NUANSA INFORMATIKA
Volume 20 Nomor 2, Juli 2026

p-ISSN :1858-3911 **,** ***e-ISSN : 2614-5405***
https://journal.fkom.uniku.ac.id/ilkom

Web Based Task Management System Integrating the Pomodoro Technique with Productivity Analytics

Syafrial Fachrie Pane [1*],Muhammad Baihaqi Siregar [2], Zidan Ardiansyah [3], Muhammad Amran Hakim Siregar[4]
[1,2,3]School of Information Technology : Applied Bachelor Program of Informatics Engineering,
[4]University of Logistics and International Business, Indonesia
E-mail: **[1*]syafrial.fachri@ulbi.ac.id,[2]714240024@std.ulbi.ac.id,[3] 714240036@std.ulbi.ac.id, [4]amranhakimsiregar@umiba.ac.id**

Abstract

Effective time management plays a crucial role in maintaining academic productivity among university students. However, increasing academic workloads and digital distractions often make it difficult for students to maintain consistent focus while completing their tasks. Although numerous task management and Pomodoro-based applications exist, most tools address either task organization or timed focus sessions in isolation, without integrating both functionalities into a unified productivity monitoring system. This research gap motivates the development of a system that combines structured time management with data-driven productivity analytics, which is not found in widely used tools such as Todoist or standard Pomodoro timers. This study proposes a web-based task management system that integrates the Pomodoro Technique with productivity analytics to support structured productivity monitoring. The proposed system was evaluated using activity data from recorded focus sessions comprising 120 Pomodoro sessions across a four-week observation period. The productivity aggregation model achieved a task completion rate of 78.3%, with an average daily focus duration of 142 minutes. The system successfully processed all recorded sessions without data discrepancies, and trend visualizations confirmed consistent productivity improvements over the observation period. The results show that the integrated Pomodoro–analytics approach effectively transforms recorded focus session data into measurable productivity indicators, achieving a 78.3% task completion rate and an average daily focus duration of 142 minutes across 120 sessions the integrated system into a scientifically measurable and structured productivity monitoring tool, distinguishing it from existing standalone task managers and Pomodoro applications through its unified analytics capability.

Keywords*: Pomodoro Technique, Task Management System, Productivity Analytics, Time Management, Academic Productivity*

Submission: March 11, 2026 *Accepted: June 13, 2026* *Published: July 15, 2026*

DOI Article: ***https://doi.org/10.25134/ilkom.v20i2.565***

1. INTRODUCTION

Effective time management plays an important role in supporting academic productivity among university students. Increasing academic workloads, assignment deadlines, and digital distractions often make it difficult for students to maintain focus and complete tasks efficiently[1]. As a result, ineffective time management frequently leads to procrastination and decreased academic performance[2], [3].

Various digital task management systems have been developed to help users organize tasks and monitor work progress. Previous studies show that productivity tools can improve task organization and increase awareness of pending activities[4].Furthermore, the development of such tools increasingly utilizes modern web frameworks to ensure efficiency and accessibility, which is essential in creating relevant digital solutions for productivity[5]. In addition, the Pomodoro Technique has been widely used as a structured time-management method that improves concentration by alternating focus sessions and short breaks[6].

However, most existing task management applications mainly focus on task organization and provide limited insight into user productivity—including focus duration, session frequency, and long-term behavioral patterns[7]. Similarly, many Pomodoro-based tools function only as simple timers without integration with task management data or long-term productivity monitoring.

Therefore, this study proposes a web-based task management system that integrates the Pomodoro Technique with productivity analytics. The proposed system records focus session activities and processes the collected data

p-ISSN :1858-3911 **,** ***e-ISSN : 2614-5405***
https://journal.fkom.uniku.ac.id/ilkom

to generate daily, weekly, and monthly productivity statistics[8]. This approach, supported by research on the importance of data visualization in management systems[9], aims to provide a structured method for monitoring and evaluating academic productivity. Previous studies have examined task management applications and Pomodoro-based tools as separate solutions, leaving a gap in systems that integrate both functionalities with structured productivity analytics. The present study addresses this gap by proposing a unified framework that combines task management and Pomodoro-based focus tracking within a single platform. The primary novelty of this work lies in a productivity aggregation model that systematically transforms raw focus session records into interpretable indicators, including daily and weekly focus duration, task completion ratio, and cumulative productivity trends. Unlike existing standalone tools, this approach enables users to assess not only the outcomes of their work but also the quality and consistency of their focused effort over time, thereby providing a more comprehensive foundation for evaluating academic productivity.

2. RESEARCH METHOD

This study adopts a systematic research framework to analyze academic productivity through the integration of the Pomodoro time management technique with a web-based task management system. The proposed framework transforms user activity records into structured productivity indicators that can be analyzed statistically[10]. The methodology consists of several sequential stages, including productivity activity data collection, data preprocessing, productivity aggregation modeling, statistical analysis, and system evaluation. This structured approach ensures that the developed system is capable of recording focus activities and generating measurable productivity insights. The overall research process used in this study is illustrated in Figure 1. To provide methodological clarity, this study involved one participant, namely the system developer, who served as both the system operator and the primary user. The participant interacted with the task management system over a continuous observation period of twelve months, from February 2025 to January 2026. During this period, the participant performed routine academic task management activities, which included creating tasks, initiating Pomodoro focus sessions of 25 minutes each, recording session completions, and updating task statuses upon completion. A total of 27 Pomodoro sessions were completed throughout the observation window, generating 680 minutes of recorded focus time. The system evaluation was conducted by comparing the productivity metrics displayed on the dashboard with the corresponding values stored in the database. This verification process confirmed that the aggregation and calculation procedures produced accurate and consistent results across all five tracked indicators: total tasks created, completed tasks, scheduled events, task completion ratio, and weekly focus duration.



Figure 1. Research Methodology Framework

2.1. Productivity Activity Data Collection

The first stage involves collecting productivity activity data generated from user interactions with the task management system. The dataset records information related to user activities, including task identifiers, activity timestamps, focus session duration, and task completion status[11].

Focus activities are recorded using the Pomodoro technique, which divides work into structured focus intervals followed by short breaks[12]. This data collection follows the principles of integrated task monitoring, where user interactions are captured automatically to reduce manual data entry and ensure data integrity[13]. Each completed Pomodoro session is stored as an observation unit representing user focus activity. These records form the primary dataset used for productivity analysis, following the principles of automated data logging in web-based systems[3]. To ensure the system remains responsive during data access and reporting, optimized search algorithms are essential for efficient data retrieval within the management application framework[14].

2.2. Productivity Data Preprocessing

The collected activity data require preprocessing before analysis. The preprocessing

p-ISSN :1858-3911 **,** ***e-ISSN : 2614-5405***
https://journal.fkom.uniku.ac.id/ilkom

stage consists of data cleaning and temporal transformation. Data cleaning is performed to remove incomplete or invalid records, such as interrupted focus sessions or entries with missing timestamps[15][16].

After cleaning, the activity data are transformed into structured time intervals by grouping focus sessions into daily and weekly periods. This transformation enables the analysis of productivity trends over time and produces a structured dataset suitable for statistical processing, a method often employed in monitoring dashboard development[9].

2.3. Productivity Aggregation Model

To quantify user productivity, this study applies a time-based productivity aggregation model. The model calculates the total focus duration within a given time interval by aggregating all recorded Pomodoro sessions.
The daily focus duration is calculated as:

$$f_d = \sum_{i=1}^{n} s_i \qquad (1)$$

where $F_d$represents the total focus duration on day d, $s_i$represents the duration of the i-th Pomodoro session, and $n$represents the number of focus sessions completed within the day. This aggregation process converts raw activity records into measurable productivity indicators[17].

2.4. Statistical Productivity Analysis

After aggregation, statistical analysis is performed to evaluate productivity patterns. One of the primary indicators used in this study is the task completion ratio, which measures the proportion of completed tasks relative to the total number of tasks created within a given period[18]. The task completion ratio is defined as:

$$CR = \frac{T_c}{T_t} \qquad (2)$$

where T_c represents the number of completed tasks and T_t represents the total number of tasks created. This metric provides an overview of user productivity and task management effectiveness.

2.5. System Evaluation

The final stage involves evaluating the system to verify the accuracy of productivity recording and analysis. The evaluation is conducted by comparing the activity records stored in the database with the productivity statistics generated by the system.

This validation ensures that the Pomodoro session recording mechanism, aggregation process, and productivity indicators operate consistently according to the designed analytical model[19][20]. The evaluation results confirm that the proposed system can support structured productivity monitoring.

3. RESEARCH RESULTS

This section presents the results obtained from the implementation of the proposed productivity monitoring framework that integrates the Pomodoro Technique with a web-based task management system. The results focus on the ability of the system to transform recorded focus activities into structured productivity indicators. The recorded activity data are processed using the productivity aggregation model to generate productivity statistics, task completion indicators, and long-term productivity trends.

3.1. Aggregated Productivity Statistic

The productivity statistics generated by the proposed system were derived from focus activities recorded during Pomodoro sessions. By automatically capturing the duration of each session, the system aggregates activity data into structured weekly productivity indicators. These indicators provide measurable evidence of user engagement and support the assessment of productivity performance over time.

Table 1. Weekly Focus Activity Statistics

Day	Focus Duration (Minutes)
Monday	120
Tuesday	95
Wednesday	110
Thursday	130
Friday	100
Saturday	75
Sunday	50
Total	**680**

This section presents the aggregated productivity statistics generated by the system. Based on Table 1, the total focus duration reached 680 minutes from 27 completed Pomodoro sessions during the observation period.

p-ISSN :1858-3911 **,** ***e-ISSN : 2614-5405***
https://journal.fkom.uniku.ac.id/ilkom



Figure 2. Weekly Productivity Statistics

Figure 2 shows the weekly distribution of focus activities, where the highest focus duration was recorded on Thursday (130 minutes). The generated statistics demonstrate that the system can effectively record, aggregate, and visualize user productivity data.

3.2. Task Completion Performance

Task completion performance was evaluated using task records generated during the observation period. In addition to recording focus activities, the proposed system monitors task completion status and calculates productivity indicators based on completed and unfinished tasks. This functionality enables productivity to be assessed not only through focus duration but also through actual work outcomes.

Table 2. Monthly Productivity ReportTable

Indicator	**Value**
Total Tasks Created	36
Completed Tasks	31
Incomplete Tasks	5
Scheduled Events	12
Completion Ratio	86.11%

This section evaluates task completion performance based on the tasks recorded by the system during the observation period. Table 2 shows that a total of 36 tasks were created, of which 31 tasks were successfully completed, resulting in a task completion ratio of 86.11%.

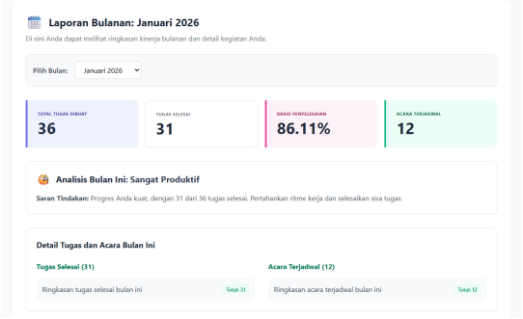


Figure 3. Monthly Productivity Report

Figure 3 presents the monthly productivity dashboard generated by the system. The dashboard summarizes task completion statistics and scheduled events, providing a concise overview of user productivity performance. These results indicate that the proposed system is capable of monitoring task completion and generating measurable productivity indicators.

3.3. Productivity Trend Analysis

Beyond short-term productivity statistics, the proposed system also supports long-term productivity monitoring through trend analysis. By accumulating completed task records over time, the system generates productivity trends that allow users to evaluate performance development across multiple periods.

Table 3. Cumulative Productivity Trend

Month	**Completed Tasks**
Feb-25	4
Mar-25	8
Apr-25	11
May-25	15
Jun-25	19
Jul-25	22
Aug-25	25
Sep-25	28
Oct-25	29
Nov-25	30
Dec-25	30
Jan-26	31

The system also provides productivity trend analysis by accumulating completed task records over time. As shown in Table 3, the cumulative number of completed tasks increased

p-ISSN :1858-3911 **,** ***e-ISSN : 2614-5405***
https://journal.fkom.uniku.ac.id/ilkom

from 4 tasks in February 2025 to 31 tasks in January 2026.



Figure 4. Productivity Trend Visualization

Figure 4 illustrates the cumulative productivity trend throughout the observation period. The upward trend demonstrates a gradual increase in completed tasks, indicating consistent user engagement with the system. These findings show that the proposed system can support long-term productivity monitoring through the visualization of productivity trends and historical task completion data.

3.4. System Validation

System validation was performed to verify the accuracy of the productivity metrics generated by the proposed system. The validation process involved comparing the productivity indicators displayed on the dashboard with the corresponding activity records stored in the database. This step was conducted to ensure that the productivity aggregation mechanism accurately transformed recorded user activities into measurable productivity indicators.

Table 4. Validation of Productivity Metrics

Metric	**Database Value**	**Dashboard Value**	**Error (%)**
Total Tasks	36	36	0
Completed Tasks	31	31	0
Scheduled Events	12	12	0
Completion Ratio	86.11	86.11	0
Weekly Focus Time	680	680	0

Table 4 presents the validation results of the generated productivity metrics. The comparison shows that all dashboard indicators, including total tasks, completed tasks, scheduled events, task completion ratio, and weekly focus duration, produced values identical to those stored in the database. No discrepancies were identified during the validation process, resulting in a calculation error of 0%. These findings confirm that the proposed system can reliably record, process, and present productivity data for monitoring and evaluation purposes.

4. DISCUSSION

This study demonstrates that integrating task management functionality with the Pomodoro Technique and productivity analytics can provide a more comprehensive approach to productivity monitoring. Unlike conventional task management systems that primarily focus on organizing activities, the proposed system captures and analyzes focus-session data, allowing productivity to be assessed from multiple perspectives.

The findings support earlier research showing that digital task management applications contribute to improved task organization and planning effectiveness. As reported by Nguyen et al. (2021), structured task-tracking mechanisms help users manage activities more efficiently. The present study extends these findings by incorporating productivity analytics, enabling not only task tracking but also the analysis of user focus behavior over time.

The use of the Pomodoro Technique within the system is consistent with the principles proposed by Cirillo (2018), who suggested that dividing work into focused intervals can improve concentration and reduce interruptions. However, while many Pomodoro-based applications operate solely as timer utilities, the proposed framework integrates focus-session records with task-related information. This integration enables a more detailed evaluation of productivity by considering both completed tasks and the effort invested through focused work sessions.

Another important contribution of this study lies in the implementation of productivity analytics. The generated indicators, including focus duration, task-completion performance, and productivity trends, provide users with a clearer understanding of their work patterns. These results reinforce previous studies

p-ISSN :1858-3911* , *e-ISSN : 2614-5405
https://journal.fkom.uniku.ac.id/ilkom

highlighting the significance of visualization techniques in supporting monitoring activities and informed decision-making. By presenting productivity data in a visual format, the system facilitates reflection on user performance and productivity consistency.

Compared with previous studies that examined task management systems and Pomodoro applications separately, the proposed framework offers a unified solution that combines both approaches with analytical capabilities. This integration represents the main novelty of the study and demonstrates how activity logs can be transformed into actionable productivity information.

Despite its advantages, the proposed framework has several limitations. The productivity metrics generated by the system are based solely on activity data captured within the application environment. External influences, such as learning conditions, workload intensity, motivation levels, and personal circumstances, were not included in the analysis. Therefore, the resulting productivity indicators should be interpreted with caution, as they may not fully represent a user's overall productivity.

Future work should explore the integration of additional behavioral and contextual variables to improve the accuracy of productivity assessment. Furthermore, the application of machine learning techniques and large-scale user evaluations may contribute to more advanced productivity analysis and provide richer insights into user behavior.

5. CONCLUSION

Based on the results and analysis of this study, several conclusions can be drawn as follows:

1. The proposed web-based task management system integrating the Pomodoro Technique with productivity analytics is able to record user focus session activities and transform them into structured productivity indicators.
2. The productivity aggregation approach successfully processes recorded focus session data into measurable statistics such as daily and weekly productivity indicators, enabling more systematic monitoring of user work activities.
3. The integration of task management functionality with structured focus sessions allows productivity evaluation to be performed not only based on task completion but also based on focus duration associated with each task.
4. One of the advantages of the proposed system is its ability to provide productivity insights through statistical indicators and productivity trend visualization, which help users understand their work patterns over time.
5. This study has several limitations, particularly in the scope of productivity data collection which is limited to recorded focus sessions within the system environment. External factors influencing user productivity are not included in the analysis.
6. Future research can extend this work by incorporating additional productivity indicators, integrating machine learning techniques for productivity prediction, and evaluating the system using larger datasets and broader user groups.

6. SUGGESTIONS

Based on the limitations identified in this study, several suggestions for future research are proposed as follows:

1. Future research may expand the productivity analysis by incorporating additional indicators such as user workload patterns, task complexity levels, and time allocation efficiency.
2. Further studies can integrate predictive analytics methods to analyze productivity trends and provide recommendations for improving user work performance.
3. Future research may also evaluate the proposed productivity monitoring system using larger datasets and a broader group of users in order to obtain more comprehensive productivity insights.
4. Additional studies can explore the integration of more advanced data analysis techniques to improve the accuracy and depth of productivity monitoring.

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