

THE IMPACT OF WORKLOAD AND TECHNOLOGY COMPETENCE ON TECHNOSTRESS AND PERFORMANCE OF EMPLOYEES

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ABSTRACT

Stress is a physiological and psychological pressure perceived by an individual that placing himself/herself in a risk, both physically and mentally. The research objective of this research is to find out whether the level of technology competence and workload has an impact on employee performance through technostress as an intervening variable. The respondents of this study were 138 people whom work at Production and Engineering department of a multinational company using automation technology equipment in operation. A technique of data collection was done by using questionnaire and interviews. Data was analysed using the SEM (Structural Equation Modelling) approach. From the research it can be concluded that the workload and competence level of automation technology had significant impact to technostress. Further, the study also shows a significant relationships between workload and employee performance which the Technostress acts as an intervening variable in the relationship.

Keywords: *technostress, technology competence, employee performance, workload.*

Introduction:

Rapid technological developments in the industry world has brought changes to the work system within the organization in order to make organization can survive and win the competition (Poole & Denny, 2001). This fact has an impact on every individual who works in an organization to produce a better performance continually, both in quantity and quality. Especially for organization that use high technology (hitech) in its production activities, each employee is required to be more and more expert to operationalize various machines (Quinn, 2007). This is due to changes in production technology that will change the existing working system (Brillhart, 2004).

Kupersmith (2003) argued that self adjustment to the changes in technology which is quickly developed and cannot be prevented is not an easy matter. Some individuals are able to accept these changes, but there are also people who have difficulty in accepting the changes that occur. Circumstances in which a person cannot cope and accept the technology changes which is quickly developed then it becomes the

pressure/stress for employees known as Technostress (Ennis, 2005).

The technostress term was firstly proposed by Brod (1984), who called technostress as a disease caused by the inability of an individual to adapt the new technologies in a healthy manner. Some limited studies on technostress are ever done. According to Weil & Rosen (2010), several studies had been discussed about technostress. For example, Hudiburg & Necessary (1997) examined the stress on the use of computers, computer or technology disruptions that cause stress. Weil and Rosen (1997) have also examined the theme of this technostress and introduced the concept of technophobia, Cyberphobia, computerphobia, computer anxiety, computer stress, negative computer attitudes, and computer aversio. According to the researchers above, technostress is negative impression against changes in behavior, thinking, or psychology as a reaction to the technology usage, either directly or indirectly.

Technostress may occur due to a number of causes and can also cause a variety of effects for individuals and organizations. Some surveys conducted on the

librarians in America (Kupersmith, 2003; U.S. Department of Health and Human Services, 2005), found a number of technostress major causes. Two factors expected to be positively related to the level of technostress on employees working in high-tech work environment were excessive job demands (work load) and insufficient mastery of the technology competence on employees. The second factor was also mentioned as a factor for technostress in several other studies (Cooper & Payne, 1994; Cooper & Straw, 1995; Brillhart, 2004). The higher performance demands and complexity of the technical problems that occur in high-tech equipment has led to increased workload in individuals who work in it. The change of this high-tech tools usage, would take effect on the workload of the employees because there was necessity to learn and master the high-tech, which was a new form of psychological pressure.

The technostress symptoms according Brillhart (2004) might have an impact on physical disorders, psychological disorders and behavioral disorders. In terms of company management, excessive stress is feared to have negative effect on the employees' behavior and performance. A number of studies had found negative impact of excessive stress on the absenteeism level, reduced levels of productivity, reduced organizational commitment, as well as the decline in the quality of interpersonal relationships and employees' turnover (Beehr, 1978; Cooper & Payne, 1994; Praptini, 2000; Lestari, 2002; Quinn, 2007).

Technostress levels experienced by employees might also lead to decreased company performance due to decreased individual performance. According to Brillhart (2004), stress or pressure could lead to productivity if they were in acceptable levels, but the study results of Skeem (2005), also suggested that stress could also be counter-productive if it was outside the tolerance limits.

Researches on stress in general and its impact on individual performance have been widely applied in the field of organizational behavior. However, research on stress caused by the impact of industrial technology (industrial technostress) is still relatively limited. This study aims to determine whether workload and the level of technology competence have impact to Technostress, as well as whether Technostress has an impact on performance of employees.

Literature Review:

Workload and Technostress:

Workload can be defined as the number of activities that must be completed by a person or group of people over a certain period of time under normal circumstances (Carlson, 2003). In Internet Dictionary (2010), workload is defined as work that a person is expected to do in specific time. Still from the same source, we can also find the workload definition as the

amount of work assigned to a person or a group, and that is to be done in a particular period, which is also defined as the amount of hour requires to carried out specific maintenance tasks.

By Carlson (2003), work overload is distinguished in quantitative and qualitative overload. Quantitative overload is "having too much to do", while qualitative work overload is "too difficult to do". So when the employees feel too much work to do, too diverse things to do, or not enough time available to complete the assigned job, then the condition is called work overload.

Indication of work overload may be seen since an increase in production volume, an increase in the number of goods types that should be produced and use of high-tech production equipment (Csaja & Joseph, 1993; Harper, 2002; Quinn, 2007).

The correlation between workload variables with technostress can be formed on the basis of the Davis and Newstrom theory synthesis (Margianti, 1999: 73-75), that mentioned the existence of some job characteristics and work environment which contains stressful situations, for example the heavy tasks/workload (overload). Quinn (2007) confirmed that the number of disturbances in the computer and high-tech equipment would result in technostress in individuals who work within the system.

So when the employees at the engineering companies that use robots with a computer control system feel that it is too hard work to be done, too diverse things to do, or not enough time available to complete the assigned tasks, then this situation can lead to stress caused by changes in technology. Based on the explanation above, we may compile the following hypothesis:

H₁: Workload has an impact on Technostress of the employees working in the engineering Department that use high-tech production equipment.

Technology Competence and Technostress:

Competence implies possession of knowledge, skills and abilities required by a specific job. Thus it can be stated that competence is a set of knowledge and skills that should be possessed by a person in performing their duties.

Reviewed from the technology side, according to Czaja & Joseph (1993), technology automation competence is ownership of knowledge, skills and abilities that are integrated by the individual on the field of mechatronics technology, computer technology and information technology.

Thus, a person's level of automation technology competence is defined as a measure of the ability level of an individual in terms of mastering a set of skills and knowledge in the field of mechatronics technology, computer technology and information technology in running the automatic system

equipment in production process. The higher the individual competencies of automation technology, the easier the computer or technology disturbance management during the equipment running process. This will reduce the negative stress caused by changes in the working system due to the changes in available technology (Weil & Rosen, 2010).

Quinn (2007) suggested that individual performance was affected by factors such as the individual ability in the form of knowledge and skills they had. In industries that implementing high-tech, it was suspected a correlation between the technology competence level of employees with technostress level. An individual with high level of automation technology competence was expected to perform well adaptation to the new technology changes so he or she did not have technostress. In contrast to individuals with low level of automation technology competence, was expected to have technostress problems.

Based on the explanation above, the following hypothesis is formulated:

H₂: The technology competence level has an impact to Technostress in employees who work at the engineering Department that use high-tech production equipment

Technostress and Performance of Employees :

Work performance or work achievements can be defined as a person's success in executing a job. Performance is successful achievement obtained by an employee of their work results during a particular period as compared with the work standard that has been determined and have been agreed together. Improved performance for both individuals and groups become the center of attention in an effort to improve organizational performance (Mathis & Jackson, 2002:78).

In European Journal of Scientific Research, Riggio (2003) said that:

"Most workers feel some sense of purpose and accomplishment about their jobs, which can be very rewarding and self-satisfying. However, work can also be a tremendous burden, with deadlines to meet, work overload and difficult bosses placing a considerable pressure and strain on workers. Therefore, jobs and the work environment commonly produce stress, which if not properly handled, can result in negative and dysfunctional behavior at work".

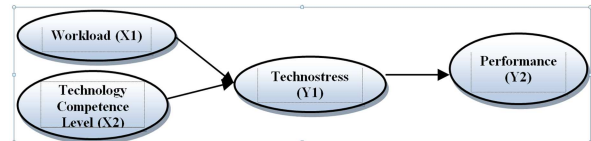
Based on the definition of performance and the indicators above, the researchers saw an early indication of a link between the technostress level and performance on individuals. In the high-tech industrial environment, it is thought that high technostress level can decrease the performance of employees.

H₃: Technostress affect the performance of the employees working in high-tech industrial environments.

Study Model:

Based on a literature review and analysis of the correlation between variables above, the research model can be constructed as follows:

Figure 1. Study Model



Study Methods:

Population and Data Collection Technique:

This was an explanatory study that examined the impact and correlation between numbers of variables. The study was conducted on employees who are working in the Engineering Department of one multinational company that run in non-dairy creamer production, as many as 138 people. The selection of research objects located in Central Java Indonesia was based on the consideration that the company production system had been changed from semi-manual production system into a production system with high-tech equipment. The production process in the factory had largely used robotic equipment that were operated from a control room, starting from the raw materials receiving, the cooking process, drying up and packing process.

The study samples were all employees who work in the Engineering Department as many as 138 people, used saturated sampling method in which the entire population was used as respondents. The data collection was performed by questionnaires that were distributed to the respondents. In addition, researchers also conducted in-depth interviews with the company management to obtain information from the company's point of view.

Variables Measurement:

Measurement of workload variables (X1) in this study included the aspects of work amount and time to complete the work items and they were integrated in 8 questions. Measurement of the technology competence level concept (X2) used empirical indicators correlated with the competence level of mechatronics technology, computer technology and information technology which consisted of 6 question items. Furthermore technostress variable (Y1) was measured by using empirical indicators that were synthesized by Cooper & Straw (1995), which included indicators of physical changes, behavioral changes, and character and personality changes, with a total of 6 question

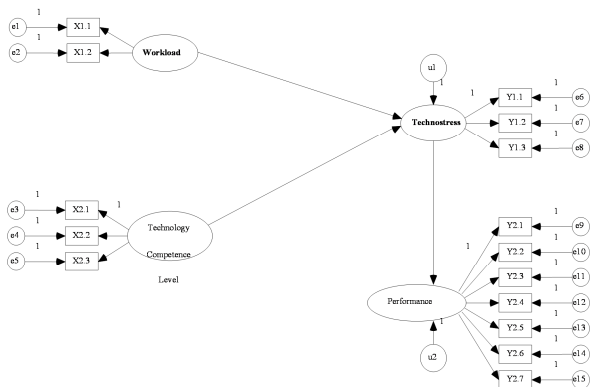
items. Finally, performance measurement was based on the work results that were achieved by the employees in carrying out the tasks assigned to them based on skills experience, and determination as well as the time, which consisted of 8 question items.

All study concepts were measured using a Likert scale at the level of the ordinal, with the scale of 1-5, which 1 (strongly disagree), to 5 (strongly agree). Validity and reliability tests of this study instrument showed that all question items used in this study were valid with $r > 0.30$. All concepts studied were also met the reliable elements of Cronbach Alpha value > 0.60 .

Data Analysis Techniques:

Data analysis technique here used inferential statistical analysis with SEM (Structural Equation Modeling) method. SEM analysis was used to test the impact between variables in the research model and those that have been hypothesized.

Overall, the research model to be tested is as follows.



Results and Discussion:

Basic Assumptions of SEM Test:

Basic assumption test in the SEM, that was test for normality, linearity and outliers showed that the data met all the basic assumptions of SEM test. Absolute value of Critical Ratio for Multivariate was $1,015 < 1.96$ then the assumption of multivariate normality was met. Examination of the multivariate outliers was performed by Mahalanobis distance criteria at the level of $p < 0.001$

Outliers test found that the most distant point of observation was the first respondent with Md value= 61 035. When compared to a χ^2_{89} value=135.98, then the value of the first point Md<135.98, so it was concluded that all observation points was not outliers.

Goodness of SEM Fit:

Goodness of fit overall model test results, in order to determine whether the hypothetical model was supported by empirical data, was provided in the table below.

Table 2. Test Results of Goodness of Fit Overall Model

Criteria	Cut-of value	Model Results	Notes
CMIN/DF	≤ 2.00	1.511	Fit
GFI	≥ 0.90	0.804	Moderate
AGFI	≥ 0.90	0.867	Moderate
CFI	≥ 0.95	0.890	Moderate
RMSEA	≤ 0.08	0.063	Fit

Goodness of Fit Overall test results showed 2 of 5 criteria indicated the Fit model, while the 3 other criteria showed moderate model. According to Solimun (2009), the best criteria that were used as the model goodness indication was the value of Chi Square / DF < 2, and RMSEA<0:08. In this study, the CMIN/DF and RMSEA values have met the cut-off value. Therefore, SEM model in this study was suitable and feasible for use, so that interpretation could be performed for further discussion.

Confirmatory Factor Analysis:

Measurement model was measured from loading factor value (standardize coefficient) for each indicator to the latent variables. Loading factor value indicates the weight of each indicator as a measurer of each variable studied. Indicator with a large loading factor indicates the indicator as a dominant variable measurer.

Results of confirmatory factor analysis to the indicators of the four variables were presented as follows:

Table 3. Confirmatory Factor Analysis

		Estimate
Technostress	<--- Workload	.415
Technostress	<--- Technology	-.454
Technostress	<--- Competence	
Performance	<--- Technostress	-.940
Y21	<--- Performance	.327
Y22	<--- Performance	.588
Y23	<--- Performance	.645
Y24	<--- Performance	.480
Y25	<--- Performance	.521
Y26	<--- Performance	.408
Y27	<--- Performance	.484
Y13	<--- Technostress	.508
Y12	<--- Technostress	.391
Y11	<--- Technostress	.455
X21	<--- Technology	.840
X21	<--- Competence	
X22	<--- Technology	.804
X22	<--- Competence	
X23	<--- Technology	.741
X23	<--- Competence	
X11	<--- Workload	1.077
X12	<--- Workload	.596

Based on the table above, it is seen that all study indicators have a standardized coefficient or loading factor p-value of <0.05. Some indicators were even declared as fixed. It could be concluded that all indicators were significant in measuring the research variables.

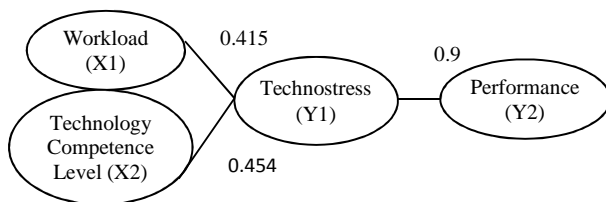
Structural Model:

In this structural model we tested the hypothesis for the correlation between variables (direct effect). We present the complete results of the tests on the correlation between the variables as follows:

Table 4. SEM Hypothesis Test

Correlation between Variabels	Coefficient	P-value	Notes
WorkLoad (X1) → Technostress (Y1)	0.415	0.002	Significant
Technology Competence (X2)→Technostress (Y1)	-0.454	0.001	Significant
Technostress (Y1) → Performance (Y2)	-0.940	0.001	Significant

Hypothesis test results are graphically presented as follows:



Based on the tables and figures above, the test results of the structural model can be interpreted as follows:

1. The impact of workload on Technostress was indicated by a coefficient of 0.415 with a p - value of <0.05 so that it can be mentioned that there was a significant impact of Workload on Technostress. Since the coefficient was positive (0.415), then their correlation was in the same direction. This means that the higher the workload, the higher the Technostress.
2. The impact of Technology Competence on Technostress was demonstrated by the coefficient of -0.454 with a p value of <0.05. This means that there was a significant impact of Technology Competence level on Technostress. Since the coefficient was negative (-0.454) the correlation was inversely proportionate. This means that the higher the Technology Competence level, the lower the Technostress.
3. Technostress impact on the performance coefficient of -0.940 with a p value of <0.05 so that it could be interpreted that there was a strong significant impact from Technostress on Performance of Employees. The impact was

inversely proportionate which means the higher the Technostress, the lower the performance of employees.

Discussion:

The study results found that changes in production technology that was made too quickly and without properly preparing employees could cause Technostress. Factors such as excessive workload (over work load) due to the changes in technology that affect the work system changes in this study was found to be significantly and positively correlated to the technostress emergence. Interviews with the company management found that in the early stages of new production technologies implementation in the company, there were indications that showed an increasing stress on employees such as increased absenteeism, increased number of employees who went to the company clinic, as well as the increased number of self resignation percentage of employees. These facts were compounded by the frequent occurrence of product defects due to improper machine operation, which would increase the workload of the employees because they had to work longer (overtime).

Furthermore, the study results found a significant correlation between Technology Competence Level and Technostress. In-depth interviews to the company management admitted that in the early stages of the use of automation equipment, the majority of individuals in the work environment felt confused and did not understand how to operate the new production system. Training was not enough, considering the limited time due to high workload. Less training was one of the obstacles in the effort to increase automation technology competence in each individual. The third hypothesis that technostress would have an impact on employee performance was proven in this study. This finding was in line with the company management recognition that there had been a decline in the productivity of employees, especially in the initial period of new technology production system changes. It was recognized by a manager at the company's Technical Support who leads a group of engineers charged with the maintenance execution and equipment repair. The manager admitted that in the past 3 years he felt psychological pressure changes in his duties as follows:

"I felt an increase in psychological distress due to extra workload, especially since the increased complexity of production equipment using automation technology. Technical issues that arised were always different and required different handling. In addition, the increase of product types also forced me and my team to do new settings and other modifications to suit the needs of the production process for new product types".

One other Manager in the System Engineering Department who leads a group of engineers in charge of setting up treatment programs in Computerized Maintenance Management System (CMMS) and new projects supervision also said in line with the comments above:

"I find it very difficult and was ever increasing in the past 3 years. The number of automated equipment need highly variable spare parts and difficult to obtain in the market, making it difficult for the planned maintenance. In terms of handling the production capacity increasing project, I need to have additional skills and competencies especially in process engineering, installation and commissioning of the automated equipment."

The findings in this study supported some previous Technostress studies (Poole & Denny, 2001; Kupersmith, 2003; Carlson, 2003; Skeem, 2005; Quinn, 2007) that the introduction of a new technology did not always have a positive impact, but could cause technostress on employees if it was not prepared properly. Subsequent impact of technostress on the employees could give a negative effect on the organization because of excessive technostress might degrade the performance of employees.

Conclusions:

Based on the analysis and research objectives, we can draw conclusions as follows:

1. There was significant and positive impact of Workload to Technostress on employees who work in industries with high-tech production equipment. The existence of the positive coefficient indicated their correlation was in one direction. This means that the higher the workload, the higher the Technostress.
2. There was significant and inversely proportionate impact of Automation Technology competence to Technostress on employees who work in industries with high-tech production equipment. The higher the Technology competence level, the lower the Technostress.
3. There was significant impact of Technostress to the performance of employees who work in industries with high-tech production equipment. The higher the Technostress, the lower performance of employees in engineering department.

Theoretical Implications and Recommendations:

Based on the obtained study results, it appears both theoretical and applied implications:

1. This study reinforces earlier theories regarding the existence of significant impact of Workload and competencies to stress. The study also found technostress role as a mediating variable between

Workload & Technology Competence to the performance of employees.

2. The study findings made a contribution to the stress theory in the context of Technostress that occurs specifically in the industrial world with high technology (robotic equipment) in the production process.
3. To avoid excessive technostress, it is needed to develop organizational handling. To the management board in industrial world, it is advisable to conduct a comprehensive and thorough preparation prior to performing production system replacement from manual system to high-tech automation system. This is to avoid the occurrence of company's losses due to the decline in the performance of employees who experience technostress. It's important to implement the appropriate changing management steps for this change can make positive impact to the occurrence of stress rather than negative stress. Technology-based training
4. For individual handling, all employees in the various fields of industry are recommended to continually learn and improve their competences in a sustainable manner in order to be individuals who are ready to accept new challenges and not become a victim of the work system changes itself.

To make this study model steady, future research should re-examine this study model in other industry sectors that use high-tech production process. In addition, on the other hand, it will be interesting to observe high-tech industry that is able to make technology changes in company environment smoothly that do not lead technostress but can improve the performance of employees.

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