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DEVELOPING A TIME-MANAGEMENT APPLICATION FOR STUDENTS

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A capstone project submitted for Graduation with University Honors

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ABSTRACT

Managing time effectively to complete assignments while balancing studying and daily life can be a challenge for students pursuing higher education. To address this, I have developed a time-management application specifically tailored to the needs of students. The application, named *Starting Today*, is designed to select and assign homework tasks to students based on an adjustable algorithm that considers the due date, priority, and difficulty of each task. The aim of this application is to reduce procrastination and promote better time management skills among students. This project encompasses the creation and implementation of the application.

During the development process, I used Flutter, a cross-platform framework for creating user-friendly interfaces for both desktop and mobile devices. *Starting Today* includes features such as a customizable task list, a work-hour estimator, a modifiable calendar, and the capacity to synchronize with assignments on the widely-used learning management system, Canvas, as well as events on Google Calendar via APIs. The groundwork for this project entailed an exhaustive analysis of existing applications and academic literature in the realm of educational technology. During the implementation phase, I conducted tests on various versions of the application across different systems, such as web platforms and Android mobile devices. These tests allowed me to make necessary modifications based on my findings and the capabilities offered by Flutter.

This project holds promising potential for significant contributions to the domain of technology-aided learning. By providing an effective time-management tool, I aim to alleviate student stress and confusion, paving the way for enhanced educational outcomes.

ACKNOWLEDGMENT

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Introduction

The increasing prevalence of academic stress, primarily driven by homework and grade-related concerns (Beiter et al., 2015; Wuthrich et al., 2020), poses a significant challenge, particularly for first-time college students struggling with self-regulation. Such students are prone to procrastination, exacerbating their stress levels (Wang et al., 2021). However, the adoption of effective time management strategies can mitigate pressure and boost academic performance. Students who perceive control over their time often experience enhanced mental health and educational outcomes (Macan et al., 1990). With the aim of helping students harness these benefits, this project proposes a user-friendly application designed to improve students' time management. The objective is to alleviate the challenges students face in organizing their workload and adhering to deadlines.

Background

The development of *Starting Today* is grounded in an extensive review of existing literature and research. The problem of academic stress among students is well-documented, with numerous studies highlighting its detrimental effects on mental health and academic performance (Beiter et al., 2015; Wuthrich et al., 2020). Research indicates that students often struggle with effective time management, leading to increased pressure and anxiety levels (Beiter et al., 2015). Moreover, poor time management skills are linked to lower academic achievement and a higher tendency towards procrastination (Britton & Tesser, 1991). There is a consensus that effective time management is a crucial element in reducing these factors and improving educational outcomes (Macan et al., 1990). This underscores the urgent need for interventions that help students develop sound time management habits.

Mobile applications have become increasingly common in educational settings (Nidal, 2020); however, existing time-management applications often fall short in fully addressing students' needs. Many of these applications offer generic solutions that do not cater to the specific challenges students encounter when managing their academic workload. Additionally, most applications lack features that promote active engagement and accountability, such as personalized task prioritization and integration with academic calendars.

Considering these limitations, there is a pressing need for a comprehensive time-management solution tailored to students' unique needs. This project aims to create an application that not only aids students in better task organization but also fosters a proactive approach to time management. This is anticipated to result in improved educational outcomes and a decrease in academic stress.

Development Process

Starting Today depended on the use of various tools and technologies to guarantee its functionality and cross-platform accessibility. Initially, Qt was the chosen platform for development. However, after facing substantial hurdles with its setup and development environment, and despite more than a month spent trying to resolve them, it became clear that continuing with Qt was not feasible. With the approval of my mentor, I transitioned to using Flutter, which provided a more intuitive and efficient development environment.

Flutter and FlutterFlow were the primary technologies employed, facilitating the development across different platforms. Flutter, a Google-developed open-source UI software development kit, was crucial in creating high-quality native interfaces for mobile, web, and

desktop platforms from a single codebase. FlutterFlow, a visual builder for Flutter applications, accelerated the prototyping and development of the application's user interface components.

User Authentication & Storage

- Firebase was the cornerstone for authentication and storage within the application. The integration of Firebase was motivated by its reliable authentication capabilities and real-time database functionality, aligning perfectly with the project's requirements. Firebase Authentication offered secure user authentication services, enabling users to sign in using their email/password combinations or Google accounts. Concurrently, Cloud Firestore provided a scalable and flexible NoSQL database solution for storing user data and task information.

Third Party Integration

- The application leveraged the Google Calendar API as well as the Canvas LMS API for integration with students' existing calendars. This allowed users to synchronize their academic events and assignments directly within *Starting Today*, offering a comprehensive view of their tasks and commitments. The decision to incorporate the Google Calendar API was influenced by its widespread usage and reliability, and including the Canvas LMS API ensured superior user experience and augmented the application's utility for managing academic schedules.

In summary, the choice of these tools and technologies was steered by their ability to facilitate cross-platform development, ensure secure authentication, provide efficient data storage, and smoothly integrate with external services (Litayem et al., 2015).

Features of the Application

Figure 1: Screenshots of the application during typical use. From left to right: log-in screen, homepage, generated task page

User Authentication

- The application offers secure user authentication through Firebase Authentication, allowing users to sign in using their email/password combination or their Google accounts.

Task Generation

- The app employs a customizable task generation feature, allowing users to generate random tasks based on adjustable criteria such as due date, priority, and difficulty.

- Tasks are randomly selected to encourage users to focus on assignments in a structured manner (30 minute to 1-hour chunks), promoting productivity and time management skills (Pan, 2015). The task generator follows the idea that frequent switching between subjects improves learning and retention (Pan, 2015; Szpiro and Sarit, 2014)
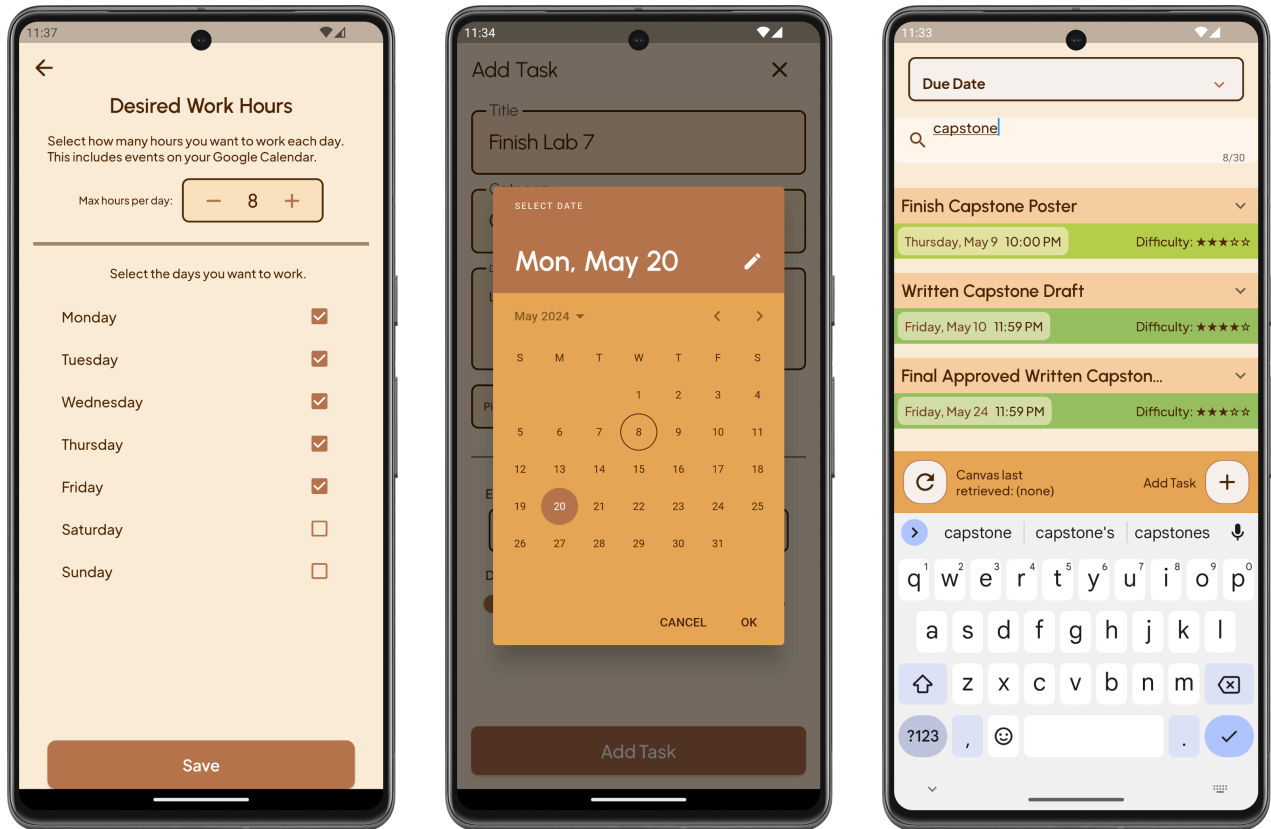

Figure 2: Screenshots of the application during interaction with the task management pages

Task Management

- Users can efficiently manage their tasks through a dynamic task list, allowing sorting by due date, title, or category, and includes a search bar for quick access to specific tasks.

Effective task management is crucial for organizing workload and prioritizing assignments, facilitating better time management and reducing stress.

- The customizable task list also serves to eliminate the risk of lost or forgotten assignments (Stormont-Spurgin, 1997).

Calendar Integration

- Integration with Google Calendar and Canvas LMS enables users to sync their academic events and assignments directly within the app. Calendar integration provides a comprehensive overview of academic schedules, enabling effective time planning and resource allocation, thus promoting efficient time management and productivity.

Settings Customization

- Users can personalize their settings, including desired work hours and days of the week for work, and toggle night mode for optimal viewing comfort. Settings customization empowers users to tailor the app to their individual preferences and habits, improving user experience and satisfaction, thus promoting a personalized approach to time management.

Additional Features:

- Homepage & Task Generation: Provides an overview of daily tasks, streaks, and progress bars, allowing users to randomly pick tasks to work on for a selectable time, promoting task prioritization and productivity.
- Generated Task Page: Displays a countdown timer and task information, allowing users to generate another task, mark the task as done, or complete and delete it, fostering task completion and progress tracking.

- Calendar Page: Utilizes Google Calendar API to display events, integrates a complex scheduling algorithm for task distribution, and enables users to add, edit, and delete events, facilitating effective time planning and task scheduling.

- Task List Page: Offers sorting options, search functionality, and dynamic task lists, with color-coded categories and Canvas integration for task retrieval and addition, ensuring efficient organization and management of tasks.

Testing and Iteration

The testing and iteration phase of the project presented several challenges, particularly in integrating various APIs and mastering the intricacies of Flutter and FlutterFlow. Challenges encountered included the integration of APIs, mastering Flutter/FlutterFlow for cross-platform development, and fine-tuning the task distribution algorithm.

1. Platform and Device Testing:

    - *Starting Today* was tested on multiple platforms, including Android and web, to ensure consistent performance across different environments.

    - Testing was conducted on a range of devices with varying screen sizes and resolutions to identify and address any issues related to responsiveness and layout.

2. Challenges Encountered:

    - Integration of APIs: One of the primary challenges encountered during testing was integrating external APIs, such as Canvas, Google Calendar, and Firebase/Firestore. Ensuring smooth communication between the application and these services required extensive troubleshooting and debugging.

- User Interface Design: Mastering the formatting and widget functionalities in Flutter/FlutterFlow posed significant challenges. It took time to understand the nuances of widget placement, styling, and responsiveness to create a visually appealing and user-friendly interface.

- Task Distribution Algorithm: Implementing the task distribution algorithm for scheduling tasks across different days proved to be complex. It required careful consideration of factors such as task priority, due dates, and available work hours. Balancing these variables to generate an optimal task distribution was a challenging and iterative process.

3. Iterative Approach:

- To address the challenges encountered during testing, an iterative approach was adopted. Each issue identified during testing was systematically addressed through modification and refinement of the application.

- For API integration, thorough testing and troubleshooting were performed to ensure accurate data retrieval and synchronization. This involved revising the code to handle edge cases and unexpected responses from the APIs.

- User interface design was iteratively refined based on user feedback and usability testing. Adjustments were made to improve the layout, navigation, and overall user experience of the application.

- The task distribution algorithm underwent multiple iterations to fine-tune its functionality and accuracy. Feedback from testing sessions was used to adjust the algorithm parameters and optimize task scheduling for different scenarios.

In summary, the testing and iteration process played a crucial role in refining the application and addressing challenges encountered during development. Through continuous testing and refinement, the application was improved to offer the best user experience across various platforms and devices.

Potential Impact

The time-management application developed in this project, *Starting Today*, holds promise for significantly impacting student time management and academic success. By equipping students with tools to organize tasks, set reminders, and monitor progress, the application empowers them to manage their time more effectively, potentially reducing procrastination and enhancing productivity (Britton & Tesser, 1991).

Moreover, the application's comprehensive approach fills a critical gap in educational technology, offering features specifically tailored to the unique challenges students face in balancing their academic workload (Stormont-Spurgin, 1997). Unlike existing tools, which may lack functionality or fail to address the nuanced needs of students, this application integrates task generation, management, and calendar integration functionalities to provide a holistic solution.

This comprehensive approach has the potential to revolutionize the way students approach time management, encouraging proactive practices and fostering a greater sense of ownership over academic responsibilities. By optimizing task distribution and smoothly integrating with external platforms, the application encourages students to take control of their time, potentially leading to improved academic performance and overall satisfaction with the learning process. In essence, the application represents a significant step forward in addressing

the time management needs of students and has the potential to reshape the landscape of educational technology by offering a more effective and user-centric solution.

Key Findings and Outcomes:

Throughout the course of the project, several key findings and outcomes emerged, underscoring the significance and potential impact of the time-management application. The successful development and implementation of *Starting Today* highlighted its effectiveness in addressing the time management needs of students. Key features such as task generation, management, and calendar integration proved to be instrumental in helping students organize their workload and prioritize tasks effectively. Feedback from testing sessions indicated a positive response to the application's user interface and functionalities, suggesting its potential to improve student time management and academic success.

The project can be considered a success in achieving its objectives of developing a comprehensive time-management application for students. However, the development process also presented several challenges and valuable lessons. The complexities associated with integrating external APIs, mastering Flutter/FlutterFlow for cross-platform development, and fine-tuning the task distribution algorithm underscored the importance of perseverance and adaptability in overcoming obstacles. Additionally, the iterative nature of the development process emphasized the significance of user feedback and continuous refinement in creating a user-centric application (Trujillo, 2021).

Looking ahead, there are several potential updates and enhancements that could further enhance the application's functionality and utility. These include:

- Enhanced API Integration: Continuously improving the integration with external APIs such as Canvas, Google Calendar, and Firebase/Firestore to ensure problem-free communication and data synchronization.

- Advanced Task Management Features: Introducing additional features such as task prioritization, progress tracking, and collaborative task management to further streamline the organization of tasks.

- Personalization and Customization: Offering users more options for personalization and customization, such as customizable themes, characters, task categories, and notification preferences, to cater to individual preferences and habits.

- Artificial Intelligence Integration: Exploring the integration of artificial intelligence or machine learning technologies to provide intelligent task recommendations, predictive scheduling, and adaptive time management strategies tailored to individual user behavior and preferences.

In conclusion, while the project has achieved significant success in developing a time-management application for students, there is ample room for further growth. By incorporating user feedback and embracing emerging technologies, *Starting Today* can continue to evolve and adapt to meet the ever-changing needs of students in effectively managing their time and achieving academic success.

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