

Analysis Of Internal And External Factors On The Productivity Of Maintenance Workers

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Abstract

Work productivity is a picture of the ability of employees to produce compared to the inputs used. The high level of work productivity can increase the value and achievement of a company. Many factors affect the level of productivity of workers, such as individual factors to work environment factors. Therefore, researchers will examine the factors that affect the level of productivity in maintenance workers. This research method uses quantitative methods with the type of observational research with a cross-sectional design. The population in this study were maintenance workers at PT. X in the Surabaya city, with sampling using a total population of 40 people. The results of this study show that there are several factors that affect productivity in workers. Based on the results of the analysis, productivity at PT. X is influenced by age, education level, length of service, and noise exposure. This is known from the results of the significance value which has a value of $\alpha < 0.05$. But on the factor of marital status has no influence on the level of productivity of workers. So it can be concluded that the level of productivity of workers can be influenced by older age, lack of education, long working time and noise exposure. So it is necessary to make improvements in order to increase productivity in workers such as implementing fit to work, adjusting workload and getting enough rest.

Keywords: Occupational Health, Work Productivity, Work Period, Age workers, Education, Noise Condition

1. Introduction

Developments in the industry nowadays, many problems occur, one of which is related to human resources that are the foundation for the Company. All company targets in maintaining and managing quality human resources are increasingly urgent by the changing environmental dynamics related to the importance of productivity in workers. Employee work productivity as a benchmark for every company in carrying out its business activities both in terms of quality and quantity of products. Companies not only have large capital to achieve their goals but companies need to pay attention to other production factors including nature, labor and expertise where these factors cannot stand alone but must support each other to achieve goals effectively and efficiently (Wirawan., et al, 2019).

High efficiency at work can be determined by a worker's excellent health, but when a worker's health is compromised, it may be harder for them to concentrate or perform physically demanding tasks. Work tiredness is one example of a health issue that employees may encounter (Suma'mur, 2014). The most susceptible among

workers to health issues is the industrial workforce. According to previous research, 43.3% of workers in the informal sector had health issues, including weariness, which could lead to a decline in productivity (Sunaryo, M & Rhomadhoni, M.N., 2020).

Growing quantity and quality can be used to interpret productivity. The ability of an individual or group of individuals to produce products in the form of goods or services, both in number and quality, and to varying degrees, is known as work productivity. The individual's health is one of the crucial elements that can affect work productivity (Mahawati., et al, 2021). An indicator of how well workers are utilized in a production process to produce the desired output is labor productivity. The workforce's average age is one of the supporting factors. Workers with a productive age level of 15 to 50 years old can learn new activities quickly and are adept at using technology. With non-productive age workers, however, it is different because their physical capabilities are undoubtedly declining and it is challenging for them to adapt to technology, which will result in a loss in work productivity. Increasing staff productivity is one of the company's strategies for enhancing competitiveness. However, raising productivity at work is a difficult task. The top leadership of an organization or company typically faces numerous challenges while attempting to boost job productivity, necessitating a unique strategy, particularly from the staff members of the company themselves (Aspiyah, M & Martono, S., 2017).

One of the many variables that can impact a worker's level of productivity is their nutritional status. According to the Manpower Act, the working time is 7 hours per day and 40 hours per week for people who work six days a week, and 8 hours per day and 40 hours per week for people who work five days a week. A person can typically work well for 6 to 10 hours each day (Aprilyanti, S., 2017). The ability to work for long stretches of time is only one aspect of extending working hours; working long hours also increases the likelihood of exhaustion, health issues, disease, accidents, and discontent. The performance and quality of the work can be negatively impacted by excessive workloads. A physiologically excessive workload will undoubtedly have an effect on one's health and productivity at work (Suma'mur, 2014). Industrial workers are those who are most vulnerable to health problems. Previous research stated that 43.3% of workers in the informal sector experienced health problems, one of which was fatigue, which could result in decreased productivity (Sunaryo, M., et al., 2023).

A good work environment if employees in a company carry out their operational activities can run smoothly. Increasing employee productivity for the better needs to be supported by a healthy and conducive work environment. Employee productivity can increase if the work environment around employees is conducive, because a conducive work environment will be able to provide smoothness, a sense of pleasure, security and safety in carrying out the tasks assigned to him. Companies really need optimal employee productivity in order to get maximum results, so it is very important for companies to pay attention in terms of providing motivation for employees such as bonuses and rewards. This is done so that employees feel not quickly satisfied so that it will further increase their productivity so that the desired goals are achieved (Khairunisa, N.B., et al, 2020).

Therefore, this study was conducted to determine whether age, marital status, Education, work period, noise conditions in the workplace can affect the level of productivity of workers. if these factors affect the level of productivity in workers, this can provide an appropriate evaluation in regulating the work system in order to improve productivity in workers. So that the performance of workers can increase and this can increase the company's targets and all work activities in the workplace can be carried out properly.

2. Materials and methods [This section provides detailed methodology carried out to achieve the objective]

2.1 Materials

This study uses quantitative research methods with the type of observational research and cross-sectional approach. This research was conducted at PT.X is one of the companies in the field of services and ports in the city of Surabaya.

2.2 Data collection procedures

The population in this study were all workers with a total population of 40 workers. The sample in this study is the total population, so there are 40 respondents. The data collection used is primary data with interview techniques with the help of questionnaires and observations.

2.3 Data analysis

The test used in this study is the regression test, to determine the effect between the independent variables (Internal factors include age, marital status, Education, work period) (External factors include noise conditions in the workplace) and the dependent variable (work productivity). Assessment using the results of p value <0.05 then the hypothesis is accepted which means that there is an influence of the independent variable with the dependent variable.

3. Results and discussion [A good scientific paper has minimum 5 sections]

The following are the results of research Analysis of the effect of Internal factors i.e. age, marital status, Education, length of service and External factors i.e. noise conditions in the workplace

3.1 Distribution of age, marital status, Education, work period, noise conditions in the workplace, and worker productivity

Table 1. Distribution of respondents based on age

Age	Information	n	%
	26-35 Years	14	35
	36-45 Years	17	42,5
	≥ 46 Years	9	22,5
	N	40	100

The results of the age distribution show that 42,5% of respondents have an age within 36-45 years.

Table 2. Distribution of respondents based on Education

Education	Information	n	%
	High School	7	17,5
	Diploma III	13	32,5
	Diploma IV / Bachelor	10	25
	N	40	100

The results of the education distribution show that 32,5% of respondents have a level of education is Diploma III

Table 3. Distribution of respondents based on Marital status

Marital Status	Information	n	%
	Unmarried	4	10
	Married	33	82,5
	Divorce	3	7,5
	N	40	100

The results on the distribution of marital status show that Most workers are married i.e. 82,5% of respondents are married.

Table 4. Distribution of respondents based on work Period

Work Period	Information	n	%
	≤ 10 Years	13	32,5
	>10 Years	27	67,5
	N	40	100

The results on the distribution of work period show that 67,5% of respondents have work period more than 10 years, while 33% of respondents have work period less than or equal to 10 years.

Table 5. Distribution of identification noise conditions

Identification noise condition	Information	n	%
	Does Not exceed by threshold limit value	26	65
	exceed by threshold limit value	14	35
	N	40	100

The results on the distribution of identification noise condition showed that 65% of respondents Work in a quiet environment, 35% of respondents Work in noisy environments.

Table 6. Distribution of Work Productivity

Work Productivity	Information	n	%
	lack of Productive	13	32,5
	Productive	27	67,5
	N	40	100

The results on the distribution of productivity show that 32,5% of respondents have a lack of productive status, while 67,5% of respondents have a productive work status.

3.2 Results of the analysis of the effect of age, marital status, Education, work period, noise conditions in the workplace on work productivity

The results of the analysis in the study, is in the table below:

Table 7. Analysis of Factors Affecting Work Productivity

Variabel	Wald	Df	Sig
Age	9.836	1	0.012
Education	8.005	1	0.029
Marital Status	0.133	1	0,779
Work Period	8.566	1	0.003
Noise Condition	11.216	1	0,001

Based on the results in Table 7, the results of the age analysis have a significance value or P value < from the alpha value (α) (0.05), which is 0.012, which means age factors have a significant influence on worker productivity. This is in line with research conducted on assembly workers at PT. X found that operators with low work productivity are dominated by operators with old age and operators with medium and high work productivity are dominated by workers with a young age. The results of the correlation test show a very strong relationship between age and work productivity with the direction of a positive relationship (Novianti, et al., 2017). The higher the age, the higher the productivity. The increasing age of the worker, the more the level of productivity increases because the worker is in productive age, but the older the age of the worker, the lower the level of productivity due to limited physical and health factors that influence (Kumbadewi, LS., 2016). This research is also in line with research conducted by Yasefia.A on nurses in hospital inpatient installations. Dr. Reksodiwiryono also pointed out that there is a relationship between age and productivity (Yasefia, 2015). This research is in line with research conducted by Pratama, et al (2015) it is known that age variables have a significant influence on work productivity variables. Basically, age is one of the factors that affect labor productivity. As you get older, the knowledge of the tea picking workforce will be better. This is because the increase in work productivity is only up to a certain age where then if the age increases, then productivity decreases. This decrease can be caused by weakened physical and health conditions (Pratama, et al., 2015).

The results of the analysis of the effect of education level on productivity in employees are known to have a significant influence. This is known based on the significance value of 0.029 which is less than the value of alpha (α) (0.05). These results are in line with research conducted by Harahap, et al., conducted at BPSDM DKI Jakarta Province in 2019 showing an increase in performance as long as the education level factor also increases (Harahap, et al., 2019). This is in line with the results of research by The World Bank in collaboration with the State Civil Service Agency (BKN) which states that the higher the level of education for civil servants, the greater the chance of promotion by two points for Bachelor and four points for Master's and

Doctoral (Dewi, D.K.R., et al, 2016). Understanding education is a conscious and planned effort to realize the learning process and learning atmosphere so that students actively develop their potential to have religious spiritual strength, personality, self-control, intelligence, noble character, and skills needed by themselves, society, nation and state. Education is an effort to persuade or learn to the community, so that people want to take actions (practices) to maintain (overcome problems), and improve their health (Harahap, et al., 2019).

Then on the work period, it is also known to have a significance value or P value < from the alpha value (α) (0.05), which is 0.005. Based on these results, it can also be seen that the tenure factor has a significant influence on the level of productivity of workers. According to research by Aprilyanti, S., and Pamungkas et al. (2017), the duration of the workday is one of the elements that affects a person's productivity at work. Someone is working a lot of hours. A worker's skills and ability to perform the work will improve the longer they work there. Continuous work experience might help a person become more technically mature. A person's tenure indicates how well-versed they are in using technical parts of tools and working methods. There are a number of elements that indicate whether an employee is experienced or not, as well as an indicator of work experience, including the amount of time/age spent working, the level of knowledge and abilities, and the mastery of the task at hand and the equipment. This research is in line with research conducted by Jannandrayuga Subadra (2015) on Sewing Process Workers at Star Konvection Karanganyar, it is known that of the 31 respondents studied, respondents who have a new category of work period with productivity that does not meet the target there are 7 respondents and for respondents who have a new category of work period with productivity meeting the target there are 3 respondents. As for respondents who have a medium working period with productivity that does not meet the target there are 7 respondents and for respondents who have a medium category working period with productivity that meets the target there are 14 respondents. Based on the results of the gamma correlation test shows that there is a significant correlation with the value of $p = 0.047$; $r = 0.647$. So concluded, There is a significant relationship between the two variables with a value of $p = 0.047$; $r = 0.647$ with correlation direction + (positive) and strong correlation strength (Subadra, J., 2015).

The results of the effect of noise exposure on productivity show that from the data with categories for noise, p value = 0.001 is obtained, which means $p < 0.05$ so that the test results show a significant value, so that H_0 is accepted, in other words, the influence of work environment factors (noise) that exceeds TLV on the productivity of the maintenance section. Based on research conducted by Farisky (2021) about the relationship between noise and work productivity in Katahui has a low relationship so that it can be known if noise has a low effect on the level of worker productivity (Farisky, et al, 2021). Research conducted by Setiawan (2016) on the relationship between noise perception and work productivity found that the relationship between noise perception and work productivity at a significant level of 1%. The significant value indicated by the value of $r = 0.680$ and the value of $P = 0.000$ is smaller than the significant level used, which is 0.01 ($0.000 < 0.01$) so that it can be said that there is a significant positive correlation between the level of noise perception and employee work productivity. This shows that the higher the level of noise perception in a job, the more it will affect the level of employee work productivity (Setiawan, F., 2016). Noise is a sound that is not desired by humans around him and can cause health problems in humans who are exposed. Noise intensity that exceeds the

NAV of >85 dBA can cause hearing loss, comfort disturbances, sleep disturbances, stress, and other disorders. Sound or sound produced from a source that can be heard by humans as nerve cell stimulation in the ear by longitudinal vibrational waves produced from the sound source. Longitudinal waves can propagate through air media or can also be other conductors, if the sound or sound is

not desired or desired by humans then the sound or sound can be said to be noise. Noise prevention is very necessary to reduce the risks that can occur to workers. Noise prevention can be done starting from planning machines and installing tools that can reduce the noise generated by production machines. Noise prevention is very necessary to reduce the risks that can occur to workers. Noise prevention can be done starting from planning machines and installing tools that can reduce the noise generated by production machines (Suma'mur, 2017).

In the results of the marital status analysis, it is known that it has a significance value exceeding the alpha value, which is 0.779. Based on this, it can be concluded that marital status has no influence on the level of productivity in workers. This research is in line with research conducted by Suryani (2016), that marital status has no significant relationship with the work productivity of female factory workers with a p value of 1,000 (p value > 0.05). It is known that the impact of marriage on employee productivity shows that married employees are more absent, experience higher turnover and are more quickly satisfied in their jobs than their unmarried colleagues. It can be concluded that the results of the study do not fit between theories because the possibility of married factory workers has greater burdens and responsibilities than factory workers who have not worked. So that married factory workers will usually be enthusiastic about working because they want more wages to meet the needs of themselves and their families (Suryani, et al., 2016). Research conducted by Sintha Fransiske, et al (2022), also shows that marital status has no relationship with the status of work productivity in the workforce during the pandemic (Sintha. F.S., et al. 2016).

4. Conclusion

Productivity is a process by which human resources can produce an output with a productive measure. Productivity can also be interpreted as a process that focuses attention on the output produced by human resources with a ratio between input and output. Work productivity itself is the ability of a person or group of people to produce products in the form of goods or services, both in quantity and quality, increasing from time to time. A person's work productivity can be influenced by many factors, such as work, environmental, individual or health factors. Low productivity describes the condition of the company that is less than optimal in using its workforce which eventually the company will lose because the resulting target is not commensurate with the costs borne

Based on the results of the analysis, to determine the influence of internal factors (age, length of work, level of education, marital status) and external factors (noise conditions at work) on productivity. It is known that these factors have a significance value or P value < of alpha value (α) (0.05), namely age (0.012), education level (0.029), length of service (0.003), noise conditions (0.001). This shows that these factors have a significant influence on the level of productivity in workers. But the marital status factor has a significance value or P value > of the alpha value (α) (0.05), which is 0.779 so that Marital status factors have no influence on productivity in workers.

In order to prevent working hours from exceeding the allotted time and to be able to adjust the workload to the capabilities of the workforce, it is necessary to monitor, supervise, and improve the work system for

employees. This will prevent workers from complaining about feeling bored at work. After working for 4 hours, employees must take a 30-minute break to allow their bodies to recover. By taking this break, they may organize their time better and make the most of their day off. Rest to lessen work-related exhaustion, and change sleep schedule to allow for 7-8 hours per day so that they are rested or in good health when they resume their jobs.

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Conflict of interest

This research was conducted in 2023 and has never been published anywhere, therefore the author hopes that this article can be published in a reputable journal Scopus.

References [If possible, avoid citing from website, proceedings, and Wikipedia]

- Ahmadi, F., Erbil, P., Ahmadi, N., & Cetrez, Ö. A. (2019). Religion, culture and meaning-making coping: A study among cancer patients in Turkey. *Journal of Religion and Health*, 58, 1115–1124. <https://doi.org/10.1007/s10943-018-0646-7>
- Bakar, B. A. (2020). Integrating spirituality in tourism higher education: A study of tourism educators' perspectives. *Tourism Management Perspectives*, 34(February), 100653. <https://doi.org/10.1016/j.tmp.2020.100653>
- Chalik, A. (2010). Religion and local politics: Exploring the subcultures and the political participation of east java NU elites in the post-new order era. *Journal of Indonesian Islam*, 4(1), 109–150. <https://doi.org/10.15642/JIIS.2010.4.1.109-150>
- Aprilyanti, S. "Effect of Age and Working Period on Work Productivity (Case Study: PT. OASIS Water International Palembang Branch)". 2017. *Journal of Industrial Systems and Management* Vol 1 No 2..
- Aspiyah, M., & Martono, S. "The Influence of Work Discipline, Work Environment and Training on Work Productivity". 2017. *Management Analysis Journal*, 5(4).
- Dewi, D., K., R., Suwendra, I., W., & Yulianthini, N., N. (2016). Pengaruh Tingkat Pendidikan dan Motivasi Kerja Terhadap Kinerja Karyawan. *E-Journal Bisma Universitas Pendidikan Ganesha Jurusan Manajemen*, vol.4
- Farisky, Ardini Mei, and Herry Koesyanto. "Hubungan Kebisingan Terhadap Produktivitas Kerja Pada Area Produksi Di PT. Alis Jaya Ciptatama, Ceper, Klaten." *Indonesian Journal of Public Health and Nutrition* 1.3 (2021): 456-461.
- Harahap, Susi Susilawati, et al. "Hubungan usia, tingkat pendidikan, kemampuan bekerja dan masa bekerja terhadap kinerja pegawai dengan menggunakan metode Pearson Correlation." *Jurnal Teknovasi* 6.2 (2019): 12-26
- Khairunisa Nur Baiti, Djumali, Eny Kustiyah. "Produktivitas Kerja Karyawan Ditinjau Dari Motivasi, Disiplin Kerja Dan Lingkungan Kerja Pada Pt. Iskandar Indah Printing Textile Surakarta". *Edunomika – Vol. 04, No. 01* (Februari 2020)
- Kumbadewi LS, Suwendra I wayan, Susila GPAJ. "Pengaruh Umur, Pengalaman Kerja, Upah, Teknologi, dan Lingkungan Kerja terhadap Produktivitas Karyawan". 2016;4. -*Journal Bisma Universitas Pendidikan Ganesha*

- Mahawati, E., Yuniwati, I., Ferinia, R., Rahayu, P. P., Fani, T., Sari, A. P., ... & Bahri, S. "Workload Analysis and Work Productivity". Our Writing Foundation. 2021
- Novianti, Brigita, Bina Kurniawan, and Baju Widjasena. "Hubungan antara Usia, Status Gizi, Motivasi Kerja, dan Pengalaman Kerja dengan Produktivitas Kerja Operator Bagian Perakitan di PT. X." *Jurnal Kesehatan Masyarakat (Undip)* 5.5 (2017): 79-88.
- Pratama, Ary Rahmady, and Dwi Retno Andriani. "Analisis faktor-faktor yang mempengaruhi produktivitas kerja pemetik teh di PTPN XII (Persero) Kebun Wonosari." *Habitat* 26.1 (2015): 1-9.
- Setiawan, Felis. *Hubungan Persepsi Kebisingan dengan Produktivitas Kerja Karyawan*. Diss. University of Muhammadiyah Malang, 2016.
- Sintha Fransiske, S., Nanang Nasrulloh, and Iin Fatmawati. "Status Gizi dan Faktor Lainnya dengan Produktivitas Kerja Tenaga Kerja Pada Masa Pandemi Covid-19." (2022).
- Suma'mur. "Corporate Hygiene and Occupational Health (HIPERKES) (2nd ed.)". 2014. Jakarta: CVSagung Seto.
- Sunaryo, M., & Rhomadhoni, M. N. "Overview and Control of Work Climate With Health Complaints on Workers". 2020. *Medical Technology and Public Health Journal*, 4(2), 171-180.
- Sunaryo, Merry, et al. "Analysis of energy needs and energy intake with health status of field workers at PT. A." *Bali Medical Journal* 12.2 (2023): 1964-1966.
- Suma'mur, P. K. "Higiene perusahaan dan kesehatan kerja (HIPERKES)." (2017).
- Subadra, Jannandrayuga. "Hubungan Masa Kerja dengan Produktivitas Kerja pada Pekerja Proses Menjahit di Star Konveksi Karanganyar." (2015).
- Suryani, Lilis, Rina Marlina, and Maria Alia Rahayu. "Hubungan Umur, Tingkat Pendidikan, Status Pernikahan, Status Gizi Dan Kejadian Anemia Terhadap Produktivitas Kerja Buruh Pabrik Perempuan." *HSG Journal* 1.1 (2016).
- Wirawan, P. J., Haris, I. A., & Suwena, K. R. "Pengaruh Disiplin Kerja Terhadap Produktivitas Kerja Karyawan Bagian Produksi Pada Pt. Tirta Mumbul Jaya Abadi". 2019. *Jurnal Pendidikan Ekonomi Undiksha*, 10(1), 305. <https://doi.org/10.23887/jjpe.v10i1.20149>
- Yasefia A. "Hubungan Umur, Sikap, Motivasi dan Disiplin Kerja dengan Kinerja Perawat di Instalasi Rawat Inap RS Dr. Reksodiwiryo Padang". 2015

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