WORK PRODUCTIVITY AND DIGITAL FATIGUE AS DETERMINANTS OF PRODUCTION EMPLOYEE PERFORMANCE IN THE PHARMACEUTICAL INDUSTRY

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Abstract

The rapid advancement of digital technology has intensified the use of digital devices in daily work processes, including production activities within the pharmaceutical industry. This condition often leads to digital fatigue, which subsequently reduces employees' work effectiveness. At the same time, work productivity remains a crucial factor in meeting operational standards and ensuring the quality of a company's output. This study aims to analyze the influence of work productivity and digital fatigue on the performance of production employees at PT Otto Pharmaceutical. This research employed a quantitative approach with an explanatory design. Data were collected using questionnaires distributed to employees through a probability random sampling technique. A total of 135 respondents were analyzed using IBM SPSS Statistics through validity testing, reliability testing, and linear regression analysis. The findings indicate that work productivity has a positive and significant effect on employee performance. Digital fatigue also shows a significant influence, contributing to the decline in performance. Simultaneously, both variables demonstrate a significant contribution to the performance of production employees. These findings suggest that higher levels of employee productivity lead to improved performance, whereas increasing digital fatigue tends to decrease work outcomes. The study provides practical implications for organizational management, particularly in regulating digital workloads, optimizing technology-based work systems, and creating a work environment that minimizes digital fatigue. This research also strengthens empirical evidence regarding the role of productivity and digital fatigue in shaping employee performance within the pharmaceutical industry in the era of digital transformation.

Keywords: Digital Fatigue; Performance; Work Productivity

INTRODUCTION

The rapid development of digital technology has brought significant changes to the way organizations conduct operational activities, coordinate tasks, and monitor employee performance. This process of digital transformation enables work processes to be carried out more quickly, efficiently, and flexibly; however, at the same time, it introduces new challenges related to the increasing intensity of digital device usage, denser information flows, and escalating demands for responsiveness. Such conditions not only reshape organizational communication patterns but also directly affect employees' cognitive and psychological workload, as described in the information overload context highlighted . In manufacturing and pharmaceutical companies such as PT Otto Pharmaceutical, the utilization of digital systems in administrative processes, production control, reporting, and interdepartmental coordination has become an integral part of daily operations. Continuous interaction with digital instructions, system-based standard operating procedures, and reporting applications requires employees particularly those in the production division to maintain a high level of accuracy throughout the entire work process.

Employee performance remains a fundamental element in human resource management and a key determinant of organizational success in achieving strategic objectives. As noted by Hasibuan Malayu (2019), employee performance reflects work outcomes achieved in accordance with assigned responsibilities and is closely related to effectiveness and efficiency in task execution (Hasibuan Malayu, 2019, p. 34). This perspective is aligned with the view of Hartatik and Ismail (2024), who emphasize that performance represents a systematic process involving planning, monitoring, and evaluation to achieve optimal productivity outcomes (Hartatik, 2024, p. 6). In digitally intensive work environments, employee performance is increasingly shaped not only by individual abilities and motivation but also by external factors such as technological systems, communication intensity, and digital work design.

Alongside increasing digitalization, the phenomenon of digital fatigue has emerged as a critical issue in modern work contexts, particularly in occupations that demand sustained digital interaction. Digital fatigue refers to emotional, mental, and physical exhaustion resulting from prolonged exposure to digital devices and continuous information processing. Levitin (2014) explains that excessive information streams in the digital era can overwhelm cognitive capacity and disrupt effective decision-making processes (Levitin, 2014), while Effendy (2013) notes that excessive communication intensity may lead to inefficiencies that hinder organizational goal attainment (Effendy & Surjaman, 2011, p. 31). Carr (2010) further argues that persistent digital exposure contributes to reduced attention span and increased cognitive load (Carr, 2020). These conditions are consistent with the concept of work fatigue described by Suma'mur (2014), who defines fatigue as a decline in physical and mental capacity due to continuous work pressure and activity demands (Suma'mur, 2017, p. 144). Within PT Otto Pharmaceutical, ongoing exposure to digital reporting systems, system-based instructions, and regulatory monitoring mechanisms may intensify the risk of digital fatigue among production employees.

In modern organizational settings, work productivity is no longer limited to physical output but also encompasses employees' ability to manage information, utilize digital technologies, and complete tasks effectively. Drucker (2012) emphasizes that productivity in

the knowledge-based era is strongly influenced by individuals' capacity to process information and apply knowledge appropriately within work processes (Drucker, 2012, p. 55). The Asian Productivity Organization (2015) similarly defines productivity as the relationship between output and input shaped by multiple factors, including skills, technological mastery, work environment quality, and adaptability to digital change (Kalaw & Philippines, 2015, pp. 7;10-12). This understanding is reinforced by Weihrich and Koontz (2010), who conceptualize productivity as the ratio of output to input while considering output quality (Koontz et al., 2012, p. 15). In technology-intensive environments, Supriyadi et al. (2025) highlight that excessive cognitive load caused by dense information flows and high technology usage may reduce focus, deplete psychological resources, and ultimately lower work productivity (Supriyadi et al., 2025).

Empirical evidence consistently shows that increasing digital workload and mental fatigue resulting from continuous technology use can negatively affect employee productivity and performance. Upadhyaya and Vrinda (2021) found that technostress arising from excessive technology use has a direct impact on declining individual productivity (Upadhyaya & Vrinda, 2021), a finding supported by Zhao et al. (2020), who reported that digital pressure inhibits cognitive capacity and triggers resource depletion, leading to reduced performance and productivity (Zhao et al., 2020). Furthermore, Bailenson (2021) emphasizes that escalating digital communication demands, including constant responsiveness and video-based interactions, contribute to digital fatigue that disrupts focus and work effectiveness (Bailenson, 2021). At the organizational level, AlMakhmari et al. (2024) confirm that techno-stressors such as information overload and high digital demands significantly reduce employee productivity, particularly in the absence of effective coping strategies (AlMakhmari et al., 2025).

Despite these findings, much of the existing literature has examined digital fatigue, technostress, or work productivity in isolation, thereby limiting a comprehensive understanding of how work productivity and digital fatigue interact simultaneously to influence employee performance. This limitation is particularly evident in studies conducted within the pharmaceutical sector, where production processes are highly complex and subject to strict quality and regulatory standards. PT Otto Pharmaceutical represents a relevant research context, as employees in the production division experience sustained digital exposure through system-based work instructions, digital reporting mechanisms, and regulatory monitoring systems.

Accordingly, this study seeks to analyze the influence of work productivity and digital fatigue on employee performance, both partially and simultaneously, within the production division of a pharmaceutical manufacturing company. By integrating these variables into a single analytical model, this research aims to address existing gaps in the literature and contribute empirical evidence on employee performance in technology-intensive work environments, particularly within the pharmaceutical industry in the era of digital transformation.. Therefore, based on the theoretical and empirical review presented above, this study proposes the following model of intervariable relationships:

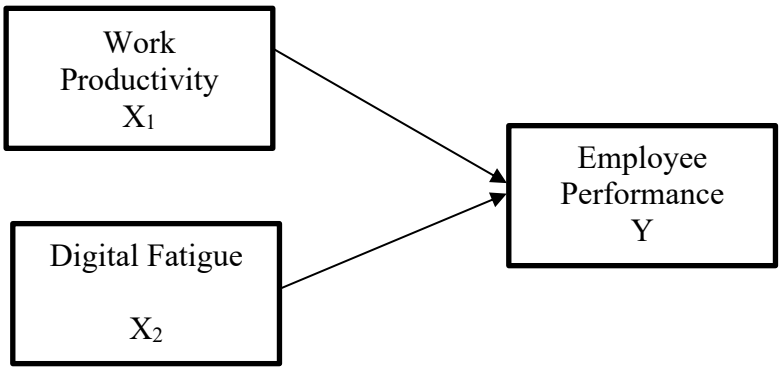

Figure 1.
Research Model

Based on the research model presented above, the hypotheses proposed in this study are as follows:

H_1: Work productivity has a positive and significant effect on employee performance.
H_2: Digital fatigue has a negative and significant effect on employee performance.
H_3: Work productivity and digital fatigue simultaneously have a significant effect on employee performance.

REVIEW OF LITERATURE

Employee Performance

Employee performance constitutes a fundamental element in human resource management and serves as a key determinant of organizational success in achieving strategic objectives. Hasibuan Malayu (2019) defines performance as the work outcomes achieved by employees in accordance with assigned responsibilities, which can be measured through work effectiveness and efficiency (Hasibuan Malayu, 2019, p. 34). This definition emphasizes that performance is not merely the quantity of output produced, but also reflects how effectively and efficiently employees utilize their capabilities and resources. This perspective is reinforced by Hartatik and Ismail (2024) in Manajemen Kinerja, who conceptualize performance as a governance process encompassing planning, monitoring, and reviewing targets to achieve optimal productivity (Hartatik, 2024). Their explanation highlights that employee performance is a dynamic and systematic process rather than a static outcome. Collectively, these viewpoints suggest that employee performance emerges from the interaction of internal factors, such as individual ability and motivation, and external factors, including the work environment, technological systems, and the increasing complexity of digital communication demands.

Work Productivity

In modern organizational contexts, work productivity is no longer viewed solely as the ability to generate physical output, but also encompasses the capacity to manage information, utilize digital technology, and complete tasks effectively. Drucker (2012) emphasizes that productivity in the knowledge era is largely determined by individuals'

ability to process information and appropriately apply knowledge within work processes (Drucker, 2012). This view underscores the central role of cognitive and informational competencies in shaping productivity outcomes. The Asian Productivity Organization (2015) defines productivity as the relationship between output and input formed through the interaction of various factors, including skills, quality of the work environment, technological mastery, and adaptability to digital change (Kalaw & Philippines, 2015). This definition is consistent with the perspective of Weihrich and Koontz (2010), who conceptualize productivity as the ratio of output to input while considering output quality (Koontz et al., 2012). Furthermore, Supriyadi et al. (2025) argue that individuals working in environments characterized by high technological intensity and dense information flows are more likely to experience excessive cognitive load, which reduces focus capacity, depletes psychological resources, and ultimately leads to increased errors and declining work productivity (Supriyadi et al., 2025).

Relationship between Digital Fatigue, Work Productivity, and Employee Performance

A growing body of empirical research indicates that increasing digital workload and mental fatigue resulting from continuous digital device usage can reduce employees' ability to perform optimally. Upadhyaya and Vrinda (2021) found that technostress arising from excessive technology use has a direct negative effect on individual productivity (Upadhyaya & Vrinda, 2021). This finding is supported by Zhao et al. (2020), who explain that digital pressure can inhibit cognitive capacity, trigger resource depletion, and ultimately reduce both employee performance and productivity (Zhao et al., 2020). In addition, Bailenson (2021) highlights that the escalating burden of digital communication, including demands for constant responsiveness and video-based interactions, contributes to digital fatigue that disrupts focus and work effectiveness (Bailenson, 2021). From an organizational perspective, AlMakhmari et al. (2024) confirm that techno-stressors such as information overload and high digital demands exert a significant negative impact on employee productivity, particularly when organizations fail to provide adequate coping strategies (Alkandari & Alabdulhadi, 2023). Collectively, these studies suggest that digital fatigue and excessive digital demands play a crucial role in shaping work productivity and employee performance in technology-intensive work environments.

RESEARCH METHOD

This study was designed using a quantitative approach with a survey method, which allows researchers to examine relationships among variables in an objective, measurable, and generalizable manner within the study population. The quantitative approach was selected because this research aims to analyze the causal relationships between work productivity, digital fatigue, and employee performance relationships that can be rigorously explained through numerical data systematically analyzed using statistical techniques (Creswell & Inoue, 2025). The survey method was considered appropriate as it provides respondents with the opportunity to directly express their perceptions, work experiences, digital workload, and productivity capacity, thereby enabling the collected data to reflect the actual conditions of employees working in a pharmaceutical company characterized by high accuracy demands and digitally intensive work processes, such as PT Otto Pharmaceutical.

The population of this study comprised all employees in the production division of PT Otto Pharmaceutical, namely those directly involved in raw material processing, packaging activities, system-based quality control, and digital reporting that supports daily production operations. The focus on production employees was deliberately chosen because this unit represents the group with the highest intensity of interaction with digital work instructions, reporting systems, quality documentation platforms, and technological tools supporting pharmaceutical manufacturing processes. The sampling technique employed was purposive sampling, with inclusion criteria consisting of a minimum of one year of work experience, direct involvement in production activities, and willingness to provide objective and accurate data (Zherdeva et al., 2025). This technique was deemed appropriate because not all production employees possess sufficient work experience or an equal level of digital exposure, and therefore selected respondents were expected to better represent the empirical conditions related to productivity levels, digital workload, and performance in the pharmaceutical production environment.

Data were collected using a closed-ended questionnaire based on a five-point Likert scale, ranging from "strongly disagree" to "strongly agree." The research instrument was developed based on three main constructs: work productivity, digital fatigue, and employee performance. Work productivity was measured using indicators including quantity of work output, quality of work, timeliness, efficiency in resource utilization, and task management capability, as proposed by Sutrisno (2020) and Bate'e (2020). Digital fatigue was measured through four indicators reflecting cognitive load resulting from digital technology use, namely mental exhaustion, decreased concentration, boredom due to high intensity of digital device usage, and pressure to remain continuously responsive, as identified in recent studies on technostress and digital fatigue (Hapsari et al., 2025; Septiawan, 2025). Employee performance was measured using indicators of work effectiveness, quality of work outcomes, discipline, responsibility, and teamwork capability, as described by Sedarmayanti (2019), Sutrisno (2020), and Mangkunegara (2021). The development of this instrument aimed to comprehensively capture the influence of work productivity and digital fatigue on employee performance within the operational context of pharmaceutical production (Andrina et al., 2022; Mangkunegara, 2021; Sedarmayanti, 2018).

Prior to conducting the main analysis, the research instrument was subjected to validity and reliability testing. Validity testing was conducted using the Pearson Product Moment correlation, whereby each item was considered valid if the calculated correlation coefficient exceeded the critical value of the r-table according to statistical criteria (Ghozali & Latan, 2021). Reliability testing was performed using Cronbach's Alpha coefficient, and the instrument was deemed reliable if it achieved an alpha value of at least 0.70, indicating satisfactory internal consistency (Gliem & Gliem, 2003). These instrument testing procedures were essential to ensure that all indicators consistently and accurately represented their respective theoretical constructs.

Data that met the validity and reliability requirements were subsequently analyzed using SPSS software version 27. Descriptive analysis was employed to provide an overview of respondents' characteristics and general response patterns for each research variable. Inferential analysis was then conducted using multiple linear regression to examine the partial and simultaneous effects of work productivity and digital fatigue on the performance of production employees at PT Otto Pharmaceutical. Through this research design, the study

seeks to present empirical findings that explain how productivity and digital fatigue contribute to employee performance within a pharmaceutical production environment governed by stringent quality standards. The quantitative approach supported by SPSS enables the relationships among variables to be tested in a measurable and systematic manner, thereby allowing the results to serve as a basis for formulating strategies related to productivity enhancement, digital workload management, and more effective and adaptive human resource management practices in the production area of PT Otto Pharmaceutical.

RESULTS AND DISCUSSION

The research findings were obtained through the distribution of questionnaires to 107 respondents, representing a total population of 146 employees in the production division of PT Otto Pharmaceutical. Data collection was conducted between October and December 2025, ensuring that the data accurately reflected employees' working conditions at the time of the study. The demographic characteristics of the respondents indicate a relatively balanced gender distribution, although male respondents slightly predominated, accounting for 52.3%, while female respondents comprised 47.7% of the sample. In terms of age, the majority of respondents were within the productive age range of 30–35 years, representing 27.1% of the total sample. This was followed by respondents aged 25–29 years at 24.6%, while those aged 36–40 years accounted for 19.8%.

With respect to length of service, most respondents had worked for the company between 2 and 5 years, representing 31.4% of the sample. Respondents with a tenure of 6–10 years constituted the second-largest group at 25.7%, followed by those with 11–15 years of service at 18.9%. The diversity of respondent characteristics provides a representative demographic profile for analyzing the effects of work productivity and digital fatigue on the performance of production employees. These findings serve as an important empirical foundation for understanding how productivity levels and digital fatigue contribute to employee performance within the pharmaceutical industry, which is characterized by high demands for process accuracy, operational efficiency, and strict compliance with production quality standards.

Table 1.
Summary of Descriptive Analysis Results

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Work Productivity	135	24.00	50.00	38.7259	6.72091
Digital Fatigue	135	8.00	40.00	19.0370	5.97933
Employee Performance	135	30.00	50.00	41.1259	5.09672
Valid N (listwise)	135				

Based on the results of the descriptive statistical analysis, the research data were obtained from 135 respondents, all of whom were declared valid. The work productivity variable recorded a mean value of 38.73 with a standard deviation of 6.72, indicating that respondents' productivity levels were relatively high, although individual variations were

still evident. This finding suggests that most employees are able to perform their tasks effectively; however, differences in workload management capabilities and the ability to utilize technology optimally continue to influence productivity outcomes.

The digital fatigue variable showed a mean value of 19.04 with a standard deviation of 5.98, reflecting a moderate level of digital fatigue among respondents. This condition indicates that the intensity of digital device usage in daily work activities has the potential to generate cognitive and emotional fatigue when not properly managed. Excessive exposure to digital systems and continuous connectivity demands may gradually reduce employees' psychological resilience and concentration.

The employee performance variable exhibited a mean value of 41.13 with a standard deviation of 5.10, indicating that overall employee performance falls within a good category and remains relatively consistent across respondents, which suggests that employees are generally able to meet work targets and quality standards despite variations in workload intensity and digital demands. This finding is consistent with previous studies emphasizing that work productivity and digital fatigue are critical factors influencing employee performance in technology-based work environments (Bailenson, 2021; Upadhyaya & Vrinda, 2021; Zhao et al., 2020).

Table 2.
Results of the Pearson Correlation Test

Correlations

		Work Productivity	Digital Fatigue	Employee Performance
Work Productivity	Pearson Correlation	1	-.089	.438**
	Sig. (2-tailed)		.303	.000
	N	135	135	135
Digital Fatigue	Pearson Correlation	-.089	1	-.110
	Sig. (2-tailed)	.303		.205
	N	135	135	135
Employee Performance	Pearson Correlation	.438**	-.110	1
	Sig. (2-tailed)	.000	.205	
	N	135	135	135

**. Correlation is significant at the 0.01 level (2-tailed).

The validity testing of the research instrument was conducted on 36 statement items using the Pearson correlation technique through Corrected Item–Total Correlation analysis. The results indicate that all items obtained correlation coefficient values (r-calculated) exceeding the r-table value of 0.190 at a 5% significance level with a total of 107 respondents. These findings demonstrate that each statement item satisfies the validity criteria and is able to adequately represent the constructs being measured. The item-to-total correlation

coefficients ranged from 0.612 to 0.971, indicating that the relationships between individual items and their respective constructs fall within the strong to very strong category (Ghozali & Latan, 2021).

Furthermore, the reliability of the research instrument was assessed using Cronbach's Alpha coefficient to evaluate the internal consistency of each research variable. The analysis results show that the Leadership Style variable (X_1) achieved a Cronbach's Alpha value of 0.941, the Quiet Quitting variable (X_2) recorded a value of 0.985, and the Employee Performance variable (Y) obtained a value of 0.983. All coefficients exceed the recommended minimum reliability threshold of 0.70, confirming that the instrument demonstrates excellent internal consistency. These results affirm that each item is stable, reliable, and capable of accurately measuring the intended research constructs. Accordingly, the research instrument is deemed appropriate and reliable for use in subsequent stages of data analysis (Ghozali & Latan, 2020; Sugiyono, 2014; Taherdoost, 2016; Tavakol & Dennick, 2011).

Table 3
Coefficient of Determination (R^2) Results

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.443[a]	.197	.184	4.60294

a. Predictors: (Constant), Digital Fatigue, Work Productivity.

Based on the results of the coefficient of determination test presented in the Model Summary table, the regression model demonstrates an adequate capability in explaining variations in employee performance. The multiple correlation coefficient (R) of 0.443 indicates a moderate simultaneous relationship between work productivity and digital fatigue in relation to employee performance. According to Ghozali (2021), a correlation coefficient within this range reflects a meaningful association in a multiple linear regression model. Furthermore, the coefficient of determination (R Square) value of 0.197 suggests that work productivity and digital fatigue jointly account for 19.7% of the variance in employee performance, while the remaining 80.3% is influenced by other factors not included in the research model. This condition is consistent with the views of Mangkunegara (2021) and Sedarmayanti (2018), who argue that employee performance is shaped by various determinants, such as work motivation, leadership style, work environment, and individual characteristics, which cannot be fully accommodated within a single research model (A. P. Mangkunegara, 2021; Sedarmayanti, 2018).

Table 4
ANOVA (F-test)

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	684.169	2	342.085	16.146	.000[b]
	Residual	2796.690	132	21.187		
	Total	3480.859	134			

a. Dependent Variable: Employee Performance
b. Predictors: (Constant), Digital Fatigue, Work Productivity

The results of the ANOVA test presented in Table 4 indicate that the developed regression model meets the criteria of model adequacy. The F-value of 16.146 with a significance level of 0.000 confirms that the third hypothesis (H_3) is accepted, indicating that work productivity and digital fatigue simultaneously exert a significant effect on employee performance. This finding underscores that the combination of employees' ability to generate work output effectively and the level of digital fatigue they experience plays a crucial role in explaining variations in performance. The results are consistent with the findings of Zhao et al. (2020) as well as Upadhyaya and Vrinda (2021), who argue that productivity factors and technology-based pressures jointly influence individual performance, particularly in work environments that are highly dependent on digital technologies (Upadhyaya & Vrinda, 2021; Zhao et al., 2020). Furthermore, a study by Supriyadi et al. (2025) also confirms that digital fatigue contributes significantly to employee performance when examined alongside other work-related factors.

Table 5
Partial Significance Test (t-test) Analysis

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	29.620	2.754		10.754	.000
	Work Productivity	.327	.059	.431	5.505	.000
	Digital Fatigue	-.061	.067	-.071	-.911	.364

a. Dependent Variable: Employee Performance

The partial regression analysis demonstrates that work productivity has a positive and statistically significant effect on employee performance. The regression coefficient of 0.327,

accompanied by a t-value of 5.505 and a significance level of 0.000, indicates that the first hypothesis is accepted. This finding suggests that an increase in work productivity is consistently followed by a tangible improvement in employee performance. Work productivity reflects an individual's ability to manage tasks, time, and work resources effectively in order to generate optimal output. The results of this study are consistent with the findings of Zulkarnaini and Haholongan (2025), who report that work productivity makes a significant contribution to enhancing employee performance, and are further reinforced by Mangkunegara (2021), who emphasizes that productivity constitutes a key determinant in the achievement of organizational performance (A. P. Mangkunegara, 2021; Zulkarnaini & Haholongan, 2025).

The partial test results for the digital fatigue variable reveal a negative regression coefficient of –0.061, with a t-value of –0.911 and a significance level of 0.364. As this significance value exceeds the threshold of 0.05, the second hypothesis is not empirically supported. This finding indicates that digital fatigue does not exert a direct and significant effect on employee performance. Such a condition implies that the impact of digital fatigue tends to be indirect and is influenced by other intervening factors, including job stress, psychological well-being, and individuals' adaptive capacity in responding to technological demands. This result is in line with the study conducted by Brilianti et al. (2023), which found that digital stress does not always directly affect performance, and is further supported by Netty Laura and Meidina (2022), who emphasize that the influence of digital pressure on performance is often mediated by variables related to employee well-being (Brilianti & Budiarto, 2023; Netty Laura & Meidina, 2022).

Overall, the findings of this study indicate that employee work behavior, particularly quiet quitting, exerts a stronger influence on performance than structural factors such as leadership style. This result emphasizes that improvements in employee performance do not solely depend on formal managerial aspects, but are also closely related to the level of employee engagement and psychological commitment to their work. Organizations therefore need to place greater emphasis on strengthening employee engagement through the creation of a supportive work environment, the provision of fair and transparent reward systems, and the availability of continuous opportunities for personal and professional development. Although leadership remains an important factor within this context, the approaches adopted should be oriented toward fostering work relationships that are capable of minimizing the emergence of disengagement behaviors. Accordingly, the relationship between leadership, quiet quitting, and employee performance should not be viewed as independent constructs, but rather as interconnected elements that collectively shape the psychological and organizational dynamics determining overall employee performance quality.

CONCLUSION

Based on the results of the analysis and discussion, it can be concluded that work productivity has a positive and significant effect on the performance of employees in the production division of PT Otto Pharmaceutical. This finding indicates that employees' ability to manage tasks, time, and work resources effectively plays a crucial role in enhancing performance outcomes. Higher levels of work productivity are consistently associated with better quality and effectiveness of employee performance. Meanwhile, digital fatigue is shown to have a negative relationship with employee performance, although its partial effect is not statistically significant. This result suggests that digital fatigue does not directly reduce performance, yet it still has the potential to influence employees' working conditions through psychological and cognitive aspects if not properly managed. In this context, digital fatigue tends to function as a supporting factor whose impact may be strengthened or weakened by other working conditions, such as workload management systems, organizational support, and individual adaptability to technological demands.

Simultaneously, work productivity and digital fatigue are proven to have a significant combined effect on employee performance. This finding emphasizes that performance achievement in a technology-based pharmaceutical production environment is not determined solely by the ability to generate work output, but also by how organizations manage the intensity and pressure associated with the use of digital systems. The combination of high work productivity and effective management of digital fatigue therefore becomes a key factor in maintaining the stability and quality of employee performance.

The practical implications of this study highlight the importance of management's role in improving work productivity through the strengthening of efficient work systems, the provision of skill development and training programs, and the optimization of technology utilization. In addition, companies need to pay close attention to the potential risks of digital fatigue by regulating digital workloads, providing adequate recovery time, and creating a work environment that supports a balance between technological demands and employees' capacities. These efforts are expected to encourage sustainable improvements in employee performance and to enhance organizational competitiveness in responding to the challenges of digital transformation within the pharmaceutical industry.

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