Data Science : Journal Of Computing And Applied Informatics
Journal homepage: https://jocai.usu.ac.id

Analysis of Employee Work Stress Using CRISP-DM to Reduce Work Stress on Reasons for Employee Resignation

Emral Hakim and Ahmad Muklason*
Department of Technology Management, Institut Teknologi Sepuluh Nopember, 60111, Surabaya, Indonesia
*Corresponding Author: mukhlason@is.its.ac.id

ARTICLE INFO
Article history:
Received 05 December 2023
Revised 01 February 2024
Accepted 06 Maret 2024
Available online 31 July 2024

E-ISSN: 2580-829X
P-ISSN: 2580-6769

How to cite:
Emral Hakim and Ahmad Muklason, "Analysis of Employee Work Stress Using CRISP-DM to Reduce Work Stress on Reasons for Employee Resignation", Data Science : Journal Of Computing And Applied Informatics, vol.8, no.2, July 2024, doi: http://doi.org/10.32734/jocai.v8.i2-14615

ABSTRACT
Internal audit activities at one of EPC companies have found a trend of increasing work stress as a reason for employee resignation in the period Q4 2021 - Q1 2023. In implementing ISO 45001:2015 this must be controlled because it is tend to a psychological occupational disease. For this reason, a work stress survey was carried out. The results of which were reviewed using Cross Industry Standard Process for Data Mining (CRISP-DM). Descriptive analysis found two factors that influence the level of work stress, namely demands for work quality and taking responsibility for other people's work results. More specifically, the level of work stress is because employees are required to exceed their capabilities but at the same time have to help other people solve problems. Apart from that, based on Cluster analysis, 2 optimal clusters were found. Cluster-1 has a moderate stress centroid for overall work stress factors. Cluster-2 has a light stress centroid for the overall work stress factor. The recommendation for controlling work stress in cluster-1 is to prepare a program to increase employee competency and improve the performance measurement system. Controlling work stress cluster-2 is annual monitoring through employee work stress surveys.
Keyword: Work Stress, Descriptive, Diagnostic, K-Modes Clustering, SECI

ABSTRAK
Kegiatan audit internal di salah satu perusahaan EPC telah menemukan tren meningkatnya stres kerja sebagai alasan pengunduran diri karyawan pada periode Q4 2021 – Q1 2023. Dalam implementasi ISO 45001:2015 ini harus dikendalikan karena cenderung menjadi penyakit psikologis kerja. Oleh karena itu, dilakukan survei stres kerja. Hasilnya ditinjau menggunakan Cross Industry Standard Process for Data Mining. (CRISP-DM). Analisis deskriptif menemukan dua faktor yang mempengaruhi tingkat stres kerja, yaitu tuntutan untuk kualitas kerja dan tanggung jawab atas hasil kerja orang lain. Lebih khusus lagi, tingkat stres kerja adalah karena karyawan diminta untuk melebihi kemampuan mereka tetapi pada saat yang sama harus membantu orang lain memecahkan masalah. Selain itu, berdasarkan analisis Cluster, 2 cluster optimal ditemukan. Cluster-1 memiliki centroid stres moderat untuk faktor stres kerja secara keseluruhan. Cluster-2 memiliki centroid stres ringan untuk faktor stres kerja secara keseluruhan. Rekomendasi untuk mengendalikan stres kerja di cluster-1 adalah untuk menyiapkan program untuk meningkatkan kompetensi karyawan dan meningkatkan sistem pengukuran kinerja. Pengendalian stres kerja cluster-2 adalah pemantauan tahunan melalui survei stres kerja karyawan.
Keyword: Stres kerja, deskriptif, diagnostik, K-mode clustering, SECI

1. Introduction

All companies that engage in construction services such as Engineering, Procurement and Construction (EPC) must be based on security and safety aspects [1]. There are two types of safety and health certificates

that are applied in Indonesia such as certificates with International Standards, namely International Organization for Standardization (ISO) 45001:2018, and National Standard, namely Occupational Health and

Safety Management Systems (SMK3). One form of assessment to maintain the competency certificate is that the organization must carry out internal audit activities [2].

One of the risk findings obtained was in the Human Resource function, namely an increase in the amount of employee work stress as a reason for employee resignation. Work stress is an occupational disease in psychological terms that can lead to unsafe behavior at work [3,4,5,6,7]. This reason for work stress has dominated the factors causing employee resignations since Q4 2021 – Q1 2023 as below:

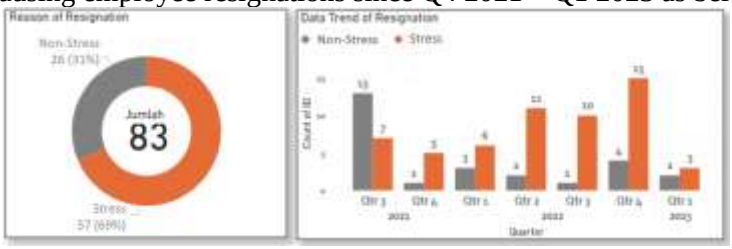

Figure 1. Trends in employee resignation data due to stress and non-stress
(Source: Internal Data)

This situation makes productivity decreasing. Of course, the most troublesome thing is finding replacement employees. This situation has hidden costs that shown below:

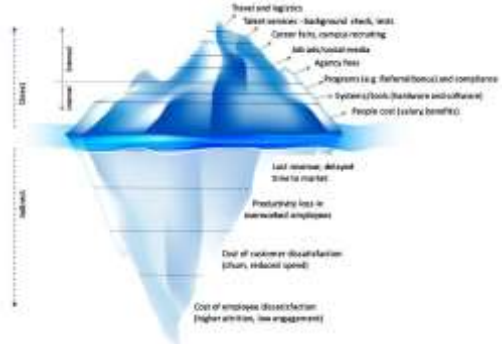

Figure 2. The impact this has on the employee recruitment process
(Source: Ashutosh, 2018)

These risk findings must be controlled and reported by Management Representative (MR) team so that the MR team must prepare an improvement program to anticipate a spike in employee resignations due to stress factors in the next period[8].

2. Methods

Many models have been developed to measure work stress with the aim of controlling the number of employee resignations. Starting from researchers' opinions for dependent and independent proof, or which have been developed by adding the Delphi method (collection and validation of expert opinions) combined with decision analysis. However, not all methods are universally applicable. Methods must be adapted to the problem and context faced.

This research uses an EHS approach based on Ministry of Manpower Regulation (PERMENAKER) Number 5 of 2018 [9]. The survey data obtained will be subjected to descriptive and diagnostic analysis as exploratory data analysis, and then following the Cross Industry Standard Process for Data Mining CRISP-DM) framework with cluster analysis modeling. It is hoped that the results of this research will be able to provide policy recommendations for controlling work stress through Focus Group Discussions (FGD) which will produce recommendations for controlling work stress so that it does not interfere with company productivity. Another contribution is also in response to the implementation of ISO 45001:2018 and SMK3 towards the absorption of applicable government regulations.

2.1. Data collection

The Stress Diagnosis Survey (SDS) containing 30 questions with six stress indicators such as:

1. Role ambiguity, namely pressure that arises due to feelings of ambiguity in roles or responsibilities.
2. Role conflict, namely the pressure that arises when an employee has to face a conflict between conflicting demands or expectations in his or her role or responsibility.
3. Qualitative workload, namely the pressure that arises when employees feel inadequate or unskilled in completing the tasks given.

4. Quantitative workload, namely pressure that arises due to workload that is too heavy or too much in a limited time.
5. Career development, namely the pressure that arises when employees feel that their career development is hampered or does not meet expectations.
6. Responsibility towards others, namely the pressure that arises when employees feel responsible for other people, such as a team or work group, and feel they have to ensure that their work is done well.

Each questionnaire will be given seven values (categorical) with the following value conditions:

1. Score (1), if the conditions described never cause stress
2. Score (2), if the conditions described low rarely cause stress
3. Score (3), if the conditions described rarely cause stress
4. Score (4), if the conditions described sometimes cause stress
5. Score (5), if the conditions described low often cause stress
6. Score (6), if the condition described often causes stress
7. Score (7), if the conditions described always cause stress

After filling in, the next step is to carry out a scoring system like the table guide.

Table 1. Stress Factors Based on Minister of Manpower Regulation Number 5 of 2018

Assessment	Information	Score Sums of Questionnaire
Score of TP	Role Ambiguity	1+7+13+19+25
Score of KP	Role Conflict	2+8+14+20+26
Score of BBKuan	Quantitative Workload	3+9+15+21+27
Score of BBKual	Qualitative Workload	4+10+16+22+28
Score of PK	Career Development	5+11+17+23+29
Score of TJO	Responsibility Towards Others	6+12+18+24+30

Conclusion of score of sums of questionnaire:
Score ≤ 9 = LIGHT stress; Score 10-24 = MEDIUM stress; Score > 24 = SEVERE stress

2.2. CRISP-DM

CRISP-DM has six main stages [10] as below figure.

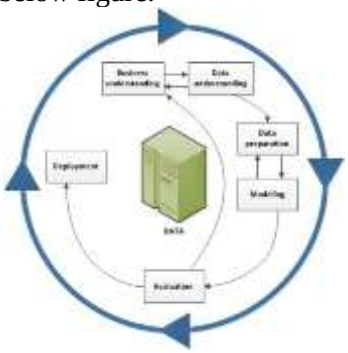

Figure 3. CRISP-DM Framework
Source: https://www.ibm.com/docs/it/spss-modeler/saas?topic=dm-crisp-help-overview

1. Business Understanding, namely this stage involves understanding the business problem that you want to solve using data mining. At this stage, define business goals and success criteria.
2. Data Understanding, namely this stage involves understanding the data available to solve business problems. At this stage, relevant data is identified and collected, and data exploration (Descriptive and Diagnostic Analysis) is carried out to determine the characteristics and quality of the data.

Figure 4. Risk Matrix
Source: https://safetyculture.com/topics/risk-assessment/5x5-risk-matrix/

3. Data Preparation, namely this stage involves preparing data for further processing. At this stage, data selection, data cleaning, data transformation, and data sample creation are carried out.
4. Modeling, this stage involves developing a model that will be used to solve business problems. At this stage, appropriate method selection, model formation, and model testing are carried out. This research uses Clustering - K-Modes Algorithm as unsupervised learning.

Figure 5. System Modeling in CRISP-DM
Source: https://resources.experfy.com/ai-ml/coding-deep-learning-for-beginners-types-of-machine-learning/

Figure 6. Categorical Cluster Algorithm Classification [11]
Source: (Aggarwal & Reddy, 2013)

5. Evaluation, namely this stage involves evaluating the results obtained from using the model. At this stage, an evaluation is carried out on model performance, suitability of the model to business needs, and risk analysis.
6. Deployment, namely this stage involves implementing the model in a business environment. At this stage, the model is integrated into the business system, and continuous monitoring and improvement of the model is carried out. SECI was chosen because of work stress related to knowledge scope.

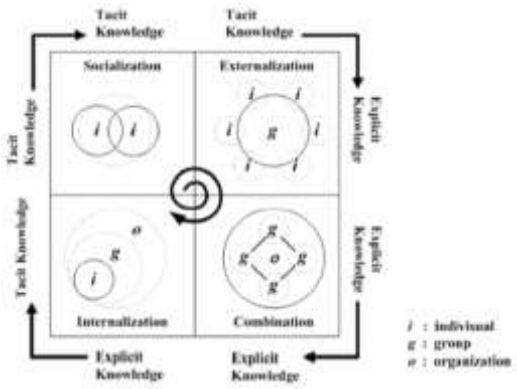

Figure 7. SECI Framework [13]

Source: (Mendoza, Norman B.; Cheng, Eric C.K; Yan, Zi;, 2022) from (Cheng, Eric C.K;, 2018)

3. Results

3.1. Data Exploration

A. Descriptive Analysis

The descriptive analysis stage aims to determine the phenomena that occur. This use storytelling which is communicating information by combining data, narrative, and visualization [14]–[16]

1. Based on Demography of Respondent

Figure 8. Demographic of Respondent

The results of the descriptive analysis are focused on "PIC" because it is clear based on the organizational structure who is the superior. If it is compared to the other five profiles, it will mix and create bias [17].

2. Based on Respondent Demographics on the resulting employee work stress values

Table 2. Matrix of PIC Job Stress Levels against Job Stress Factors

The level of moderate stress was in the range of 60% - 66%, meaning that there were 6 to 7 people with moderate stress out of the 10 people surveyed. Severe stress is in the range of 1% - 9%, meaning that there are 1 to 9 people with severe stress out of 100 people surveyed.

Table 3. Risk Evaluation Matrix

Moderate Stress	Consequence				
Likelihood	Insignificant	Minor	Moderate	Major	Extreme
	1	2	3	4	5
Almost Certain 5	5	10	15	20	25
Likely 4	4	8	12	16	20
Possible 3	3	6	9	12	15
Unlikely 2	2	4	6	8	10
Remote 1	1	2	3	4	5

a). Moderate Stress Matrix

Severe Stress	Consequence				
Likelihood	Insignificant	Minor	Moderate	Major	Extreme
	1	2	3	4	5
Almost Certain 5	5	10	15	20	25
Likely 4	4	8	12	16	20
Possible 3	3	6	9	12	15
Unlikely 2	2	4	6	8	10
Remote 1	1	2	3	4	5

b). Severe Stress Matrix

We plot using table risk evaluation matrix and we got both Medium and Severe are in Yellow Area. It means we have to control the work stres [18].

3. Based on Respondent Demographics on the resulting employee work stress values

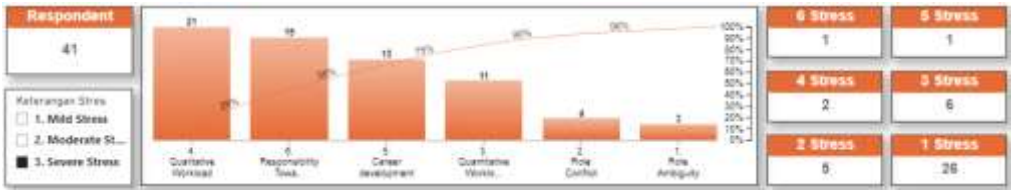

Figure 9. Distribution of Severe Stress

Pareto's results are a focus on qualitative workload, responsibility for others, career development, and quantitative workload.

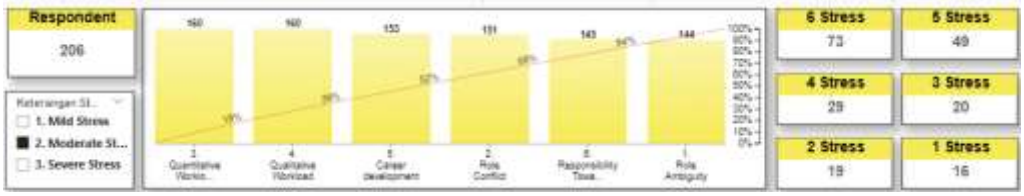

Figure 10. Distribution of Moderate Stress

Pareto's results are a focus on quantitative workload, qualitative workload, career development, role conflict, and responsibility towards others.

B. Diagnostic Analysis

This diagnostic analysis uses data drilling techniques, namely exploring the sub-factors of each work stress factor so that it can be seen why the work stress factor is so influential [19].

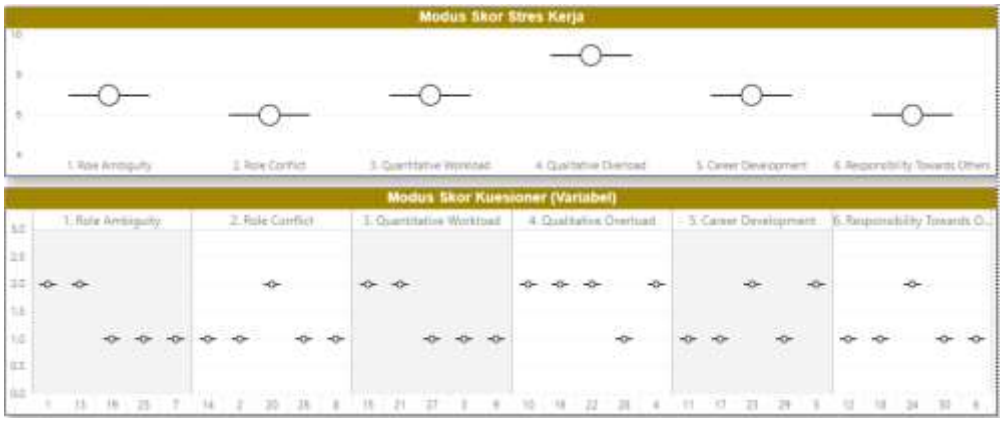

Figure 11. Distribution of average questionnaire scores

Table 4. Pareto Effects of the Work Stress Questionnaire (SEVERE)

Most Influential Factor		Number of Respondents	% Ratio	Aggregate Ratio (Pareto)		Most Influential Questionnaire	Centering Value (Severe Stress Score > 24)	
							Modes	Agg. Modes
4	Qualitative Workload	25	29%	29%	4	I am asked a lot about the quality of work	7	7
					16	As the days go by, my tasks become more complex	6	13
					22	The organization expects me to be able to exceed my abilities	6	19
					10	The tasks given to me are sometimes too difficult and/or too complex	6	25
					28	I lack the training and/or experience to adequately perform my duties	4	29
6	Responsibility Towards Others	19	26%	55%	12	I am responsible for guiding and/or helping my subordinates solve work-related problems	7	7
					18	In my job, I make several decisions that can affect the safety and well-being of others	6	13
					26	My responsibilities in this organization relate more to people than to things	7	20
					6	I am responsible for the development of other employees	5	25
					30	I am responsible for other people's career paths	5	30
5	Career development	15	20%	75%	17	I often think that my career progress has been hampered by this organization	7	7
					29	I feel hampered in advancing my career	7	14
					9	There are few opportunities for me to develop in this organization	7	21
					23	I have few opportunities to develop and learn new knowledge and skills in my job	6	27
					11	If I move up a position, I can move to another department	2	29
3	Quantitative Workload	11	15%	90%	15	At the same time, I am expected to be able to multitask and be responsible for a number of work projects	7	7
					21	I really have more work than can usually be done in a day	7	14
					3	I have to take my work home every evening or weekend to make up time	7	21
					27	I find it difficult to take annual leave	6	27
					9	I spend too much time on unimportant meetings that take up my work time	2	29
2	Role Conflict	4	6%	96%	20	There are some of my works that are understood by one person but not by another	6	6
					26	I receive conflicting requests from one or more people	7	13
					2	I work on tasks or projects that do not fit the job description	5	18
					8	I am in the gray zone between my superiors and my subordinates	6	24
					14	Many formal work orders are not obeyed	5	29
1	Role Ambiguity	3	4%	100%	13	My authority is limited in carrying out my job responsibilities	7	7
					1	The targets of my work do not match the job description	-	
					7	There is no clarity to whom I should report the results of the work	-	
					19	I didn't understand what the organization expected of me	-	
					25	In terms of overall organizational goals, I don't understand the part of the job that I have to do	4	11

Table 5. Pareto Effects of the Work Stress Questionnaire (MEDIUM)

Most Influential Factor		Number of Respondents	% Ratio	Aggregate Ratio (Pareto)		Most Influential Questionnaire	Centering Value (Moderate Stress Score 10 - 24)	
							Modes	Agg. Modes
3	Quantitative Workload	140	18%	18%	15	At the same time, I am expected to be able to multitask and be responsible for a number of work projects	6	6
					21	I really have more work than can usually be done in a day	6	9
					3	I have to take my work home every evening or weekend to make up time	2	11
					9	I spend too much time on unimportant meetings that take up my work time	2	13
					27	I find it difficult to take annual leave	1	14
4	Qualitative Workload	160	17%	35%	22	The organization expects me to be able to exceed my abilities	6	6
					4	I am asked a lot about the quality of work	1	7
					16	As the days go by, my tasks become more complex	8	15
					10	The tasks given to me are sometimes too difficult and/or too complex	2	17
					28	I lack the training and/or experience to adequately perform my duties	2	19
5	Career development	155	17%	52%	17	I often think that my career progress has been hampered by this organization	8	8
					9	There are few opportunities for me to develop in this organization	8	8
					23	I have few opportunities to develop and learn new knowledge and skills in my job	3	11
					29	I feel hampered in advancing my career	3	14
					11	If I move up a position, I can move to another department	1	15
2	Role Conflict	151	16%	68%	20	There are some of my works that are understood by one person but not by another	6	6
					26	I receive conflicting requests from one or more people	6	6
					2	I work on tasks or projects that do not fit the job description	6	12
					14	Many formal work orders are not obeyed	2	14
					8	I am in the gray zone between my superiors and my subordinates	1	15
6	Responsibility Towards Others	141	16%	84%	26	My responsibilities in this organization relate more to people than to things	6	6
					18	In my job, I make several decisions that can affect the safety and well-being of others	3	9
					6	I am responsible for the development of other employees	6	15
					12	I am responsible for guiding and/or helping my subordinates solve work-related problems	1	16
					30	I am responsible for other people's career paths	1	17
1	Role Ambiguity	144	16%	100%	13	My authority is limited in carrying out my job responsibilities	6	6
					1	The targets of my work do not match the job description	1	7
					19	I didn't understand what the organization expected of me	2	9
					25	In terms of overall organizational goals, I don't understand the part of the job that I have to do	2	11
					7	There is no clarity to whom I should report the results of the work	1	12

Table 6. Recap of Questionnaire That Influences Job Stress

Matrix		Moderate													
		2	3	4	5	6	15	16	17	18	20	21	22	23	24	26
Severe	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	16	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	17	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	18	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	22	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	23	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

There are 19 questioners that affected job stress moderate and severe. 12 questioners (63%) that influence both Moderate Stress and Severe Stress (Green Marked). Then we can see the sorting contribution of stress level as shown on Table 7 as below:

Table 7. Sorting Contribution of Severe Stress Level and Moderate Stress Level

Severe Stress		Moderate Stress	
9%	Qualitative Overload	66%	Qualitative Overload
8%	Responsibility Towards Others	66%	Quantitative Overload
6%	Career Development	63%	Career Development
5%	Quantitative Overload	60%	Responsibility Towards Others
2%	Role Conflict	60%	Role Ambiguity
1%	Role Ambiguity	62%	Role Conflict

It shown that qualitative workload factors dominate. So, it can be seen that "I am asked a lot about the quality of my work" and "I am responsible for guiding and helping subordinates solve their problems".

3.2. Modelling – Unsupervised Learning use Cluster K-Modes

Use python software with elbow will get 2 clusters optimal that shown as Figure 13 below:

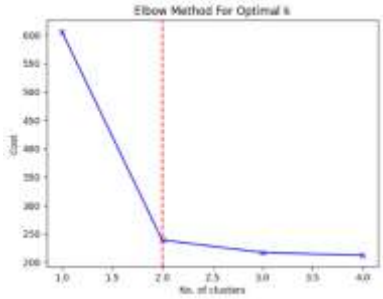

Figure 13. Determination of Optimal Clusters

Then use K-Modes algorithm to separate those clusters which shown on Table 8 below:

Table 8. Clusters formed through K-Modes

	Role Ambiguity	Role Conflict	Quantitative Workload	Qualitative Workload	Career Development	Responsibility Towards Others	cluster
0	2. Moderate Stress	2. Moderate Stress	2. Moderate Stress	2. Moderate Stress	2. Moderate Stress	2. Moderate Stress	0
1	2. Moderate Stress	2. Moderate Stress	2. Moderate Stress	2. Moderate Stress	2. Moderate Stress	2. Moderate Stress	0
3	2. Moderate Stress	2. Moderate Stress	2. Moderate Stress	2. Moderate Stress	2. Moderate Stress	2. Moderate Stress	0
3	2. Moderate Stress	2. Moderate Stress	2. Moderate Stress	3. Severe Stress	2. Moderate Stress	2. Moderate Stress	0
4	2. Moderate Stress	2. Moderate Stress	2. Moderate Stress	2. Moderate Stress	2. Moderate Stress	2. Moderate Stress	0
...	...	...	...	...	...	...	...
237	1. Light Stress	2. Moderate Stress	1. Light Stress	1. Light Stress	2. Moderate Stress	2. Moderate Stress	0
238	1. Light Stress	1. Light Stress	1. Light Stress	1. Light Stress	1. Light Stress	1. Light Stress	1
239	1. Light Stress	1. Light Stress	1. Light Stress	1. Light Stress	1. Light Stress	1. Light Stress	1
240	1. Light Stress	1. Light Stress	1. Light Stress	2. Moderate Stress	2. Moderate Stress	1. Light Stress	1
241	1. Light Stress	2. Moderate Stress	1. Light Stress	2. Moderate Stress	2. Moderate Stress	1. Light Stress	0

242 rows × 7 columns

It can be seen that each data has a cluster identification in the table on the right column. For example, data lines 0 - 4 are cluster-0, data lines 238 - 240 are cluster-1.

The data distribution is formed as shown in Figure 14 below:

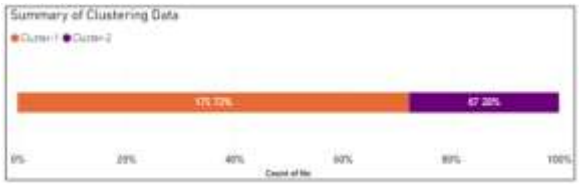

Figure 14. Distribution of Cluster-1 and Cluster-2

The data center (centroid) of segment-1 and segment-2 looks like Figure 4.15 below:

```
[ ] print(km.cluster_centroids_)

[['2. Moderate Stress' '2. Moderate Stress' '2. Moderate Stress'
  '2. Moderate Stress' '2. Moderate Stress' '2. Moderate Stress']
 ['1. Light Stress' '1. Light Stress' '1. Light Stress' '1. Light Stress'
  '1. Light Stress' '1. Light Stress']]
```

Figure 15. Centroid of Cluster-1 and Cluster-2

It can be seen that segment-1 has the entire centroid of moderate stress data. Segment-2 has the entire centroid under mild stress.

3.3. Evaluation

This part explains information by exploring the data by cluster on each profile.

a. Based on Level

Figure 14. Cluster information by Level

Information:

a. For the "staff" level, there are 92 people (69%) in segment-1 (moderate stress) and 41 people (31%) in segment-2 (light stress).

b. For the "senior staff" level, there are 41 people (77%) in segment-1 (moderate stress) and 12 people (23%) in segment-2 (light stress).

c. For the "section head" level, there were 24 people (71%) in segment-1 (moderate stress) and 10 people (29%) in segment-2 (light stress).

d. For the "department head" level, there are 12 people (92%) in segment-1 (moderate stress) and 1 person (8%) in segment-2 (light stress).

e. For the "division head" level, there are 5 people (83%) in segment-1 (moderate stress) and 41 people (17%) in segment-2 (light stress).

f. For the "group head" level, there is 1 person (33%) in segment-1 (moderate stress) and 2 people (67%) in segment-2 (light stress).

b. Based on Age

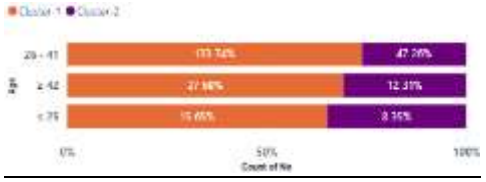

Figure 15. Cluster information by Age

Information:

a. For those aged "26-41", there were 133 people (74%) in segment-1 (moderate stress) and 47 people (26%) in segment-2 (light stress).

b. For age "≥ 41", there were 27 people (69%) in segment-1 (moderate stress) and 12 people (31%) in segment-2 (light stress).

c. For age "≤ 25", there are 15 people (65%) in segment-1 (moderate stress) and 8 people (35%) in segment-2 (light stress).

c. Based on Gender

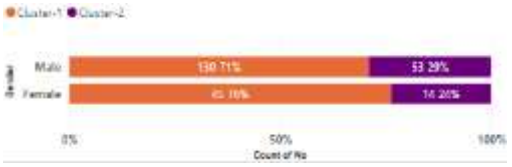

Figure 16. Cluster information by Gender

Information:

a. For the "male" gender, there were 130 people (71%) in segment-1 (moderate stress) and 53 people (29%) in segment-2 (light stress).

b. For the "female" gender, there were 45 people (76%) in segment-1 (moderate stress) and 14 people (24%) in segment-2 (light stress).

d. Based on Marriage Status

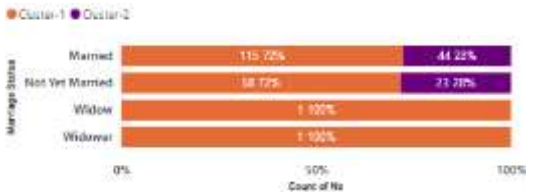

Figure 17. Cluster information by Marriage Status

Information:

a. For marital status "married", there were 115 people (72%) in segment-1 (moderate stress) and 44 people (28%) in segment-2 (light stress).
b. For marital status "not married", there were 58 people (72%) in segment-1 (moderate stress) and 23 people (28%) in segment-2 (light stress).
c. For the marital status of "widower", there is 1 person (100%) in segment-1 (moderate stress) and 0 people (0%) in segment-2 (light stress).
d. For the marital status "widowed", there is 1 person (100%) in segment-1 (moderate stress) and 0 people (0%) in segment-2 (light stress).

e. <u>Based on Working Period</u>

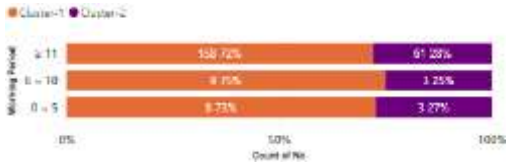

Figure 18. Cluster information by Department

Information:

a. For work period "≥ 11", there were 158 people (72%) in segment-1 (moderate stress) and 61 people (28%) in segment-2 (mild stress).
b. For the work period "6-10", there are 9 people (75%) in segment-1 (moderate stress) and 3 people (25%) in segment-2 (light stress).
c. For the "0-5" work period, there were 8 people (73%) in segment-1 (moderate stress) and 3 people (27%) in segment-2 (light stress).

D. Deployment

Of the 19 questionnaires that have the most influence on moderate and severe work stress factors, the next step is to formulate work stress control using the S-E-C-I technique as follows [13], [23].

Table 8. SECI Formulation of 19 Influential Questionnaires

	Questionnaire	SOCIALIZATION *(tacit-to-tacit)*	EXTERNALISATION *(tacit-to-explicit)*	COMBINATION *(explicit-to-explicit)*	INTERNALISATION *(explicit-to-tacit)*
15	At the same time, I am expected to be able to multitask and be responsible for a number of work projects	The supervisor explains the business background, competition issues and competencies	-	-	Learn from webinars, other digital materials about how to multitask
22	The organization expects me to be able to exceed my abilities	The supervisor explains the business background, competition and competency issues and opportunities for promotion	-	-	Learn from webinars, other digital materials regarding increasing competency
21	I really have more work than can usually be done in a day	Superiors together with HR verify Workload Analysis, opportunity to improve work processes	-	-	Learn from webinars, other digital materials regarding work priority scales (Important and Urgent)
12	I am responsible for guiding and/or helping my subordinates solve work-related problems	Provide clarity on the main tasks and functions that must be carried out routinely, and carry out periodic performance measurement	Create standard operating procedures (SOP) and work instructions (specific work documents)	-	Ask subordinates to read and implement the SOP and work documents
16	As the days go by, my tasks become more complex	Superiors together with HR verify Workload Analysis, opportunity to improve work processes	-	-	-
4	I am asked a lot about the quality of work	The supervisor explains the business background, competition and competency issues and opportunities for promotion	-	-	Learn from webinars, other digital materials on how to focus on quality of work
18	In my job, I make several decisions that can affect the safety and well-being of others	The superior explains that work must be based on procedures and be professional	-	-	-
20	There are some of my works that are understood by one person but not by another	The supervisor provides an explanation regarding the uniqueness of the job which requires unique skills	Create standard operating procedures (SOP) and work instructions (specific work documents)	-	-
6	I am responsible for the development of other employees	The boss explained that the job would be easier if it could be done together	-	-	-
24	My responsibilities in this organization relate more to people than to things	The boss explained that currently administrative work is not fully covered by digitalization	-	-	-
2	I work on tasks or projects that do not fit the job description	The supervisor must clarify the job with the job description from the HRD team. If necessary, adjustments must be made to the dimensions of work and worker compensation	-	-	-
23	I have few opportunities to develop and learn new knowledge and skills in my job	The boss directs process improvements (innovation) in his work. This can be developed by increasing creativity and knowledge	-	-	-
29	I feel hampered in advancing my career	Superiors and HR formulate employee career advancement programs, then provide outreach to all employees	-	-	-
26	I receive conflicting requests from one or more people	Superiors together with HR clarify work according to the organizational hierarchy and do not violate the company's code of ethics	-	-	-
17	I often think that my career progress has been hampered by this organization	Superiors and HR formulate employee career advancement programs, then provide outreach to all employees	-	-	-
3	I have to take my work home every evening or weekend to make up time	Superiors together with HR verify Workload Analysis, opportunity to improve work processes	-	-	-
5	There are few opportunities for me to develop in this organization	Superiors and HR formulate employee career advancement programs, then provide outreach to all employees	-	-	-
10	The tasks given to me are sometimes too difficult and/or too complex	Provide clarity on the main tasks and functions that must be carried out routinely, and carry out periodic performance measurement methods	Create standard operating procedures (SOP) and work instructions (specific work documents)	-	Study and implement the SOP / work document
27	I find it difficult to take annual leave	Superiors must inform subordinates about the do's and don'ts of leave time	-	-	-

4. Discussion

1. Efforts to find factors that cause work stress through descriptive analysis, diagnostic analysis and clustering analysis approaches. Descriptive analysis provides information that "demands for job quality" and "taking responsibility for the results of other people's work" are the biggest factors in work stress levels. Diagnostic analysis provides information that the variables "demands exceed capabilities" and "having to help other people solve problems" are the main causes of work stress levels. Clustering analysis divides the data into two segments, namely the moderate stress segment where the overall level of factors causing work stress is moderate stress, and the mild stress segment where the overall level of factors causing work stress is mild stress.
2. Recommendations as implications for the organization, namely the medium stress segment, will create a policy that focuses on controlling qualitative workload by implementing individual competency improvement programs. Meanwhile, the factor of taking responsibility for other people's performance will be carried out by implementing a performance appraisal system modification program to additionally evaluate employees' ability to help complete co-workers' tasks. For the mild stress segment there is no special program, only annual monitoring is carried out by filling out employee work stress surveys and asking for input and suggestions.

5. Conclusions

Work stress measurement studies guided by Minister of Manpower regulations are able to show factors that cause work stress in the work environment. However, these findings must be confirmed by the actual conditions in the company when an employee submits his resignation.

References

[1] N. Ghodrati, T. W. Yiu, S. Wilkinson, and M. Shahbazpour, "A new approach to predict safety outcomes in the construction industry," *Saf Sci*, vol. 109, pp. 86–94, Nov. 2018, doi: 10.1016/j.ssci.2018.05.016.

[2] H. Alqudah *et al.*, "The impact of empowering internal auditors on the quality of electronic internal audits: A case of Jordanian listed services companies," *International Journal of Information Management Data Insights*, vol. 3, no. 2, Nov. 2023, doi: 10.1016/j.jjimei.2023.100183.

[3] Q. Liang, Z. Zhou, G. Ye, and L. Shen, "Unveiling the mechanism of construction workers' unsafe behaviors from an occupational stress perspective: A qualitative and quantitative examination of a stress–cognition–safety model," *Saf Sci*, vol. 145, Jan. 2022, doi: 10.1016/j.ssci.2021.105486.

[4] S. Zhang, R. Y. Sunindijo, S. Frimpong, and Z. Su, "Work stressors, coping strategies, and poor mental health in the Chinese construction industry," *Saf Sci*, vol. 159, Mar. 2023, doi: 10.1016/j.ssci.2022.106039.

[5] M. Mavroulidis *et al.*, "Occupational health and safety of multinational construction companies through evaluation of corporate social responsibility reports," *J Safety Res*, vol. 81, pp. 45–54, Jun. 2022, doi: 10.1016/j.jsr.2022.01.005.

[6] A. Fernandes, M. Figueiredo, J. Ribeiro, J. Neves, and H. Vicente, "Psychosocial Risks Assessment in Cryopreservation Laboratories," *Saf Health Work*, vol. 11, no. 4, pp. 431–442, Dec. 2020, doi: 10.1016/j.shaw.2020.07.003.

[7] V. Golinko, S. Cheberyachko, O. Deryugin, O. Tretyak, and O. Dusmatova, "Assessment of the Risks of Occupational Diseases of the Passenger Bus Drivers," *Saf Health Work*, vol. 11, no. 4, pp. 543–549, Dec. 2020, doi: 10.1016/j.shaw.2020.07.005.

[8] W. Umer, "Simultaneous monitoring of physical and mental stress for construction tasks using physiological measures," *Journal of Building Engineering*, vol. 46, Apr. 2022, doi: 10.1016/j.jobe.2021.103777.

[9] Kementerian Ketenagakerjaan Republik Indonesia, "Peraturan Menteri Ketenagakerjaan Nomor 5 Tahun 2018 Tentang Keselamaan dan Kesehatan Kerja Lingkungan Kerja," Jakarta, 2018.

[10] IBM Corporation, "IBM SPSS Modeler CRISP-DM Guide," Internet News Group.

[11] C. C. & R. C. K. Aggarwal, *Data Clustering Algorythms and Applications*, 1st ed. Florida: Chapman and Hall/CRC, 2013.

[12] E. B. Ewin Karman Nduru, "Implementasi Algoritma K-Modes Untuk Menentukan Strategi Marketing STMIK Budi Darma," in *Konferensi Nasional Teknologi Informasi dan Komputer*, Medan: STMIK Budi Darma, 2018, pp. 12–19.

[13] N. B. Mendoza, E. C. K. Cheng, and Z. Yan, "Assessing teachers' collaborative lesson planning practices: Instrument development and validation using the SECI knowledge-creation model," *Studies in Educational Evaluation*, vol. 73, Jun. 2022, doi: 10.1016/j.stueduc.2022.101139.

[14] A. Lane, "Towards a theory of organizational storytelling for public relations: An engagement perspective," *Public Relat Rev*, vol. 49, no. 1, Mar. 2023, doi: 10.1016/j.pubrev.2023.102297.

[15] A. Kemp, R. Gravois, H. Syrdal, and E. McDougal, "Storytelling is not just for marketing: Cultivating a storytelling culture throughout the organization," *Bus Horiz*, vol. 66, no. 3, pp. 313–324, May 2023, doi: 10.1016/j.bushor.2023.01.008.

[16] A. M. W. Leong, S.-S. Yeh, Y. Zhou, C.-W. Hung, and T.-C. Huan, "Exploring the influence of historical storytelling on cultural heritage tourists' value co-creation using tour guide interaction and authentic place as mediators," *Tour Manag Perspect*, vol. 50, p. 101198, Jan. 2024, doi: 10.1016/j.tmp.2023.101198.

[17] D. Andino Ardi, K. Ulfah Naila El Muna, D. Dwimartha, and L. Dysi Setiawati, "Gambaran Tingkat Stres pada Pekerja PT. Sucofindo Cabang Surabaya Tahun 2022," *SEHATRAKYAT (Jurnal Kesehatan Masyarakat)* , vol. 2, no. 2, pp. 221–228, 2023, doi: 10.54259/sehatrakyat.v2i2.1659.

[18] M. Marchelli, G. Coltrinari, G. Alfaro Degan, and D. Peila, "Towards a procedure to manage safety on construction sites of rockfall protective measures," *Saf Sci*, vol. 168, Dec. 2023, doi: 10.1016/j.ssci.2023.106307.

[19] Shashi Kant Sharma, "Guidelines on Data Analytics," 2017.

[20] A. Golzari Oskouei, M. A. Balafar, and C. Motamed, "FKMAWCW: Categorical fuzzy k-modes clustering with automated attribute-weight and cluster-weight learning," *Chaos Solitons Fractals*, vol. 153, Dec. 2021, doi: 10.1016/j.chaos.2021.111494.

[21] S. S. Khan and A. Ahmad, "Cluster center initialization algorithm for K-modes clustering," *Expert Syst Appl*, vol. 40, no. 18, pp. 7444–7456, 2013, doi: 10.1016/j.eswa.2013.07.002.

[22] R. J. Kuo, Y. R. Zheng, and T. P. Q. Nguyen, "Metaheuristic-based possibilistic fuzzy k-modes algorithms for categorical data clustering," *Inf Sci (N Y)*, vol. 557, pp. 1–15, May 2021, doi: 10.1016/j.ins.2020.12.051.

[23] Y. Yati, "Idea generation techniques in pop-up tourism labs," *Annals of Tourism Research Empirical Insights*, vol. 4, no. 1, May 2023, doi: 10.1016/j.annale.2023.100096.