Quantitative Project

Digital Enterprise 23/24

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Introduction

During the course of this semester, we conducted a study on the influence of various variables on job performance and job satisfaction. The purpose of the study is to explore the impact of technostress on data scientists. This was done by measuring the effect of ICTs on job performance and job satisfaction.

With the rapid integration of information and communication technologies (ICTs) into the workplace, employees face new stressors that can impact their well-being and job performance. Our study aimed to explore these effects by examining the correlation between technostress factors—such as Usefulness, Conflicts, Insecurity, Overload, and Unreliability—and job satisfaction and performance.

We developed and distributed a survey among data scientists working in Germany to gather relevant data. The responses were analyzed to identify any significant correlations and to see if the results differed by gender.

The results of this study are presented in this report, offering an analysis of the effects of technostress on data scientists in Germany.

Research design

The project involved 35 employees working in the field of AI, Machine Learning, Data Science or similar fields. A survey was administered to collect data on how working with ICTs are affecting stress levels of participants, and to measure the outcomes due to the stressors. Survey was distributed through 3 main ways:
1. connecting through LinkedIn. Keywords such as "data", "machine learning", "AI" and similar connotations were used in the search bar, filtered out people situated in "Berlin, Germany", and then sent a connection if they are currently employed. If connection was accepted, a message was sent to invite them to fill up the survey
2. reaching out to personal contacts. That includes informally inviting university professors or family relatives to fill out the survey and requesting to forward it to their coworkers
3. reaching out to companies in berlin.

of the 35 participants, mean age is 32.97. 24 (68.6%) are Male, 11 (31.4%) are female. The majority of them have a contractual weekly working time of 40 hours. Students mainly used robust methods in analyzing the predictors, control variables and outcomes.

Findings

    1.   Relationship between conflict, insecurity and job satisfaction:

The normality assumption is not met for both predictor variables, so only robust methods are going to be used.

Figure 1 & 2: checking the normality assumption visually

Percentage bend correlation coefficient method is used to estimate if there is any correlation between conflict & job satisfaction and insecurity & job satisfaction. Conflict has a very weak positive correlation with job satisfaction of 0.09, While insecurity has a weak negative correlation with job satisfaction of -0.21. However, both p-values are >0.05, so results are insignificant.

Next, winsorized correlation method is used. Results are similar: Conflict has a weak positive correlation with job satisfaction, insecurity has a weak negative correlation with job satisfaction of -0.22. P values are still >0.05, so results are insignificant.

We have formulated a hypothesis: Insecurity and conflict are negatively influencing job satisfaction among data scientists in Germany.

Running a regression did not show any significant results. We found out that insecurity accounts for only 4% of the variation in job satisfaction and conflict for only 0.09% of the variation. Both factors combined account for 6% of the variation in job satisfaction. However, p-values are insignificant. Running a robust model did not show any significant results either. We can reject the hypothesis.

Yuen's test was used to assess gender differences in job performance, insecurity, and conflict. The results showed no significant gender differences in any of these variables.

The robust moderation analysis shows a non-significant interaction effect (b = -0.067, 95% CI [-0.310, 0.176], t = -0.562, p = 0.578), indicating that conflict does not moderate the relationship between insecurity and job performance.

These findings suggest that in this sample, job satisfaction is not significantly influenced by insecurity or conflict , nor is it affected by the interaction between these variables.

2. Relationship between overload, insecurity and job performance:

The analysis reveals that neither overload nor insecurity significantly predicts job performance in the studied sample. As a first step, the normality of the data distributions for the key variables. The Shapiro-Wilk normality tests revealed that job overload (p = 0.01713) and job insecurity (p = 0.003137) did not follow a normal distribution, while job performance (p = 0.1449) did.
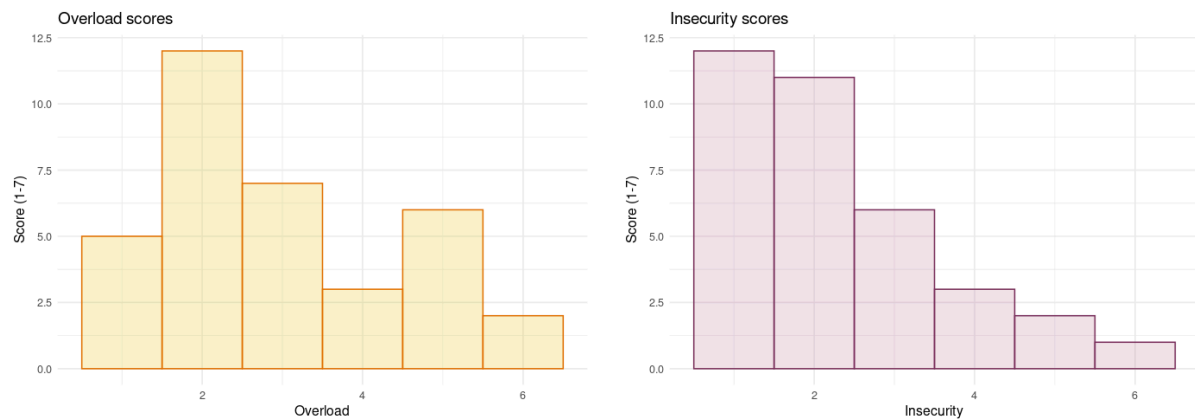

Figure 3 & 4: checking the normality assumption visually

Due to the non-normality of key predictor variables, robust methods were employed, including robust correlation and Winsorized correlation. The Winsorized correlation method corroborated these findings, indicating a weak negative correlation between overload and job performance (r = -0.06) and a weak positive correlation between insecurity and job performance (r = 0.16), both with non-significant p-values. These robust methods confirmed non-significant correlations among the variables.

Simple linear regression models showed no significant effects of overload (p = 0.457) and insecurity (p = 0.981) on job performance. Similarly, a multiple regression model incorporating control variables (age, gender, and working hours) failed to identify any significant predictors.

Yuen's test, a robust method for comparing means, was employed to assess gender differences in job performance, insecurity, and overload. The results showed no significant gender differences in any of these variables.

Finally, the robust moderation analysis shows a non-significant interaction effect (b = 0.116, 95% CI [-0.067, 0.298], t = 1.292, p = 0.206), indicating that insecurity does not moderate the relationship between overload and job performance.

These findings suggest that in this sample, job performance is not significantly influenced by perceived overload or job insecurity, nor is it affected by the interaction between these variables.

3. Relationship between conflict, unreliability and job performance:

Normality assumption is not met for either predictor variable. In order to accommodate that, robust methods were used for analysis.
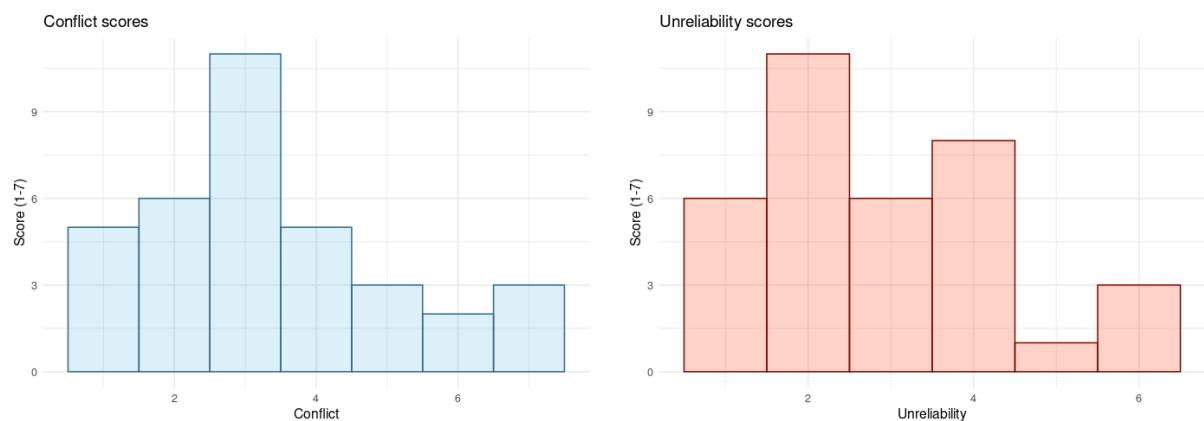

Figure 5 & 6: checking the normality assumption visually

Percentage bend correlation coefficient method was used to find the correlation coefficients of conflict and unreliability in relation to job performance. The values returned showed that conflict has a weak positive correlation with job performance (0.14) and unreliability has a moderate negative correlation with job performance (-0.29),but due to the p-values both being greater than 0.05 the results of this analysis are insignificant. Correlation was checked again with the Winsor correlation method, yielding almost exactly the same results results.

Simple linear regression models indicated that neither unreliability (p = 0.139) nor conflict (p = 0.390) had significant effects on job performance. Additionally, a multiple regression model that included control variables (age, gender, and working hours) did not reveal any significant predictors.

Yuen's test was employed to identify gender differences in job performance, unreliability, and conflict. The results showed no significant gender differences in any of these variables.

The robust moderation analysis shows a non-significant interaction effect (b = 0.100, 95% CI [-0.055, 0.254], t = 1.318, p = 0.197), indicating that insecurity does not moderate the relationship between overload and job performance.

These findings suggest that in this sample, job performance is not significantly affected by workplace conflict nor unreliability, and it is also not affected by the interaction between these variables.

4. Relationship between usefulness, overload and job satisfaction

Normality assumption has not been met. Distribution is skewed to the right for both stressors.
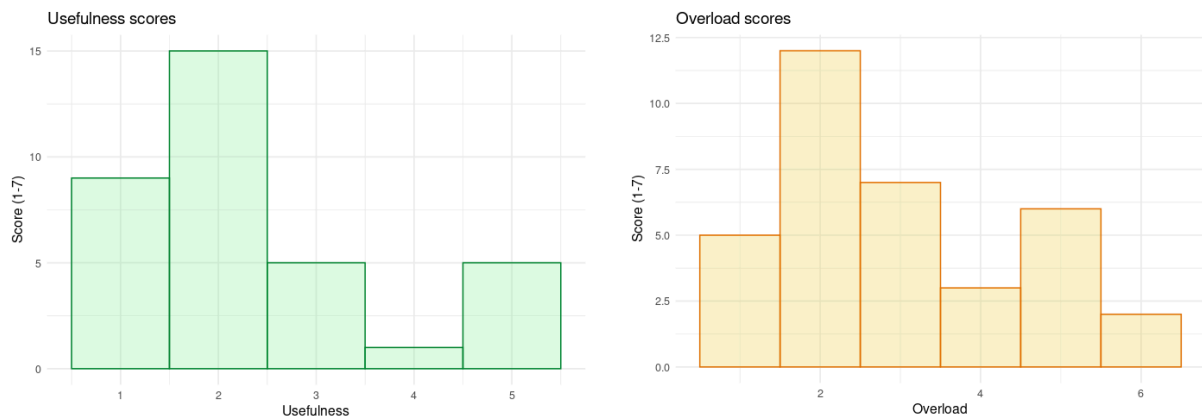

Figure 7 & 8: checking the normality assumption visually

Checking normality quantitatively:
- mean scores were 2.34 and 2.98 for usefulness and overload, while its 5.86 for job satisfaction.
- distribution is positively skewed for usefulness and overload (0.92, 0.44); negatively for job satisfaction (-1.19).
- kurtosis is negative for the predictors (-0.3, -1.06); positive for the outcome (1.28).
- Skew.2SE are significant for usefulness and job satisfaction (1.16, -1.49). no significant values for kurt.2SE.

no significant correlations found in running robust linear methods

percentage bend correlation coefficient: job satisfaction ~ usefulness r = -0.08, p = .99

job satisfaction ~ overload r = -0.10, p = .99

winsorized: job satisfaction ~ usefulness r = -0.05, p = 0.77

job satisfaction ~ overload r = -0.06, p = 0.73

spearman: job satisfaction ~ usefulness rho = -0.09, p = 0.61

job satisfaction ~ overload r = -0.09, p = 0.6

Running a simple linear regression with only overload as the predictor, and job satisfaction as the outcome, it resulted to an r-squared of 0.011, tells us that the stressor overload accounts for 1.1% the variation in job satisfaction, which is insignificant because p.value is 0.554. Running it with usefulness and overload as predictors, r squared is now 0.0116, a slight increase of 0.0009. Still not significant with the p.value of 0.830.

Even with added predictor usefulness, the model doesn't significantly predict job satisfaction.

In testing the model fit, there was 1 outlier, but not an influential case. So it was not removed In testing model generalizability, the model is not linear, and violated the assumption of Homoscedasticity and Normality.
Although, the assumption of independence has been met.

Interpretation:
The model appears to be both inaccurate for the sample and ungeneralizable to the population. In our sample, usefulness and overload are not important in predicting job satisfaction.
The assumptions have not been met and so we can probably assume that this model would not generalize the job satisfaction scores of people working with ICTs.

Running Robust parameter estimates, it is different from the original parameter estimates.
b estimates for usefulness and overload are not the same.
- usefulness - Original: 0.024, Robust: 0.1105
- overload - Original: -0.0740, Robust: -0.1026

Original model could be biased, but not problematic as p.value is not significant (0.572)

testing if confidence intervals are biased, results are:
- standard error for overload went from 0.121 to 0.130
- associated t-statistic changed from -0.612 to -0.567
- confidence interval changed from [-0.320, 0.172] to [-0.339, 0.192]
- Change is not that dramatic, but still stands that original parameters are biased

Checked if there is a significant difference of job satisfaction scores between Male and Female groups.

Mean score of Women is 5.55, while for Men is 6.04

Reporting the independent *t*-test:

On average, male participants are more satisfied with their jobs (M = 6.04, SE = 0.22), than female participants (M = 5.46, SE = 0.25). This difference was not significant t(-1.5) = 0.145, p > .05; however, there is a substantial effect d = .69.

running a robust test of independent means:

- there is no significant difference in job satisfaction scores across two groups
- $T_y(19.72) = 1.7796$, p = 0.91
- confidence scores also crosses zero [-1.0025 , 0.0799]

All the robust methods suggest there is no significant difference in job satisfaction scores between two groups

Running the robust moderation method, p.values are not significant.

Summary of our findings

The findings indicate that job performance and job satisfaction are not significantly influenced by the stressors examined.

Specifically:

Conflict, Insecurity, and Job Satisfaction:

- Correlation: Robust methods indicate no significant correlations among conflict, insecurity, and job satisfaction.
- Regression: Minimal influence of conflict and insecurity on job satisfaction; results are insignificant.
- Gender Differences: No significant differences in job satisfaction between males and females.
- Moderation: Conflict does not moderate the relationship between insecurity and job satisfaction.

Usefulness, Overload, and Job Satisfaction:

- Correlation: Robust methods show no significant correlations between usefulness, overload, and job satisfaction.

- Regression: Overload and usefulness have minimal impact on job satisfaction; models fail to predict job satisfaction significantly.
- Gender Differences: No significant differences in job satisfaction observed between males and females.
- Moderation: No significant moderation effect of usefulness and overload on job satisfaction.

Overload, Insecurity, and Job Performance:

- Correlation: Robust methods confirm no significant correlations among overload, insecurity, and job performance.
- Regression: Neither overload nor insecurity significantly predicts job performance; multiple regression models reveal no significant predictors.
- Gender Differences: No significant differences in job satisfaction between males and females.
- Moderation: Insecurity does not moderate the relationship between overload and job performance.

Conflict, Unreliability, and Job Performance:

- Correlation: No significant correlations found between conflict, unreliability, and job performance using robust methods.
- Regression: Conflict and unreliability do not significantly affect job performance; multiple regression models find no significant predictors.
- Gender Differences: No significant differences in job performance between males and females.
- Moderation: Conflict does not moderate the relationship between unreliability and job performance

Appendix A

link to project progress notion page:
https://jdncpng.notion.site/Technostress-b5c13926f137407f86e175629d9147b1?pvs=4

Email template:

Dear —,

I hope this message finds you well.

My name is —, and I am currently pursuing a Bachelor's degree in Data Science at Berlin International University. As part of my final project for a Digital Enterprise course, I am conducting a survey to explore the impact of technostress on data scientists.

I am reaching out to your esteemed company to kindly request the participation of your data scientists in this brief survey. The survey is designed to take no more than 5 minutes to complete and your company's involvement would be immensely valuable to my research.

You can access the survey through the following link: —

Thank you very much for considering this request.

If you have any questions or need further information, please do not hesitate to contact me at **–email–**

Best regards,

LinkedIn template:

Thank you for connecting with me!

I am actually reaching out to people working in Data Science, or similar fields, to ask for your perspective and feelings towards your work with ICTs (Information and communication technologies).

I am currently in my bachelors in Berlin International UoAS and this for a project under the course "Digital Enterprise", for Prof. Dr. Hasan Koç (https://www.linkedin.com/in/hasan-koç-44600a126/).

It is only a 5-minutes survey.

https://forms.gle/kjGmUQ8UXVg26cmm7

Thank you for your time.

All the best,

—

Appendix B

Distribution of work

Vanda	Nadiia	Jaeden	Harel
overload, insecurity -> job performance & control variables	conflict, insecurity -> job satisfaction & control variables	usefulness, overload -> job satisfaction & control variables	unreliability, conflict -> job performance & control variables
Summary	Introduction	Research design	standardising the code