

ENHANCING USER EXPERIENCE THROUGH TECHNOLOGY: PRODUCT ENGINEERING INTERNSHIP UTILIZING FLUTTER, KOTLIN, AND AWS

AN INTERNSHIP REPORT

Submitted by

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Under the Guidance of

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in partial fulfillment of the requirements for the degree of

BACHELOR OF TECHNOLOGY
in
COMPUTER SCIENCE ENGINEERING



DEPARTMENT OF COMPUTING TECHNOLOGIES
COLLEGE OF ENGINEERING AND TECHNOLOGY
SRM INSTITUTE OF SCIENCE AND TECHNOLOGY
KATTANKULATHUR- 603 203

NOVEMBER 2024



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Internship offer letter



KUDDLE TECHNOLOGY PRIVATE LIMITED

www.kuddle.pet

Date: 16th July 2023

Dear Divyanshu Yadav,

We are pleased to offer you the position of **Product Engineer Intern** at Kuddle Technology Private Limited.

We feel confident that you will contribute your skills and experience to the growth of our organization.

The terms and conditions of the offer are as below:

1. Your joining date would be **1st September 2024**.
2. Your CTC will be **Rs. 40,000 (Rupees Forty Thousand only)**.
3. The above offer is subject to duly conducted reference checks and background verification.

We look forward to having you join Kuddle!

Sincerely,
Kuddle
Nikhil Bansal

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Author
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ABSTRACT

During my internship at Kuddle, I focused on enhancing mobile and web applications through innovative product engineering. My primary responsibilities included developing responsive, solution-oriented applications using Flutter for cross-platform mobile development, Kotlin for backend functionality, and Next.js for robust web interfaces. A significant aspect of my role involved leveraging AWS to optimize application performance and scalability, ensuring that our solutions could handle increased user demands efficiently. I collaborated closely with cross-functional teams to gather user requirements, ensuring that our development efforts aligned with business objectives and delivered a seamless user experience. In addition to technical development, I engaged in data management and analysis, utilizing tools like Excel for effective data formatting and reporting. I also contributed to project presentations, showcasing our progress and outcomes to stakeholders. This internship provided me with invaluable insights into how cloud technologies and automation can drive operational efficiency and improve problem-solving capabilities. By applying my technical skills in real-world scenarios, I enhanced my understanding of the software development life cycle and the importance of collaboration in delivering successful products.

TABLE OF CONTENTS

ABSTRACT		v
TABLE OF CONTENTS		vi
LIST OF FIGURES		vii
LIST OF TABLES		viii
ABBREVIATIONS		ix
CHAPTER NO.	TITLE	PAGE NO.
1	INTRODUCTION	1
	1.1 Company Background	1
	1.2 Role Description	2
	1.3 Problem Statement	3
2	PROJECT AND PRODUCT	4
	2.1 App Development	4
	2.2 Web Development	5
	2.3 Product Engineering	6
3	WORKFLOW AND ARCHITECTURE	7
	3.1 Workflow Process	7
	3.2 Business Objectives	9
	3.3 User Requirements	9
	3.4 Figma UI and UX	9
	3.5 Development	9
	3.6 Testing	10
	3.7 Deployment	10
4	TECHSTACK USED	11
	4.1 Flutter and Next JS	11
	4.2 Kotlin`	12
	4.3 AWS	13
5	SKILLS LEARNT	14
6	CONCLUSION	15
REFERENCES		16

LIST OF FIGURES

CHAPTER NO.	TITLE	PAGE NO.
1.1	Kuddle Logo	1
1.2	Product Engineering	2
2.1	App Development	4
2.2	Web Development	5
3.1	Workflow Process	8
4.1	Flutter Logo.	11
4.2	Next JS Logo	11
4.4	Kotlin KTOR Logo	12
4.5	AWS Logo	13

ABBREVIATIONS

AWS	Amazon Web Services
UI	User Interface
UX	User Experience
REST API	Representational State Transfer Application Programming Interface
SDLC	Software Development Life Cycle

CHAPTER 1

INTRODUCTION

1.1 Company Background

Kuddle is dedicated to transforming the pet parenting experience, making it more joyful and convenient for pet lovers everywhere. Our mission is to create a comprehensive platform that serves as a one-stop solution for all your pet-related needs, ensuring that both pets and their owners enjoy a seamless and fulfilling journey together.

Based in Bengaluru, we have launched an extensive range of doorstep services designed to cater to every aspect of pet care. Our offerings include professional grooming to keep your furry friends looking their best, reliable dog walking to ensure they get the exercise they need, training programs that promote good behavior and socialization, veterinary consulting for health concerns, and personalized nutrition planning to support your pet's well-being.

At Kuddle, we understand that pets are beloved family members, and our passionate team of pet lovers is dedicated to ensuring a safe and enjoyable experience for your furry friends. We take pride in our obsession with quality and ease, ensuring that every service we offer is tailored to fit seamlessly into your busy lifestyle. With our flexible scheduling options, you can arrange appointments at times that work best for you, eliminating the stress and hassle often associated with traditional pet care.

Our services are designed not only to meet the needs of pets but also to provide peace of mind to pet owners. We recognize that every pet is unique, which is why we customize our offerings to cater to individual requirements and preferences. Whether you need a quick grooming session, a reliable dog walker, expert training advice, or nutritional guidance, Kuddle is here to support you every step of the way.

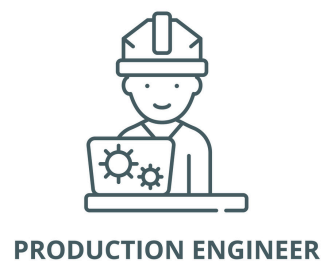


Fig. 1.1 Kuddle Logo

1.2 Role Description

As a Product Engineer Intern at Kuddle, you will play a vital role in enhancing our innovative platform for pet care services. This internship offers a unique opportunity to apply your theoretical knowledge to real-world challenges, contributing to the development and optimization of our product offerings. You will assist in the design, development, and implementation of features that enhance user experience and functionality, while collaborating with the engineering team to troubleshoot and resolve technical issues to ensure smooth operation. Analyzing user feedback and usage data will be essential in identifying trends and areas for improvement, helping to inform product decisions.

Additionally, you will work closely with cross-functional teams, including marketing, customer support, and operations, to understand user needs and align product features with business goals. Staying updated on emerging technologies and industry trends will enable you to bring innovative ideas to the team, enhancing our service offerings. Documentation will also be a key part of your responsibilities, as you help maintain comprehensive records of product specifications and user manuals to support both internal teams and customers. This internship is designed for individuals currently pursuing a degree in Engineering, Computer Science, or a related field, who possess strong analytical and problem-solving skills, and have a passion for pets and technology. By joining Kuddle, you will gain practical experience in a fast-paced, results-oriented environment, equipping you with the skills necessary to thrive in the tech industry while making a meaningful impact in the pet care sector.



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Fig. 1.2 Product Engineering

1.3 Problem Statement

In the rapidly evolving pet care industry, Kuddle faces challenges in ensuring operational efficiency and seamless access to information across its service offerings. Lengthy processes, disorganized workflows, and insufficient automation hinder timely decision-making and effective resource management. There is an increasing demand for streamlined digital solutions that can automate routine tasks, enhance data accessibility, and improve collaboration across various departments.

The current systems may lack the necessary usability and scalability, complicating integration with existing platforms. Additionally, these solutions need to facilitate real-time insights and effective data tracking to support informed decision-making.

The goal for the Product Engineer Intern is to contribute to the design and development of innovative web applications and automation tools that address these inefficiencies. By optimizing workflows and automating data management processes, the intern will help create intuitive interfaces that enhance user interaction. These solutions must align with Kuddle's business requirements, enabling the organization to scale its operations efficiently and improve communication across teams. Ultimately, the successful implementation of these digital solutions will transform operational tasks, drive greater business impact, and enhance Kuddle's ability to deliver exceptional pet care services.

CHAPTER 2

PROJECT AND PRODUCT

2.1 App Development

App development using Flutter focuses on creating high-performance, visually appealing mobile applications for both iOS and Android platforms from a single codebase. Flutter, an open-source UI software development kit by Google, enables developers to build natively compiled applications using the Dart programming language. Its core strength lies in its rich set of pre-designed widgets, which allow for fast development and a customizable user interface that can adapt to various screen sizes and resolutions.

The app development process typically begins with defining clear business objectives and user requirements, similar to web development. Gathering user needs helps in determining the functional scope and features of the app. Flutter's hot reload feature facilitates rapid iteration during development, allowing developers to see changes in real time without restarting the application, which significantly speeds up the prototyping phase.

For UI design, Flutter's extensive library of widgets can be utilized to create interactive and responsive interfaces. Developers can also leverage tools like Figma to design app interfaces, ensuring that user experiences are visually appealing and intuitive. Once the design is finalized, coding can be done using Dart, with an emphasis on modular architecture to maintain flexibility and scalability.

Testing is a crucial phase in Flutter app development, involving both unit testing and integration testing to ensure that individual components work seamlessly together. After deployment, gathering user feedback is essential for identifying performance issues and aligning the app with evolving user needs and preferences. This ongoing feedback loop allows developers to make iterative improvements, ensuring the app remains relevant and effective in meeting user demands.

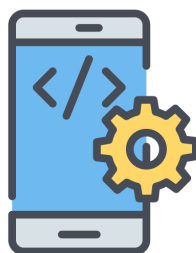


Fig. 2.1 App Development

2.2 Web Development

Web development using Next.js involves building server-rendered React applications that offer improved performance, SEO, and user experience. Next.js is a powerful framework that simplifies the development process by providing features such as static site generation (SSG), server-side rendering (SSR), and API routes, allowing developers to create dynamic and interactive web applications efficiently.

The development process typically starts with defining the project requirements and understanding the target audience. Next.js enables developers to structure their applications with a clear separation of concerns, organizing pages and components effectively. This modular approach makes it easier to manage the application as it scales.

One of the key benefits of Next.js is its ability to generate static pages at build time, which enhances loading speeds and reduces server load. For dynamic content, Next.js can render pages on the server when requested, ensuring that users receive the most up-to-date information. This flexibility is particularly advantageous for applications that require a mix of static and dynamic content.

Next.js also supports API routes, allowing developers to create serverless functions directly within the application. This feature simplifies backend development by enabling developers to handle data fetching and processing without the need for a separate server setup.

To enhance user experience, developers can take advantage of built-in routing and navigation features, ensuring smooth transitions between pages. Additionally, Next.js provides tools for optimizing images, managing global state, and implementing authentication.

Thorough testing and optimization are essential throughout the development cycle. Next.js includes various testing frameworks and tools to ensure that applications perform well across different devices and browsers. After deployment, continuous monitoring and user feedback are vital for refining the application and addressing any performance issues.



Fig. 2.1 Web Development

2.3 Product Engineering

Product engineering refers to the comprehensive process of designing, developing, and managing a product throughout its entire lifecycle, from initial concept to market launch and beyond. This multidisciplinary approach integrates various fields, including engineering, design, and business strategy, to create products that effectively meet customer needs and align with business goals. The process begins with concept development, where market needs are identified, and potential product ideas are generated through user research and market analysis.

Following this, detailed designs and prototypes are created, focusing on user experience, functionality, and aesthetics. In the development phase, engineers and developers work on building the product, ensuring it adheres to the established specifications and quality standards. Rigorous testing and validation are then conducted to confirm that the product performs as intended, including usability testing and compliance checks.

Once the product is ready, the launch phase involves preparing marketing strategies and distribution plans, as well as ensuring effective communication about the product's benefits to the target audience. After the launch, ongoing support and iteration are crucial; this includes gathering user feedback, analyzing performance data, and making necessary improvements to enhance the product's success and longevity. Overall, product engineering emphasizes collaboration among cross-functional teams to ensure that the final product not only meets technical requirements but also resonates with users and achieves desired business outcomes.

CHAPTER 3

WORKFLOW AND ARCHITECTURE

3.1 Workflow Process

During my internship as a Product Engineer, I had the opportunity to work with a diverse set of technologies, including Flutter, Next.js, AWS, and Kotlin, which significantly enriched my understanding of product development in a dynamic environment. This experience allowed me to contribute to various stages of product development, from conceptualization to deployment, particularly in the context of an e-commerce application.

In my role, I utilized Flutter to build cross-platform mobile applications, focusing on creating intuitive user interfaces that provided seamless user experiences. The workflow began with gathering business requirements and user needs through consultations with stakeholders. This foundational step was crucial in ensuring that the app aligned with market demands. I collaborated closely with the design team to create detailed prototypes and wireframes using tools like Figma, which helped visualize user flows and interactions before development began.

For the web component of the e-commerce platform, I leveraged Next.js to develop server-rendered web applications. This framework not only ensured optimal performance and SEO capabilities but also enabled easy integration with APIs for product listings, user authentication, and payment processing. The architecture was designed to support a microservices approach, where each service handled specific functionalities such as inventory management, user profiles, and order processing, ensuring scalability and maintainability.

My work with AWS involved deploying applications and managing cloud resources, utilizing services like AWS Lambda for serverless functions and Amazon S3 for storing user-uploaded content and product images. This cloud infrastructure enhanced the application's scalability and reliability, allowing us to handle varying loads during peak shopping times without compromising performance.

Additionally, I applied Kotlin for backend development, where I focused on integrating various services and ensuring efficient data handling. The backend architecture followed a RESTful API design, which facilitated communication between the frontend and backend components. I implemented robust authentication mechanisms, ensuring secure user access and data protection.

Throughout the projects, I adopted a structured approach that included thorough testing and quality assurance. This process involved unit testing, integration testing, and user acceptance testing to identify and resolve issues before the final deployment. I also employed CI/CD practices to

streamline the deployment process, ensuring that new features and updates could be rolled out smoothly and efficiently.

Collaboration with stakeholders was key throughout the development lifecycle. I actively sought feedback during various stages, from initial prototypes to pre-launch reviews, to refine the applications and ensure they met both user expectations and business objectives. This iterative process not only improved the quality of the final product but also fostered a culture of continuous improvement within the team.

Ultimately, my internship provided me with valuable hands-on experience in product engineering and a solid understanding of how to leverage modern technologies to create effective and user-friendly solutions. Working on the e-commerce application deepened my appreciation for the complexities of building scalable systems and the importance of aligning technical decisions with business goals. This experience has prepared me to contribute meaningfully to future projects in the tech industry.

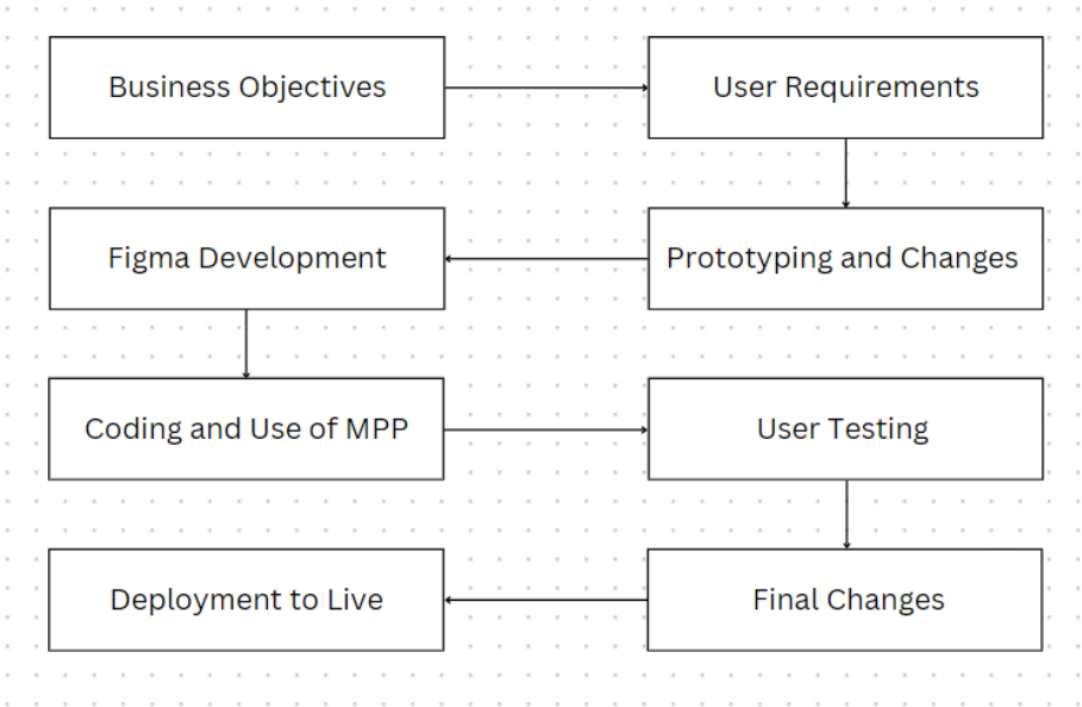


Fig. 3.1 Workflow Process

3.2 Business Objectives

The process begins by aligning with the organization's overarching goals, ensuring that development and project work contribute effectively to these aims. This phase focuses on identifying the key challenges or inefficiencies the business seeks to resolve, whether that involves improving operational efficiency, automating routine tasks, or enhancing data accessibility. These objectives guide the project's direction and establish a benchmark for measuring success, ensuring that the final deliverables provide tangible business value.

3.2 User Requirements

Once the business needs are identified, the next step is to gather comprehensive user requirements. This involves collaborating with end-users and stakeholders to understand their specific needs, pain points, and expectations through meetings, interviews, or surveys. During this phase, it's crucial to gain insights into how users interact with existing systems, identify necessary improvements, and determine the features they require. This process ensures that the final solution is tailored to the actual needs of its users, providing functionality that enhances their workflow.

3.3 Figma UI and UX

Figma is a versatile design tool that excels in both user interface (UI) and user experience (UX) design. Its cloud-based platform facilitates real-time collaboration, allowing teams to work together seamlessly. Designers can create scalable vector graphics, reusable components, and interactive prototypes, promoting efficiency and consistency. Figma supports user flow mapping and integrates feedback directly on designs, enabling quick iterations. Additionally, it emphasizes accessibility by allowing designers to test color contrast and text legibility.

3.4 Development

Development based on designs created in Figma involves translating visual prototypes into functional applications. Developers use Figma's design specifications to accurately implement styles, layouts, and components. The tool's collaborative features allow for easy communication between designers and developers, ensuring that any necessary adjustments can be made quickly. By utilizing Figma's assets, such as icons and color palettes, developers maintain consistency throughout the project, resulting in a seamless transition from design to development that enhances user experience and meets business objectives.

3.5 Testing

After the coding phase, user testing is essential to ensure the solution meets both functional and performance expectations. This stage involves thorough testing conducted by real users or testers, focusing on usability, feature functionality, and identifying errors. Most bugs, performance issues, or elements that do not align with user expectations are uncovered during this process. Based on the feedback collected, necessary changes are made to refine the application or system before its final deployment.

3.6 Deployment

The final step involves launching the solution into a live environment. At this stage, the web application or tool is prepared for deployment on a production server, making it accessible to users within the organization. Final configurations and security checks are completed to ensure the system operates smoothly. Following the implementation, post-launch monitoring is conducted to identify any unforeseen issues that may arise as users begin interacting with the new system. Support is also provided during this phase to assist users as they acclimate to the changes.

CHAPTER 4

TECHSTACK USED

4.1 Flutter and Next JS

Flutter and Next.js are powerful frameworks that serve distinct purposes in application development, each bringing unique advantages to the table. Flutter, developed by Google, is an open-source UI toolkit designed for building natively compiled applications across mobile, web, and desktop platforms from a single codebase. Utilizing the Dart programming language, Flutter offers a wide array of pre-designed widgets that empower developers to create visually stunning and highly customizable user interfaces. One of its key features, Hot Reload, allows developers to see real-time changes, significantly accelerating the development process. Additionally, Flutter's architecture ensures smooth animations and high performance by compiling directly to native code, making it an excellent choice for projects that require a seamless user experience across multiple platforms.

On the other hand, Next.js is a React-based framework that simplifies the development of server-rendered applications and static websites. It is particularly known for its focus on performance and user experience, offering features like Server-Side Rendering (SSR), which enhances page load times and improves SEO by rendering content on the server before delivering it to the client. Next.js also supports Static Site Generation (SSG), allowing developers to generate static pages at build time, which ensures rapid content delivery. Additionally, the framework includes built-in support for creating API routes, facilitating the integration of backend functionality directly within applications.



Fig. 4.1 Flutter Logo



Fig. 4.2 Next JS Logo

4.2 Kotlin and KTOR

Kotlin and Ktor are powerful tools for modern application development, especially in the realm of server-side programming. Kotlin, developed by JetBrains, is a statically typed programming language renowned for its concise and expressive syntax, which enhances developer productivity. It incorporates features like null safety to prevent common runtime errors and is fully interoperable with Java, allowing teams to integrate Kotlin into existing Java codebases seamlessly. This flexibility makes it an excellent choice for projects seeking to modernize their technology stack without extensive rewrites.

Ktor, also created by JetBrains, is an asynchronous web framework designed specifically for building high-performance applications and microservices in Kotlin. Its lightweight, modular architecture enables developers to construct applications tailored to their needs, choosing only the necessary components such as routing, authentication, and serialization. Ktor supports both server-side and client-side development, making it versatile for various types of projects. With its ability to handle a large number of concurrent requests efficiently, Ktor ensures that applications remain responsive and scalable and mostly used for creating REST APIs.

Together, Kotlin and Ktor provide a robust platform for building efficient and maintainable web applications. The combination of Kotlin's expressive language features and Ktor's flexible framework empowers developers to create high-quality software that meets modern performance demands while maintaining clean, readable code. This synergy has made Kotlin and Ktor a popular choice among developers looking to leverage contemporary technologies in their projects, from startups to large enterprises.



Fig. 4.3 Kotlin KTOR Logo

4.3 AWS

Amazon Web Services (AWS) is a leading cloud computing platform that offers a comprehensive suite of services to help businesses scale and innovate. Launched in 2006, AWS provides solutions across various domains, including computing power, storage, networking, databases, machine learning, and analytics. Its scalability allows organizations to adjust resources seamlessly based on demand, while the diverse service portfolio—such as Amazon EC2 for computing and Amazon S3 for storage—caters to a wide range of applications. With a global infrastructure of data centers, AWS ensures low-latency access and high availability. Its pay-as-you-go pricing model helps organizations manage costs effectively, and robust security measures enhance data protection and compliance with industry standards. Overall, AWS empowers businesses of all sizes to leverage flexible cloud solutions, enabling them to focus on innovation and growth.



Fig. 4.4 AWS Logo

CHAPTER 4

SKILLS LEARNT

During my internship as a product engineer, I gained a wealth of valuable skills and experiences that have shaped my understanding of the field. I learned specific programming languages and technologies relevant to product development, such as Flutter and Kotlin, and gained insight into the entire product lifecycle, from design to coding, testing, and deployment. Collaborating with cross-functional teams helped me improve my communication skills and taught me the importance of user-centered design. I faced real-world challenges that honed my problem-solving abilities and learned about Agile methodologies, emphasizing iterative development and feedback. Participating in testing processes allowed me to understand the significance of quality assurance, while analyzing user data provided insights into product performance. Additionally, I engaged in documenting processes and creating reports, which enhanced my ability to convey technical information clearly. Overall, this internship has not only equipped me with a well-rounded skill set but also helped me build professional relationships that will be invaluable for my future career in technology and product development.

CHAPTER 5

CONCLUSION

My internship as a product engineer at Kuddle has been a transformative experience, allowing me to bridge the gap between theoretical knowledge and practical application in the tech industry. Throughout my time, I developed a deep understanding of various technologies, including Flutter, Next.js, Kotlin, and AWS, and gained firsthand experience in the entire product development lifecycle. Collaborating with cross-functional teams enriched my communication skills and reinforced the importance of user-centered design, while tackling real-world challenges enhanced my problem-solving abilities.

The structured workflow I engaged in—from gathering business requirements and user feedback to implementing testing protocols and ensuring seamless deployment—provided me with a comprehensive view of how effective product engineering contributes to organizational goals. This internship not only strengthened my technical capabilities but also emphasized the value of agility and adaptability in a fast-paced environment.

As I move forward in my career, the skills and insights I gained at Kuddle will undoubtedly serve as a solid foundation for my future endeavors in technology and product development. I am excited to leverage this experience to make meaningful contributions to innovative projects and continue growing as a professional in this dynamic field.

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