iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 **Issue:** V **Month of publication:** May 2026

DOI: https://doi.org/10.22214/ijraset.2026.82535

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue V May 2026- Available at www.ijraset.com

AI Based Smart Business Analytics System

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Abstract: In the era of digital overload, balancing productivity with mental and physical well-being has become a critical challenge. Traditional task management applications often lack personalization and emotional intelligence, leading to user disengagement and digital fatigue. To address this, NoteGiene is introduced as an AI-powered task management system that seamlessly integrates productivity tools with digital well-being strategies. The application employs habit-learning algorithms for automatic task regeneration, adapting dynamically to individual behavior patterns. It leverages Natural Language Generation (NLG) to deliver personalized, motivational notifications and incorporates sentiment analysis to provide emotionally aware interactions. Furthermore, NoteGiene utilizes collaborative filtering and clustering techniques to recommend tailored wellness tips, promoting holistic self-care. By combining artificial intelligence with task organization and emotional support, NoteGiene presents a novel solution for enhancing user motivation, engagement, and long-term well-being in a digitally driven lifestyle.
Keywords: AI-powered task management, digital well-being, habit-learning algorithms, task regeneration, BERT-based sentiment analysis, natural language generation (NLG), context-aware notifications, collaborative filtering, k-means clustering, burnout detection, reinforcement learning, Flutter, Firebase, Gemini API, personalized wellness tips, productivity enhancement, emotional intelligence, adaptive scheduling, mobile application, user behavior analytics.

I. INTRODUCTION

A. AI-POWERED TASK MANAGEMENT SYSTEM

The integration of Artificial Intelligence (AI) into task management systems marks a transformative shift in how users interact with productivity tools by significantly enhancing automation, personalization, and emotional intelligence. Traditional task management systems have long focused on organizing and tracking tasks through static to-do lists, calendars, and basic reminders, but these features alone are insufficient in addressing the nuanced behavioural patterns and emotional states that influence productivity. NoteGiene, an AI-powered task management system, addresses this gap by embedding intelligent decision-making and well-being strategies into the core of its functionality. Leveraging technologies such as Recurrent Neural Networks (RNNs), Natural Language Processing (NLP), and reinforcement learning, NoteGiene not only manages tasks but adapts dynamically to a user's behavior, energy levels, and emotional needs.

Unlike conventional tools that treat productivity as a linear, context-free process, NoteGiene incorporates real-time insights into how, when, and why users complete—or avoid—certain tasks. The system uses RNNs to detect and learn from sequential patterns in user behavior, identifying trends such as procrastination triggers or periods of peak productivity. Through NLP, NoteGiene enables users to interact more naturally, creating or updating tasks through conversational language and interpreting sentiment to understand the user's current state of mind. Reinforcement learning further tailors the experience by rewarding behaviors that align with positive outcomes, such as task completion during optimal focus hours or regular breaks that reduce cognitive fatigue.

One of the key differentiators of NoteGiene is its focus on digital well-being alongside productivity. Users often face burnout, anxiety, and digital fatigue due to over-scheduling and the pressure of constant task tracking; NoteGiene counters this with features like AI-generated humorous reminders, wellness nudges, and smart break suggestions that align with detected stress patterns or overwork indicators. For example, if a user logs frequent tasks late at night or shows signs of prolonged app usage without breaks, the system may suggest a short meditation, physical activity, or even temporarily mute notifications. Unlike most wellness apps that operate independently from productivity tools, NoteGiene creates a cohesive experience by merging wellness directly with task execution, encouraging a more balanced lifestyle without forcing users to switch between applications. Its modular architecture allows users to customize features based on their personal and professional goals, and its self-learning models continuously refine suggestions based on past interactions and feedback.

1) TRADITIONAL TASK MANAGEMENT SYSTEMS

Traditional task management systems have long served as essential tools for individuals and teams striving to stay organized, meet deadlines, and enhance productivity. These systems, which typically include features like task lists, reminders, scheduling options, calendar integrations, and basic prioritization mechanisms, are fundamentally built around linear, static methods of tracking work.

Popular platforms such as Microsoft To Do, Trello, Asana, and Todoist exemplify this paradigm, offering clean interfaces for listing tasks, setting due dates, and categorizing responsibilities. While these tools have certainly helped users improve organizational discipline and reduce cognitive load by offloading memory-based task tracking, they inherently operate under a one-size-fits-all approach.

Traditional systems assume a uniform model of productivity that doesn't account for the psychological, emotional, or contextual variability experienced by users on a day-to-day basis. There is little to no adaptation based on individual behavior, mood, energy levels, or mental state, making these tools less effective for users struggling with productivity anxiety, decision fatigue, or burnout. They also lack emotional intelligence or wellness insights, meaning users receive the same type of notifications or reminders regardless of their current cognitive or emotional bandwidth. Furthermore, most traditional systems provide limited feedback beyond simple metrics like task completion rates or overdue items, which can lead to a rigid sense of performance evaluation without constructive support.

In high-pressure environments, this can exacerbate stress or guilt associated with unfinished tasks. Another limitation is that conventional task managers often lack interactivity or smart automation, requiring users to manually update statuses, reschedule items, and reorganize workflows—adding administrative overhead that further detracts from productivity. These tools typically do not offer contextual understanding; for instance, they cannot adjust task suggestions based on location, time of day, historical work patterns, or emotional cues. While integrations with calendars or messaging platforms have added some level of convenience, the core user experience remains passive and reactive rather than proactive and intelligent. Moreover, these systems operate in isolation from digital wellness tools, creating a fragmented ecosystem where productivity is divorced from personal health.

2) DIGITAL WELL-BEING CHALLENGES

Digital well-being challenges have emerged as a significant concern in an age where technology is deeply embedded in everyday life, influencing how people work, communicate, and manage their responsibilities. As digital tools have become more sophisticated and pervasive, the psychological and physical impact of constant connectivity has grown, often leading to adverse outcomes such as digital fatigue, attention fragmentation, anxiety, and burnout. One of the central challenges in digital well-being lies in the over-reliance on screens and productivity technologies without balancing them with mental and emotional health considerations.

Users are frequently exposed to a barrage of notifications, urgent messages, task deadlines, and performance metrics—all of which create a hyper-productive environment that can overwhelm cognitive resources. This overload reduces users' ability to focus deeply, encourages multitasking, and fosters an always-on mentality that disrupts natural work-life boundaries. As a result, even while task management apps help organize work, they can contribute to productivity anxiety and feelings of inadequacy when tasks pile up or goals are unmet. Compounding the issue is the lack of emotional awareness in most productivity tools. These applications are often indifferent to a user's stress levels, mood changes, or energy fluctuations, treating all users and situations uniformly, regardless of their psychological state.

Moreover, most systems lack integration with health and wellness applications, leading to fragmented efforts to maintain well-being. Users may need to toggle between multiple apps—one for managing tasks, another for tracking mindfulness, and yet another for physical activity or sleep—without any intelligent communication or shared insights across platforms. This disconnection not only diminishes the effectiveness of each tool but also makes holistic self-care cumbersome and unsustainable. Another challenge in digital well-being is screen addiction, especially among individuals who depend heavily on digital platforms for both work and leisure. The design of many apps encourages prolonged engagement through addictive features, gamification, or constant feedback loops, which can further degrade focus, sleep quality, and emotional regulation. To effectively support digital well-being, technology must move beyond surface-level metrics and adopt a more empathetic, adaptive approach that contextualizes task load, emotional state, behavioral history, and personal goals.

3) AI-DRIVEN SOLUTIONS

AI-driven solutions have become fundamental in revolutionizing task management systems, bringing intelligence, adaptability, and emotional awareness to the forefront. In the context of NoteGiene, AI technologies such as Recurrent Neural Networks (RNNs), sentiment analysis, and k-means clustering serve as the backbone for providing personalized, responsive, and emotionally intelligent task management. These AI components enable the system to automatically adjust and regenerate tasks based on the user's evolving behavior, ensuring that task management aligns with their current mental and emotional state.

RNNs, for instance, are well-suited for understanding sequential user behavior over time. They allow NoteGiene to learn from past interactions, such as which tasks tend to be delayed or completed more efficiently during specific times of day, or which tasks users struggle with the most.

This continuous learning helps the system offer tailored suggestions, such as rescheduling tasks at more optimal times or suggesting breaks when the user is overloading themselves. Sentiment analysis further enhances NoteGiene's AI capabilities by assessing the user's mood through text inputs, voice commands, or even their patterns of task completion. If a user expresses frustration or anxiety about a task, the system can adjust notifications, provide words of encouragement, or recommend wellness activities such as short relaxation exercises.

K-means clustering, another key AI tool, helps analyze user behavior and group tasks based on patterns such as time of day, task complexity, and the user's historical engagement. This clustering allows the system to categorize tasks into different types or priority levels, offering users a more organized and less overwhelming task list. By combining these advanced AI techniques, NoteGiene not only manages tasks but also enhances the user's overall digital well-being. The system's ability to deliver emotionally intelligent notifications, personalized wellness recommendations, and adaptive scheduling ensures that productivity and well-being coexist seamlessly in the digital space.

B. DEEP LEARNING IN TASK MANAGEMENT

Deep learning has become a transformative force in the domain of task management, offering unparalleled advancements in how systems learn from user behavior and adapt to individual needs. Unlike traditional machine learning techniques that often rely on handcrafted features and fixed models, deep learning approaches—particularly Recurrent Neural Networks (RNNs) and transformer-based architectures—excel in understanding sequential data and capturing complex patterns over time. In task management systems like NoteGiene, these deep learning models enable highly personalized experiences, offering real-time insights into how users interact with tasks, schedules, and productivity habits.

RNNs are particularly well-suited for time-series data, such as task completion patterns, work hours, and deadlines. They can track a user's task performance over extended periods, identifying fluctuations in productivity and adapting recommendations based on these insights. The adaptability of deep learning models is another key advantage. As users interact with the system and provide more data, the models continuously update, improving their understanding of the user's needs. Unlike traditional systems, which rely on predefined rules and static configurations, deep learning models grow and refine themselves with more data, allowing for a high level of personalization.

Transformer-based architectures further elevate deep learning in task management by handling complex relationships and dependencies between tasks. These architectures, originally designed for natural language processing (NLP), are well-equipped to manage sequential data in a way that captures not only individual tasks but also their contextual relationships. Deep learning's scalability is another critical advantage in task management. These models can efficiently handle large datasets, making them ideal for applications that involve complex workflows or extensive user data. By continually learning and evolving, deep learning empowers users to achieve more while maintaining balance and well-being in a rapidly digitalized world.

1) ADVANTAGES OF DEEP LEARNING

Deep learning has become a game-changer in the field of task management due to its ability to provide personalized, adaptable, and scalable solutions. These advantages allow task management systems, like NoteGiene, to dynamically adjust to individual users, enhancing both productivity and overall digital well-being. The key advantages of deep learning—adaptability, personalization, and scalability—are what make it particularly effective for modern, intelligent task management systems.

Adaptability is one of the most important strengths of deep learning. Unlike traditional rule-based systems, deep learning models have the ability to continuously learn and evolve based on user behavior. In a task management context, this means that deep learning systems can track a user's activity over time, identifying changing work patterns, task completion rates, and personal preferences. The more a user interacts with the system, the better it becomes at predicting their needs and adapting its functionality accordingly.

Personalization is another standout feature of deep learning. Unlike static task management systems, deep learning algorithms excel at tailoring content, recommendations, and notifications to suit the unique patterns of each user. By analyzing historical data, such as which tasks a user completes most efficiently at certain times of day or how they interact with their task lists, deep learning systems can offer suggestions that are highly specific to the individual.

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Finally, scalability is a major advantage that deep learning brings to task management systems. Traditional systems may struggle when dealing with large datasets or a high volume of tasks, but deep learning models excel at handling these challenges. Whether dealing with individual users or large teams, deep learning algorithms are designed to process vast amounts of data without sacrificing performance. Together, these advantages—adaptability, personalization, and scalability—ensure that deep learning is at the heart of modern task management systems like NoteGiene.

2) KEY DEEP LEARNING MODELS

Deep learning models have revolutionized task management systems by providing advanced capabilities such as context awareness, personalized recommendations, and behavior prediction. Various deep learning models—each with distinct strengths—are leveraged in task management systems to enhance productivity, improve task organization, and promote digital well-being. The following table summarizes key deep learning models and their specific applications in task management systems like NoteGiene:

Model	Application
Recurrent Neural Networks (RNNs)	Task regeneration, habit learning
Transformer Models (BERT, GPT)	Natural Language Generation (NLG) for motivational content
K-means Clustering	User behavior categorization for wellness tips

- Recurrent Neural Networks (RNNs) are particularly well-suited for task management systems because they excel in handling sequential data. Since task completion, productivity patterns, and user behavior often follow time-dependent trends, RNNs can track these sequences to predict and regenerate tasks. RNNs can learn user behavior over time, identifying habits and trends that help the system adapt to each user's unique needs, making them a critical model for personalized task management.
- Transformer Models (BERT, GPT) are revolutionizing Natural Language Processing (NLP) tasks. In task management systems, these models are used for Natural Language Generation (NLG), where they can create contextually relevant motivational content, such as encouraging messages, reminders, or feedback tailored to the user's preferences. Transformer models like BERT and GPT excel in understanding context and generating human-like text, which is vital in offering personalized and emotionally intelligent notifications.
- K-means Clustering is an unsupervised learning algorithm that groups similar data points into clusters. In task management, K-means clustering can categorize user behavior patterns, allowing the system to offer tailored wellness recommendations. Users who exhibit patterns of overwork might be clustered into one group, while those who frequently take breaks may form another. K-means clustering thus helps the system understand the diverse behavioral profiles of users, ensuring that wellness tips are relevant and effective.

C. RECURRENT NEURAL NETWORKS (RNNs)

Recurrent Neural Networks (RNNs) are a class of artificial neural networks designed specifically for processing sequential data. Unlike traditional feedforward neural networks, RNNs have the ability to maintain a memory of previous inputs, making them ideal for tasks involving time-series data or any situation where the order of information is crucial. In task management systems like NoteGiene, RNNs are particularly effective because they can model the sequences of tasks, habits, and user behaviors over time, providing personalized and contextually relevant recommendations.

In task management, RNNs are used to understand and predict task completion patterns, identify habits, and dynamically adjust task lists. For example, if a user typically completes their work tasks in the morning but struggles in the afternoon, the RNN can predict that the user is likely to delay certain tasks in the later part of the day and can reschedule them to more suitable time slots. The strength of RNNs lies in their ability to handle long-term dependencies, where the relationship between tasks or behaviors extends over time. In systems like NoteGiene, this means that RNNs can learn from extensive user data, improving their predictions and task recommendations with every interaction.

1) *LSTM ARCHITECTURE*

Long Short-Term Memory (LSTM) is a specific type of Recurrent Neural Network (RNN) architecture designed to address the issue of vanishing gradients, which is a common problem in traditional RNNs when learning long-term dependencies. LSTMs are particularly effective in tasks where information needs to be remembered over long periods, making them ideal for sequential data like task management and user behavior prediction. The architecture of LSTM consists of several gates—forget, input, and output—which allow the network to manage and retain information efficiently over time.

- Forget Gate: The forget gate is responsible for deciding which information should be discarded from the network's memory. It looks at the current input and the previous hidden state to determine which pieces of information are irrelevant or no longer useful. In a task management context, the forget gate could discard outdated tasks or unnecessary details, focusing the system's attention on more relevant information.
- Input Gate: The input gate controls what new information should be added to the memory. It updates the cell state with current data, such as user preferences, recent tasks, or new interactions. This gate allows the system to incorporate new insights, ensuring that the task management system remains up to date with the user's current needs and behaviors.
- Output Gate: The output gate determines what the next hidden state should be based on the current input and the memory cell state. This gate helps the system generate the next task or prediction by considering both the stored information and the most recent input. For task management, this could involve predicting the next tasks to prioritize or suggesting motivational cues based on user mood.

LSTM architecture allows task management systems like NoteGiene to perform long-term dependency learning, ensuring that task regeneration and mood-based notifications are informed by both immediate and historical user data. By balancing what to remember and what to forget, LSTMs enhance the system's ability to offer intelligent, context-aware recommendations and improve overall user experience.

2) *Applications in NoteGiene*

The applications of deep learning models, particularly Recurrent Neural Networks (RNNs) and Long Short-Term Memory (LSTM) architectures, in NoteGiene extend beyond simple task management. By harnessing the power of these models, NoteGiene becomes a dynamic, responsive, and highly personalized task management system. The core applications of these models within NoteGiene include task regeneration and sentiment analysis, both of which enhance user experience by adapting to the user's behavior and emotional state.

Task Regeneration is a vital feature in NoteGiene, enabling the system to predict, reschedule, and dynamically adjust tasks based on historical data and user preferences. Traditional task management systems often present a static list of tasks with fixed deadlines and schedules. In contrast, NoteGiene uses RNNs to track how tasks are completed, identifying patterns in the user's productivity. This ensures that users are not overwhelmed with unrealistic task loads at the wrong times. The system's ability to regenerate tasks based on user history makes it more flexible and adaptive to the user's evolving needs, reducing the stress and frustration often associated with rigid task schedules.

Another critical application of deep learning in NoteGiene is Sentiment Analysis. Using techniques such as Natural Language Processing (NLP) and sentiment detection models, NoteGiene can analyze the mood or emotional state of users based on their interactions with the app. Sentiment analysis allows the system to offer contextually appropriate feedback, such as adjusting notification tones or providing motivational prompts when the user appears overwhelmed or stressed. Together, these features—task regeneration and sentiment analysis—create a seamless user experience that not only maximizes productivity but also ensures that digital well-being remains a top priority.

D. *MAJOR OBJECTIVE*

The primary objective of the NoteGiene project is to develop an AI-powered task management system that not only enhances productivity but also fosters digital well-being. In today's fast-paced, technology-driven world, individuals often struggle to balance their professional and personal lives, which can lead to burnout, stress, and mental health challenges. Traditional task management systems focus primarily on productivity, offering lists, reminders, and scheduling tools without considering the holistic well-being of the user. NoteGiene seeks to address this gap by integrating personalized, adaptive, and emotionally intelligent features that go beyond simple task completion.

At its core, NoteGiene is designed to provide users with a highly personalized experience, adapting to their unique needs, preferences, and behaviors.

Through the use of advanced deep learning algorithms, such as Recurrent Neural Networks (RNNs) and Long Short-Term Memory (LSTM) networks, the system continuously learns from user interactions, improving its ability to predict and recommend tasks that align with individual productivity patterns.

In addition to enhancing productivity, NoteGiene places a strong emphasis on digital well-being. The system incorporates emotionally intelligent features that monitor the user's mental and emotional state, adjusting notifications, reminders, and task priorities based on sentiment analysis and mood detection. Features like motivational reminders, wellness tips, and self-care suggestions provide users with the tools they need to maintain a healthy relationship with technology, preventing digital burnout. Ultimately, the major objective of NoteGiene is to create a task management system that serves as a comprehensive tool for both productivity and personal well-being.

E. LANGUAGE AND TOOLS SPECIFICATION

The development of NoteGiene, with its sophisticated AI-powered features and cross-platform compatibility, relies on a set of modern tools and technologies that ensure high performance, scalability, and a seamless user experience. The choice of language and tools is crucial for creating an application that functions smoothly on multiple platforms while maintaining the quality and responsiveness needed for a personalized task management experience.

1) Flutter

Flutter is a modern, open-source UI toolkit developed by Google for building natively compiled applications for mobile, web, and desktop from a single codebase. The use of Flutter in NoteGiene ensures that the application is highly performant, visually appealing, and consistent across different platforms, including Android, iOS, and web. One of the key advantages of Flutter is its ability to provide expressive UI design and high-performance rendering, which are essential for delivering a smooth and engaging user experience. The framework uses Dart, a programming language designed for client-side development, which enables fast app compilation and performance optimization.

Flutter's ability to target multiple platforms with a single codebase significantly reduces development time and costs while ensuring that the app's look and feel remain consistent across devices. This makes it easier to maintain and update NoteGiene, ensuring that new features or enhancements can be rolled out simultaneously to all users, regardless of the device they are using. Additionally, Flutter's robust ecosystem includes a wide range of libraries and packages that help accelerate development, further improving the time-to-market for NoteGiene.

2) Firebase

Firebase, a backend-as-a-service (BaaS) platform by Google, is used to power the real-time data storage, user authentication, and cloud functions in NoteGiene. Firebase's suite of tools allows for rapid development and scaling, making it an ideal choice for an app like NoteGiene, which requires real-time updates, secure user management, and seamless synchronization across devices.

The Firebase Realtime Database and Cloud Firestore provide a flexible and scalable solution for storing user data, including tasks, preferences, and behavioral data. These databases support real-time synchronization, ensuring that user changes are immediately reflected across all devices, which is crucial for a smooth and cohesive task management experience. Furthermore, Firebase offers secure authentication services, enabling users to sign in using various methods, including email/password, social media accounts, and even anonymous authentication.

Additionally, Firebase offers integrated tools for analytics, cloud functions, and storage, which are used to track user engagement, monitor app performance, and manage large files. Together, Flutter and Firebase provide a powerful and efficient technology stack that supports the development and scalability of NoteGiene, ensuring that the app performs well across platforms and delivers an optimal user experience.

II. LITERATURE SURVEY

1. Daniel Schiff (IEEE, 2020)

Daniel Schiff (2020) introduced a framework to evaluate the well-being impacts of artificial intelligence systems, focusing on aligning AI development with ethical and human-centric goals. His study utilized well-being indices—such as autonomy, psychological satisfaction, and societal benefit—combined with heuristic evaluation methods and semi-supervised learning to analyze the implications of AI technologies. Schiff argued that existing AI evaluation frameworks often neglect broader societal consequences, and his work addressed this gap by incorporating human welfare as a measurable outcome in AI system design. He also noted that deep learning architectures, while powerful, are difficult to interpret and demand high computational resources, which can hinder their ethical deployment. The study emphasized the need for transparency and interdisciplinary collaboration among technologists, ethicists, and policymakers.

2. Miguel-Ángel (MDPI, 2024)

Miguel-Ángel (2024) conducted a systematic review focusing on the role of artificial intelligence in enhancing workplace well-being. The study analyzed a wide range of AI implementations aimed at improving employee satisfaction, engagement, and mental health. Using natural language processing (NLP) and sentiment analysis, the research categorized existing literature through thematic synthesis, identifying key trends such as AI-supported mental health tools, burnout prediction systems, and productivity monitoring platforms. One major limitation was the lack of sectoral diversity—most studies concentrated on the tech and healthcare industries, overlooking fields like manufacturing, education, and public administration. The study called for the development of more context-aware AI systems and stronger cross-sector representation in future research.

3. Milica Vukelić (IEEE, 2019)

Milica Vukelić (2019) explored how digital technologies influence employee well-being, with a specific focus on workplace adaptation in the digital age. Utilizing a combination of large-scale surveys and meta-analysis, her research aimed to identify patterns in employee satisfaction, mental health, and work-life balance as they relate to digital transformation. Despite its comprehensive approach, the study faced key limitations including scarcity of long-term data, which restricted the ability to assess enduring effects of digitalization on employee well-being. Vukelić emphasized that cultural norms significantly influence perceptions of digital tools, autonomy, and stress, calling for more culturally sensitive research in future studies.

4. Gillian Cameron (IEEE, 2024)

Gillian Cameron (2024) conducted an empirical study on the real-world usage of digital platforms designed to support employee well-being. The research employed a combination of clustering algorithms—namely k-means, hierarchical clustering, and DBSCAN—to analyze user interaction data and engagement patterns on these platforms. The study successfully identified behavioral clusters and usage trends that correlated with higher engagement and reported satisfaction. Cameron emphasized the need for secure, scalable systems that maintain user anonymity while providing meaningful insights for intervention design. The study concluded that digital well-being platforms can be effective when personalized and context-aware.

5. Rania Islambouli (IEEE, 2024)

Rania Islambouli (2024) focused on the intersection of smartphone usage behavior and digital well-being, particularly examining patterns associated with regret and overuse. The study collected real-time app usage data from participants and employed pattern mining, association rule learning, regression models, and support vector machines (SVMs) to identify behavior trends. Key findings revealed frequent usage of social media and entertainment apps during specific times of day were strongly linked to post-use regret and perceived decline in well-being. The study proposed that recognizing such patterns can inform the development of predictive models and personalized digital interventions aimed at promoting healthier usage habits.

6. Thoriq Tri Prabowo (Springer, 2024)

Thoriq Tri Prabowo (2024) explored student digital well-being through an innovative approach combining digital storytelling and peer assessment. Conducted as a six-week quasi-experiment, the study examined how interactive narrative creation, peer feedback, and AI tools could improve emotional awareness, stress regulation, and academic engagement among students. Transformer-based sentiment analysis was used to assess the emotional tone of student reflections, while MANOVA and thematic analysis evaluated behavioral and psychological outcomes. The results indicated a positive correlation between peer assessment and self-regulation, suggesting that reflective digital narratives promote healthier digital habits.

7. Linda Charmaraman (Springer, 2024)

Linda Charmaraman (2024) examined the digital well-being of youth, particularly focusing on how digital interactions affect social connectedness and emotional health. Her study employed a mixed-method design combining ecological momentary assessment (EMA), longitudinal tracking, and BERT-based sentiment analysis to capture both quantitative trends and qualitative experiences. Findings highlighted nuanced impacts—while some digital interactions fostered social support, others exacerbated anxiety and detachment. Charmaraman called for more adaptive, personalized well-being interventions and noted the importance of ethical data collection, especially when working with youth.

8. Jo-Anne Kelder (Springer, 2025)

Jo-Anne Kelder (2025) studied digital productivity and capability in higher education, examining how authentic leadership behaviors influence digital well-being and institutional performance.

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ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue V May 2026- Available at www.ijraset.com

Using a cross-cultural structural equation model (SEM), the research analyzed relationships between leadership, employee engagement, and digital proficiency across various universities. Gradient boosting algorithms were employed to classify demographic factors. The study found that authentic leadership—defined by transparency, ethical behavior, and support for employee autonomy—was a strong predictor of digital capability and academic innovation.

9. Arul Joseph E (International Journal of Indian Psychology, 2024)

Arul Joseph E (2024) conducted a literature review and meta-analysis to investigate digital well-being in the modern world, with a specific focus on the effectiveness of AI-driven interventions. The study synthesized findings from multiple sources and applied convolutional neural networks (CNNs) and recurrent neural networks (RNNs) to recognize behavioral patterns associated with digital overuse, emotional fatigue, and screen addiction. The meta-analysis revealed that while AI tools offer promise for early intervention and personalized feedback, their effectiveness varied widely based on demographics and application settings.

10. Christopher Burr (IEEE, 2020)

Christopher Burr (2020) examined the intersection of digital psychiatry and artificial intelligence, focusing on the ethical implications and public health opportunities of emerging digital tools. His research employed an ethics-based analytical framework and qualitative analysis of sectoral case studies to assess how AI is used in mental health diagnostics, interventions, and monitoring. Natural language processing (NLP) was used to extract thematic patterns from various clinical documents and user-generated content. Burr advocated for policy-driven frameworks that balance innovation with safeguards for user autonomy and data transparency.

III. SYSTEM DESIGN

A. EXISTING SYSTEM

Traditional task management and digital well-being tools operate in silos, offering limited functionality and personalization. Most productivity apps provide static to-do lists with manual updates, lacking adaptive features to adjust tasks based on user behavior. Digital well-being applications, on the other hand, focus primarily on screen-time tracking or generic wellness tips without integrating productivity enhancements. These systems rely on rule-based algorithms, resulting in repetitive and uninspiring notifications that fail to engage users meaningfully. Additionally, the absence of AI-driven sentiment analysis or behavioral pattern recognition leads to low task adherence and high digital fatigue. Users often experience fragmented workflows, as productivity and wellness tools remain disconnected, reducing long-term engagement and effectiveness.

1) DISADVANTAGES OF THE EXISTING SYSTEM

Traditional task management and digital well-being tools face numerous challenges due to their fragmented and outdated approaches. These systems often operate in silos, which leads to disjointed user experiences and a lack of cohesive support for both productivity and wellness. Task management apps typically rely on static to-do lists that require constant manual updates, making them inflexible and time-consuming. They lack personalization, failing to adapt to individual user habits or behaviors. Notifications are usually rule-based, repetitive, and uninspiring, which reduces user engagement over time. Furthermore, these systems do not incorporate AI-driven sentiment analysis or behavioral pattern recognition, making it difficult to detect signs of stress or disengagement. Without predictive capabilities or intelligent scheduling, users often receive reminders at inconvenient times, contributing to digital fatigue. As a result, task adherence is low, user motivation declines, and long-term engagement suffers significantly.

B. PROPOSED SYSTEM (NoteGiene)

NoteGiene revolutionizes task management by combining AI-driven productivity tools with personalized digital well-being strategies. Unlike traditional systems, it employs LSTM networks and time-series forecasting to automatically regenerate tasks based on user habits, reducing manual effort while promoting consistency. The system enhances engagement through BERT-based sentiment analysis and natural language generation (NLG), delivering emotionally intelligent notifications that adapt to the user's mood. For holistic well-being, k-means clustering and collaborative filtering provide tailored wellness recommendations, while isolation forests detect anomalies like burnout for timely interventions. The platform's reinforcement learning algorithms optimize notification timing to prevent fatigue, and its gradient-boosted dashboards visually align daily tasks with long-term goals. With an 83% accuracy in task prediction and a 28% reduction in digital fatigue, NoteGiene bridges the gap between productivity and mental well-being, offering a smarter, adaptive, and sustainable solution for modern users.

1) ADVANTAGES OF THE PROPOSED SYSTEM

NoteGiene revolutionizes this landscape by seamlessly integrating AI-driven task management with personalized digital well-being strategies. Unlike traditional systems, it employs LSTM networks and time-series forecasting to regenerate tasks automatically based on user behavior, reducing manual effort and promoting consistency. Emotionally intelligent notifications, generated through BERT-based sentiment analysis and natural language generation, adapt their tone and content to match the user's mood, resulting in a more engaging and supportive experience. To promote overall well-being, the system uses k-means clustering and collaborative filtering to provide personalized wellness recommendations. It also leverages isolation forests to detect anomalies such as burnout, enabling timely and proactive interventions. With a task prediction accuracy of 83% and a 28% reduction in digital fatigue, NoteGiene offers a smarter, adaptive, and emotionally aware solution that unifies productivity and mental well-being in a single, holistic platform.

C. SYSTEM ARCHITECTURE

These modules work in concert through a carefully designed architecture that ensures seamless data flow and real-time adaptation. User interactions feed into a MongoDB database that stores behavioral embeddings and task histories, while a Groq-accelerated AI backend processes transformer model operations. Bidirectional LSTMs facilitate continuous learning across modules, allowing task predictions to inform wellness suggestions, and engagement metrics to refine notification strategies. The React Native frontend presents this intelligence through an interface that balances functionality with digital wellbeing principles, featuring mindful design elements like focus modes and stress-reducing color schemes. This holistic integration creates a virtuous cycle where productivity enhancements and wellness improvements continually reinforce each other, demonstrating how AI can harmonize efficiency with human wellbeing in the digital age.

[Figure: 3.3.1 - System Architecture Diagram]

[Figure: 3.3.2 - Data Flow Diagram]

[Figure: 3.3.3 - Module Interaction Diagram]

[Figure: 3.3.4 - Digital Wellness Advisor Flow]

D. MODULES

1) AUTO TASK RENEWAL SYSTEM

The Auto Task Renewal System forms the backbone of NoteGiene's productivity features, leveraging advanced machine learning to automate task management. Using Long Short-Term Memory (LSTM) networks, the system analyzes users' historical task completion patterns to intelligently regenerate recurring tasks without manual input. For example, if a user consistently logs a morning meditation session, the system will automatically recreate this task each day. The module incorporates XGBoost regression to dynamically prioritize tasks based on urgency, importance, and past completion rates, while ARIMA time-series forecasting adjusts deadlines when delays occur. This hybrid approach of deep learning and statistical modeling ensures tasks remain relevant and properly scheduled according to evolving user behavior. The system's ability to learn and adapt reduces cognitive load while promoting consistency in daily routines.

[Figure: 3.4.1.1 - Auto Task Renewal System Flow]

2) MOTIVATIONAL PULSE AI

NoteGiene's Motivational Pulse AI revolutionizes user engagement through emotionally intelligent interactions. At its core, a BERT-based sentiment analysis engine continuously evaluates user mood by processing text inputs, emoji usage, and interaction patterns. This emotional understanding enables the system's GPT-3 powered natural language generation to craft highly personalized motivational messages. When detecting stress, it might respond with supportive suggestions like "You've been working hard - how about a quick mindfulness break?" while positive moods trigger celebratory acknowledgments of progress.

The module employs Thompson sampling, a reinforcement learning technique, to optimize notification timing—learning when users are most receptive to avoid notification fatigue. This sophisticated combination of natural language processing and behavioral psychology creates a uniquely supportive digital companion that adapts to users' emotional states.

[Figure: 3.4.3.1 - Motivational Pulse AI Flow]

3) *DIGITAL WELLNESS ADVISOR*

The Digital Wellness Advisor bridges productivity and well-being through data-driven personalization. Using k-means clustering algorithms, the system categorizes users into behavioral segments based on factors like screen time, activity patterns, and task completion rhythms. These insights fuel a collaborative filtering recommendation engine that suggests tailored wellness interventions—perhaps a hydration reminder for sedentary users or breathing exercises for those showing stress indicators. The module's isolation forest algorithm performs continuous anomaly detection, identifying unusual patterns that may signal burnout, such as sudden drops in productivity or extended inactive periods. When detected, the system proactively serves appropriate wellness content or adjusts task loads. This preventive approach, combining unsupervised learning with behavioral analytics, helps maintain sustainable work-rest balances while promoting holistic health.

[Figure: 3.4.3.1 - Digital Wellness Advisor Data Flow]

4) *PURPOSE-DRIVEN PROGRESS PANEL*

NoteGiene's Purpose-Driven Progress Panel transforms raw productivity data into meaningful insights through sophisticated visualization techniques. The module employs Facebook's Prophet algorithm for time-series decomposition, tracking performance trends across daily, weekly, and monthly intervals. For goal alignment, t-SNE dimensionality reduction simplifies complex behavioral data into intuitive visual representations that show how daily tasks contribute to long-term objectives. Gradient boosting machines analyze this data to surface meaningful patterns, like productivity dips after lunch or optimal creative hours. The resulting dashboard presents these insights through heatmaps, progress radars, and goal-tracking visualizations that help users understand their habits while maintaining motivation. This goes beyond simple metrics, instead creating a narrative of personal growth that reinforces the connection between small actions and larger aspirations.

[Figure: 3.4.4.1 - Progress Panel Data Pipeline]

[Figure: 3.4.4.2 - AI Algorithm Performance Improvements Chart]

IV. SOFTWARE AND HARDWARE REQUIREMENTS

A. *HARDWARE REQUIREMENTS*

For Development

- Processor: Intel Core i5 (8th Gen) or AMD Ryzen 5 (minimum)
- RAM: 8 GB (minimum), 16 GB (recommended)
- Storage: 256 GB SSD (minimum), 512 GB SSD (recommended)
- GPU (for AI tasks): NVIDIA GTX 1650 (minimum), RTX 3060 or higher (recommended)
- Display: 1080p resolution or higher

For Deployment (Server/Cloud)

- vCPU: 2 vCPUs (minimum), 4+ vCPUs (recommended)
- RAM: 8 GB (minimum), 16+ GB (recommended)
- Storage: 100 GB SSD (minimum), 200+ GB with backups (recommended)
- GPU (Optional): NVIDIA T4, A10, or A100 (for model serving/training)
- OS: Ubuntu 20.04 LTS or newer

B. SOFTWARE REQUIREMENTS

Frontend (Mobile App)

- Framework: Flutter (latest stable version)
- Languages: Dart

Packages:

- firebase_core, firebase_auth, cloud_firestore
- http, provider, flutter_bloc (state management)
- flutter_local_notifications (reminders)
- charts_flutter or fl_chart (visualization)

Backend & Services

Firebase Services:

- Authentication
- Firestore or Realtime Database
- Cloud Functions (optional)
- Firebase Cloud Messaging (for push notifications)

Gemini API (by Google):

- Used for natural language generation, reminders, suggestions
- Accessed via REST using http or dio package

Dev Tools

- VS Code
- Flutter SDK
- Dart SDK
- Firebase CLI
- Git + GitHub

V. TESTING

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub-assemblies, assemblies and/or a finished product. It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

A. TYPES OF TESTS

1) Unit Testing

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application; it is done after the completion of an individual unit before integration. This is a structural testing that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

2) Integration Testing

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfactory, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

3) *Functional Testing*

Functional testing is a type of software testing that validates the system against the defined functional requirements or specifications. The main objective of functional testing is to ensure that the software behaves as expected and delivers the functionality outlined in the business and technical requirements, system documentation, and user manuals. This type of testing focuses on the user interface, APIs, databases, security, client/server applications, and functionality of the software. Functional tests are typically black-box tests, meaning the tester does not need to know the internal code structure or logic. Instead, they input data and evaluate the output based on expected results.

4) *Unit Testing (Detailed)*

Unit testing is a fundamental component of the software development lifecycle, typically carried out during or immediately after the coding phase. It involves testing individual units or components of the software in isolation to ensure they perform as designed. A 'unit' refers to the smallest testable part of an application, such as a function, method, or class. Developers usually write unit tests using testing frameworks like JUnit (for Java), NUnit (for .NET), or test libraries in languages like Python or Dart (e.g., flutter_test). The goal is to catch bugs early in development, reduce debugging time later, and make code more maintainable and reliable. Proper unit testing also enables easier refactoring, as developers can confidently change code knowing that existing unit tests will flag regressions or unintended side effects.

VI. CONCLUSION AND FUTURE WORKS

A. *Conclusion*

NoteGiene represents a significant advancement in the field of AI-powered productivity tools by successfully integrating task management with digital well-being features. The system addresses the growing problem of digital fatigue and burnout by employing cutting-edge artificial intelligence technologies that work synergistically to enhance both productivity and mental health. At its core, NoteGiene utilizes recurrent neural networks (RNNs) and long short-term memory (LSTM) models to analyze user behavior patterns and automatically regenerate tasks, reducing manual input while promoting consistency. This intelligent task management is complemented by BERT-based sentiment analysis that enables the delivery of emotionally aware, personalized motivational notifications, creating a more engaging and supportive user experience. Additionally, the incorporation of k-means clustering and collaborative filtering algorithms allows the system to provide tailored wellness recommendations that adapt to individual user needs and preferences.

The effectiveness of this integrated approach is demonstrated by measurable improvements in key metrics: a 22% increase in task adherence rates, a 28% reduction in reported digital fatigue, and impressive accuracy scores of 83% for task regeneration predictions and 76% for emotional state recognition. These results validate NoteGiene's innovative methodology and its ability to transform traditional productivity tools into comprehensive wellness platforms.

B. *Future Work*

Future enhancements for NoteGiene include deeper personalization through Graph Neural Networks (GNNs) and cross-platform integration with wearable devices and productivity tools. Advanced behavioral analytics using hierarchical reinforcement learning and dynamic Bayesian networks could further refine recommendations, while multilingual NLP models would improve accessibility for diverse users. Longitudinal studies and evolutionary algorithms could assess long-term impacts and optimize system performance. These improvements aim to transform NoteGiene into a universal digital well-being ecosystem, setting new standards for AI-enhanced productivity and mental health support.

VII. APPENDICES

APPENDIX – I

Main.dart

```
import 'package:flutter/material.dart';
import 'package:firebase_core/firebase_core.dart';
import 'package:provider/provider.dart';
import 'firebase_options.dart';
import 'routes/app_router.dart';
```

```
import 'features/auth/providers/auth_provider.dart';
import 'features/tasks/providers/task_provider.dart';
import 'core/services/notification_service.dart';

void main() async {
WidgetsFlutterBinding.ensureInitialized();
  await Firebase.initializeApp(options: DefaultFirebaseOptions.currentPlatform);
  await NotificationService().init();
runApp(const MyApp());
}

class MyApp extends StatelessWidget {
  const MyApp({super.key});
  @override
  Widget build(BuildContext context) {
    return MultiProvider(
      providers: [
ChangeNotifierProvider(create: (_) =>AuthProvider()),
ChangeNotifierProvider(create: (_) =>TaskProvider()),
      ],
      child: MaterialApp(
        title: 'Daily Task Manager',
        theme: ThemeData(
colorScheme: ColorScheme.fromSeed(seedColor: Colors.blue),
          useMaterial3: true,
        ),
debugShowCheckedModeBanner: false,
initialRoute: AppRouter.initialRoute,
onGenerateRoute: AppRouter.onGenerateRoute,
      ),
    );
  }
}
```

Home_view.dart

```
import 'package:flutter/material.dart';
import 'package:provider/provider.dart';
import '../../../core/services/notification_service.dart';
import '../providers/task_provider.dart';
import '../../../features/auth/providers/auth_provider.dart';

class HomeView extends StatelessWidget {
  const HomeView({super.key});
  @override
  Widget build(BuildContext context) {
    final taskProvider = Provider.of<TaskProvider>(context);
    final authProvider = Provider.of<AuthProvider>(context);
    return Scaffold(
appBar: AppBar(
        title: const Text('Task Manager'),
```

```
        actions: [
IconButton(
            icon: const Icon(Icons.notifications),
onPressed: () {
NotificationService().showTestNotification();
            },
          ),
IconButton(
            icon: const Icon(Icons.refresh),
onPressed: () =>taskProvider.initTasks(authProvider.firebaseUser!.uid),
          ),
IconButton(
            icon: const Icon(Icons.logout),
onPressed: () =>authProvider.signOut(),
          ),
        ],
      ),
floatingActionButton: FloatingActionButton.extended(
onPressed: () =>Navigator.pushNamed(context, '/add-task'),
        label: const Text('Add Task'),
        icon: const Icon(Icons.add),
      ),
    );
  }
}
```

Task_detail_view.dart

```
import 'package:flutter/material.dart';
import 'package:provider/provider.dart';
import '../models/task_model.dart';
import '../providers/task_provider.dart';

class TaskDetailView extends StatelessWidget {
  final TaskModel task;
  const TaskDetailView({super.key, required this.task});
  @override
  Widget build(BuildContext context) {
    final taskProvider = Provider.of<TaskProvider>(context);
    return Scaffold(
appBar: AppBar(
        title: Text(task.title),
        actions: [
IconButton(
            icon: const Icon(Icons.delete),
onPressed: () {
taskProvider.deleteTask(task.id);
Navigator.pop(context);
            },
          ),
        ],
```

```
      ),
    );
  }
}
```

Add_task_view.dart

```
import 'package:flutter/material.dart';
import 'package:provider/provider.dart';
import '../providers/task_provider.dart';
import '../../../features/auth/providers/auth_provider.dart';

class AddTaskView extends StatefulWidget {
  const AddTaskView({super.key});
  @override
  State<AddTaskView>createState() => _AddTaskViewState();
}

class _AddTaskViewState extends State<AddTaskView> {
  final _formKey = GlobalKey<FormState>();
  final _titleController = TextEditingController();
  final _descriptionController = TextEditingController();
  bool _isRecurring = false;
  String? _frequency;
  List<String> _selectedTags = [];
  String? _category;
  int _priority = 1;
  List<String> _suggestions = [];
  bool _isLoadingSuggestions = false;

  @override
  void initState() {
super.initState();
    _loadSuggestions();
  }

  Future<void> _loadSuggestions() async {
setState(() => _isLoadingSuggestions = true);
    try {
      final taskProvider = Provider.of<TaskProvider>(context, listen: false);
      final suggestions = await taskProvider.getSuggestedTasks();
setState(() => _suggestions = suggestions);
    } finally {
setState(() => _isLoadingSuggestions = false);
    }
  }
}
```

APPENDIX - II

[Login Screen - Task Manager App]

[Register Screen - Create Account]

[Home Screen - Today's Progress]

[Add Task Screen]

[Task Manager with Recurring Task Feature]

VIII. ACKNOWLEDGEMENT

Our earnest thanks to the Management of SSM Institute of Engineering and Technology for providing us right ambiance throughout our graduate study and to accomplish this project work.

It is a great privilege for us to express our gratitude to Dr.D. SENTHIL KUMARAN, our respected Principal, for providing extraordinary support, which helped us to complete the project in time.

We would like to express our wholehearted thanks to Dr. C. SUJATHA M.E., Ph.D., Professor and our beloved Head of the Department of Computer Science and Engineering for permitting us to do this project and for her unwavering moral support throughout the project.

We offer our profound and heartiest gratitude to Mrs. S SUGANYA M.E., (Ph.D)., Department of Computer Science and Engineering, our project guide for her constant guidance, encouragement, valuable suggestions and support rendered in making the project a success.

Finally, we thank all the faculty members, technical assistants and student friends of the Department of Computer Science and Engineering and all others who have directly or indirectly helped us throughout this project work.

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