

The Causality between Worker Characteristics and Nutritional Status towards Productivity of SMEs in Indonesia

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Article History

Received: 02.01.2018

Accepted: 13.01.2018

Published: 30.1.2018

DOI:

10.36347/sjebm.2018.v05i01.007



Abstract: Some models of employee productivity have been claimed by researchers. However, these models tend to focus on large industrial and not a lot of productivity model built on the interaction of employees with the system working in SMEs. On the basis of these considerations, the study aimed to know causality on the characteristics and nutritional status of employees with productivity. Data analyzed with Structural Equation Modeling using WarpPLS 5.0 and the model shows that there is a positive effect on nutritional status to productivity, as well as negative effect on the characteristics of the employee to productivity. In addition, it also indicated the presence of the influence of individual characteristics and nutritional status to productivity through the mediation of the variable workload.

Keywords: structural equation modeling, productivity, applied ergonomic, human resources management.

INTRODUCTION

Industrial developing countries (IDC) and small and medium enterprises (SMEs) determine the highest proportion of employment [1]. Unfortunately, the working conditions in SMEs are often very poor [1]. Some of these common features of these industries are improper workplace design, ill-structured jobs, mismatch between worker abilities and jobs demand, poor human machine system design and inappropriate management program [2].

International Labor Organization [3] reported that SMEs take into account of 35% potential injuries. This leads to poor worker health and in turn this reduces worker productivity [2]. The special issue is underpinned by an ergonomics/human factor approach that aims to enhance simultaneously the work environment for people within SMEs [4], worker productivity, job satisfaction and achieve a balance characteristics with task demand [2].

Ergonomics application in Indonesian SMEs is still focused on the physical ergonomics domain [1] such as tool design, manual handling and working postures, corresponds to ergonomics issues identified in previous publication e.g. [5-10]. In addition, the research by Ariati, [11]; Tasmi & Dkk, [12] showed that there were a strong relationship between nutritional status towards their performance and productivity. Hermawati *et al.*, [1] mentioned that organizational ergonomics has strong relationship towards modeling the ideal working condition by considering each aspect of personal capacity with system design which is comparatively less popular than physical ergonomics.

Based on the limitations above, the objective of this paper is focused on model of worker productivity especially the design for SMEs. Factors related individual characteristics, nutritional status and workload and the relationship towards with productivity. The interaction among them – would allow for improving management practices, thus it can establish better intervention priorities [13].

LITERATURE REVIEW

Organizational Ergonomics

Organizational ergonomics has to do with work organization both from human resource management to workplace atmosphere covers work system, shift system, working time and design of job distribution [1] which relevant to the optimization of work system [7].

Mukhlisani N, Wignjosoebroto S, Sudarso I [14] had analyzed the causality between work system related to Occupational Health and Safety (OHS) program towards worker productivity through the mediator variable of workplace. The physical workplace has a direct impact towards the worker health, but it has no impact towards occupational safety.

Meanwhile, psychic work environment has an impact towards occupational safety, but it has no impact towards occupational health.

Individual Characteristics

Individual characteristics is a factor related to a limitation of working for human [15]. This limitation covers age, gender, anthropometry, background of education, experience, social status, religion, health condition and wellness [15]. The capacity of workload is also determined based on individual characteristics [8]. Besides that, irrelevant measuring tools to the worker posture will result in risking the working posture of the worker which also evokes the decreasing of productivity level[16].

Nutritional Status

Nutrition which is needed for every person is different from one to another and it depends on the activity of working they have done, the condition of workplace [11] and duration of working time [12]. Good nutritional status gives positive impact towards the employee’s work capacity [12]. If the food we are consumed every day is not balance with the energy we expel/use, so our body will have health problem and it will finally affect the work productivity [11].

Workload

The relationship between workload and working capacity is affected by many factors which are complex, either internal factors or external factors. The working capacity of an worker is not similar to other workers and it depends on the skill level, physical health, nutritional condition, gender, age and body posture of the worker[15].

Productivity

Productivity can be, one of the ways, measured based on the output per day and the task completion time [15,17], which becomes the important point for workers of small and medium enterprises (UKM) since

their wages depend on their productivities [1]. Some factors related to age, weight, height, working experience, body mass index and nutritional status of someone has an impact towards the productivity level [18,19,17].

MATERIAL AND METHOD

The setting of this research was determined based on something which was relevant to what Hermawati *et al.* [1] said about the importance of shifting research from big enterprise to UKM (small and medium enterprises). It had been chosen a group of UKM apple chips located in Batu, Indonesia. The location was chosen since there was no arrangement for working organization, equality of business scale, the tendency of UKM which had no concern towards the design of working facility and they were still using traditional tools (manual handling). This research was only focused on a part of cutting apples since the workers had more task switching and their interaction with the tools was longer and the writer considered that it was not ergonomic.

A cross-sectional study was conducted among workers who worked in SMEs. Data collection used questionnaire which was divided into four parts i.e.: the first part was related to the respondent’s profile. The second part was related to nutritional status by using the approach of recall of one-day food intake. The third part was related to the certain workload which was measured based on the quantity of task, the quantity of task shift and the duration of working time. While, the last part was the worker’s productivity which was in form of data about the amount of work output per hour which could be produced by the worker, completion time of task and wages per day.

The data, then, was analyzed by using SEM assisted by Warps 5.0 software. The concept of SEM diagram can be seen in figure 1 below.

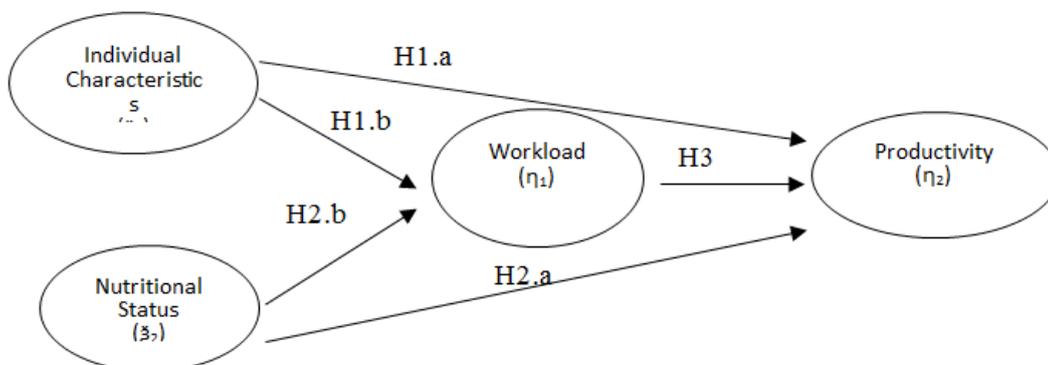


Fig-1: The Concept of Productivity Model

Based on the path diagram in figure 1 above, hypothesis which can be taken is:

H1: Individual characteristics and workload has an impact towards productivity

H1a: Individual characteristics has a direct impact towards productivity

H1b: Individual characteristics has an indirect impact towards productivity through mediator variable of workload

H2: Nutritional status and workload towards productivity

H2a: Nutritional status has a direct impact towards productivity

H2b: Nutritional status has an indirect impact towards productivity through mediator variable of workload

H3: Workload has a direct impact towards productivity

RESULT AND DISCUSSION

Model of validity test had been done (Appendix 1) and it was stated that model in this research had fulfilled Goodness of fit (GoF) criteria, internal validity, discrimination validity and it had been exempted from the problem of multicollinearity. *Goodness of Fit (GoF)* was used as an assessment about how good the path was in the model in describing the differentiation of data variation [20]. *Output Correlations Among Latent Variables* was important to be evaluated the discrimination validity of research instrument [3]. The criteria used was *Squared Roots of Average Variance Extracted (AVE)* which was a

diagonal column which was given brackets marks that had to be higher than the correlation between latent variables in the similar column (above or below it) [3]. Then, multicollinearity test on it could be found based on the result of *Output Block Variance Inflation Factors* under the condition that the score < 3,3 [3].

The model of structural equation which was shown in Figure 2 showed that the worker's productivity was affected by the worker's individual characteristics, nutritional status and workload. The existence of significant impact between individual characteristics (X1) towards productivity (Y2) was relevant to the study which had been done by [19, 21, 17] which showed the significant impact between individual characteristics towards productivity. The coefficient of path which showed the impact of worker's individual characteristics towards productivity had negative value. It means that the increasing number of weight and age which reflected the variable of individual characteristics that was able to decrease the worker's productivity level. It happened because working limitation caused by obesity which resulted in decreasing the productivity including the decreasing of task completion time and physical activity.

Appendix 1

Table-1: Model Fit and Quality Indices

No.	Criteria	Results
1.	Average Path Coefficient (APC)	P < 0,05 P = 0,004
2.	Average R-squared (ARS)	P < 0,05 P < 0,001
3.	Average Adjusted R-squared (AARS)	P < 0,05 P < 0,001
4.	Average Block VIF (AVIF)	Diterima jika ≤ 5, idealnya ≤ 3.3 1,155
5.	Average Full Collinierity VIF (AFVIF)	Diterima jika ≤ 5, idealnya ≤ 3.3 1,515
6.	Tenenhaus GoF (GoF)	Sempit ≥ 1, Sedang ≥ 0,25, Luas ≥ 0,36 0,562
7.	Sympson's Paradox Ratio (SPR)	Diterima jika ≥ 7, idealnya = 1 0,800
8.	R-squared Contribution Ratio (RSCR)	Diterima jika ≥ 9, idealnya = 1 0,982
9.	Statistical Suppression Ratio (SSR)	Diterima jika ≥ 7 0,800
10.	Nonlinear Bivariate Causality Direction Ratio	Diterima jika ≥ 7 0,800

Table-2: Output Laten Variable Coefficients

	X1	X2	Y1	Y2
R-squared			0,447	0,641
Adjusted R-squared			0,404	0,598
Composit Reliability	0,757	0,940	0,020	0,311
Cronbach Alpha	0,6	0,911	0,124	1,119
Avg.var.extrac	0,454	0,798	0,402	0,667
Full Collin. VIF	1,388	1,419	1,633	1,619
Q-squared			0,443	0,625

Table-3: Output Correlations among Latent Variables

Correlations Among Latent Variable With Squared Roots AVEs				
	X1	X2	Y1	Y2
X1	(0,674)	0,123	0,508	0,086
X2	0,123	(0,893)	0,253	0,538
Y1	0,508	0,253	(0,634)	0,401
Y2	0,086	0,538	0,401	(0,816)

Table-4: Output Block Variance Inflation Factors

	X1	X2	Y1	Y2
X1				
X2				
Y1	1,010	1,010		
Y2	1,022	1,361	1,372	

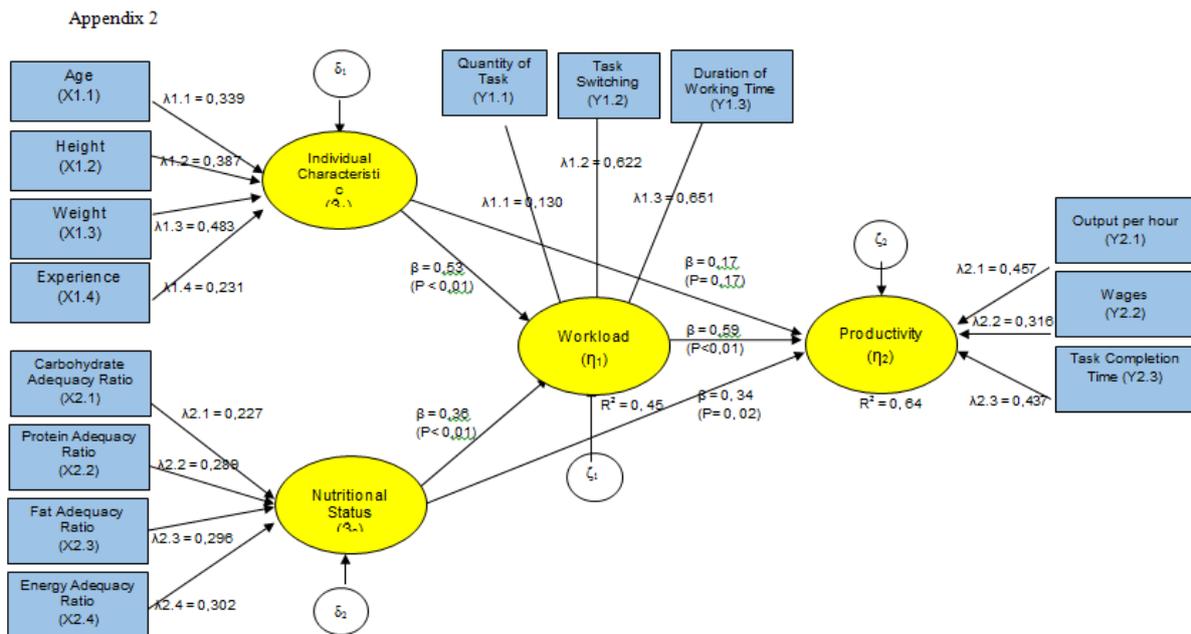


Fig-2: Model of Worker's Productivity

The worker's difficulty to mobile and/or move from their position made the task completion time became longer than usual [22]. Also stated that as the age number became more than 50 years, the productivity level would be decreasing[17].

Productivity was also affected by nutritional status where the coefficient path had positive value which meant that the nutritional status was well nourished that could increase the productivity that was illustrated through work output which could be produced per hour, wages per day and the speed of task completion. The existence of the significant impact between nutritional status and productivity both directly or indirectly through mediator variable was in line with the research which had been done by Arfiasari[16], Satyanarayana *et al.* [19], Tasmi & Dkk [12] Wolgemuth *et al.* [17]. [12 stated that the capacity of someone to work was affected by energy input. The amount of calorie needed for doing job should be fulfilled by consuming food and drinking beverages [12]. Furthermore, [19] did a test on worker's productivity level before and after consuming food and drinks. The result of the analysis proved that the worker's productivity was increased after they had eaten their food. The increase of productivity after

consuming food indicated that well menu of food during working time had an impact towards the worker's productivity.

Indirect impact between nutritional status and individual characteristics through mediator variable of workload showed positive value on coefficient path. If the increasing number of worker who had higher number of weight and they became older followed by the increasing number of workload would result in decreasing of the worker's productivity. While, for the worker who had good nutritional status which could be seen from the increasing number of Energy Adequacy Ratio, Protein Adequacy Ratio and Fat Adequacy Ratio, was still able to increase their productivity even though there was additional workload related to the increasing quantity of task switching and longer duration of working time[23].

CONCLUSION

The worker's individual characteristics and nutritional status had both direct and indirect impact. The increasing number of weight and age of the worker which described someone's individual characteristics could decrease the productivity level. If the increasing number was followed by the increasing number of

workload, it could decrease the productivity level. On the other hand, if the worker had good nutritional status and the increasing of nutritional status was followed by the increasing number of workload, the worker still could increase their productivity.

IMPLICATION

Managerial Implication

- The arrangement of work organization through facilitating adequate break time and starting to implement job distribution system to decrease the workload of worker which caused by the frequency of task switching .
- The underweight workers should add the amount of food to be consumed in increasing the weight and energy adequacy ratio. Besides, consuming food variations such as biscuit, ice cream and other snacks which contain fat in adequate number since fat gives contribution towards higher amount of energy in doing activity.

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