making it simple to discover new tasks and get inspired.

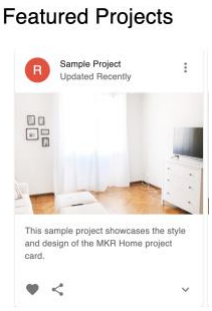

Figure 1— Project tutorials

5.2 AI-Agent Roger

Another core feature is the Chat with Roger function. This feature allows users to communicate directly with the AI assistant to ask questions, seek clarification, or receive advice on their projects. The integration of this interactive chat system ensures that users always have support and guidance available, whether they are stuck on a specific task or need general tips for improving their technique.

Powered by OpenAI's ChatGPT, Roger offers real-time, personalized feedback and guidance to users as they complete DIY projects. The AI assistant can provide suggestions, troubleshoot issues, and offer encouragement based on the user's progress. This adaptive feedback system allows for a personalized learning experience, where users can receive advice tailored to their specific actions and mistakes.

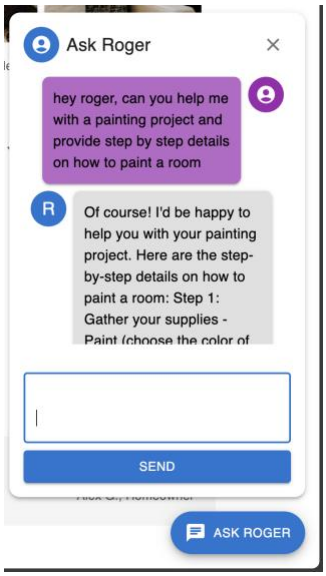

Figure 1— Ask Roger chat functionality

5.3 Gamification

To keep users motivated and engaged, MKRHome incorporates gamification elements throughout the platform. Features such as badges play an important role in driving continued use and helping users feel accomplished as they work through their DIY projects.

Research shows that gamification can significantly enhance user engagement and motivation. Zeybek & Saygı (2023) and Hassan et al. (2021) highlight the importance of rewards and challenges in learning platforms, as these elements encourage users to continue progressing through the content. These elements not only make learning more fun but also give users a sense of accomplishment and tangible goals to work toward, which can be especially motivating for beginners.

5.4 Mobile Accessibility

Recognizing the importance of mobile accessibility, MKRHome was designed with a responsive layout, ensuring that users can access the platform and work on their DIY projects from both desktop and mobile devices. This makes it easy for users to engage with the platform whether they are at home on their computer or out in their garage or garden working on a project.

The mobile version of MKRHome mirrors the desktop experience, with a user-friendly design that allows easy navigation between tutorials, profile pages, and project tracking features. The use of AWS cloud hosting ensures that the platform remains scalable, reliable, and fast, offering a seamless experience across devices.

5.5 Profile Page

The Profile Page serves as a central hub where users can manage their account details, track their progress, and connect with others. On this page, users can add a profile picture and background image, allowing for a more personalized experience. The profile also shows essential statistics, such as the number of projects completed, the number of followers, and a toolbox where users can add their favorite tools or items for quick reference.

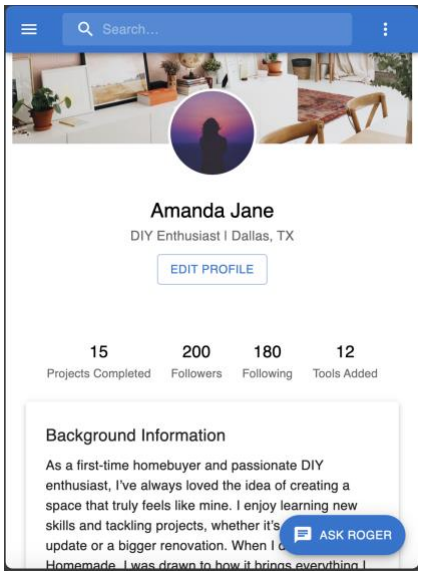

Figure 1— Example Profile page

6 CONCLUSION

The MKRHome project aims to fill the gap in hands-on learning tools for DIY home improvement by creating an interactive, AI-powered platform that combines educational technology with real-world applications. Inspired by methods like project-based learning and adaptive feedback, MKRHome offers a scalable, user-friendly solution for homeowners.

With step-by-step tutorials, personalized AI feedback, gamification, and mobile access, MKRHome helps users effectively engage with DIY projects. Real-time feedback from the AI assistant, Roger, supports users throughout their journey, while gamified features keep them motivated. The platform is accessible on both desktop and mobile devices, allowing users to learn anytime.

In conclusion, MKRHome not only fills a gap in the DIY learning market but also showcases how AI and multimedia can improve skill-based learning. As DIY learning grows, MKRHome is set to transform how people approach home improvement, building confidence and proficiency. Its innovative features make it a valuable tool for first-time homeowners and DIY enthusiasts.

7 REFERENCES

Bergman Jr., B. J., & McMullen, J. S. (2020). Entrepreneurs in the making: Six decisions for fostering entrepreneurship through maker spaces. *Business Horizons, 63*(6), 811-824. https://doi.org/10.1016/j.bushor.2020.07.004

Hassan, M. A., Habiba, U., Majeed, F., & Shoaib, M. (2021). Adaptive gamification in e-learning based on students' learning styles. *Interactive Learning Environments, 29*(4), 545-565. https://doi.org/10.1080/10494820.2019.1588745

Merriam, S. B., & Bierema, L. L. (2014). *Adult learning: Linking theory and practice*. Jossey-Bass.

Pliakos, K., Joo, S.-H., Park, J. Y., Cornillie, F., Vens, C., & Van den Noortgate, W. (2019). Integrating machine learning into item response theory for addressing the cold start problem in adaptive learning systems. *Computers & Education, 137*, 91-103. https://doi.org/10.1016/j.compedu.2019.04.009

Wisniewski, B., Zierer, K., & Hattie, J. (2020). The power of feedback revisited: A meta-analysis of educational feedback research. *Frontiers in Psychology, 10*, 3087. https://doi.org/10.3389/fpsyg.2019.03087

Zeybek, N., & Saygı, E. (2023). Gamification in Education: Why, Where, When, and How?—A Systematic Review. *Games and Culture, 19*(2), 237-264. https://doi.org/10.1177/15554120231158625