

Uncertain Supply Chain Management

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The role of workers' perceptions towards the uncertain result of ergonomic program

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ABSTRACT

Manual activities of workers in palm oil factories cause pain complaints that can be resolved with an ergonomic program. However, the uncertainty of the success of the ergonomic program requires active involvement from workers. This study aims to discuss the role of workers' perceptions towards the success of the ergonomic program intervention in palm oil mills. By referring to the theory of reasoned action and technology acceptance model, acceptance of workers to ergonomics programs are influenced by perceived usefulness, perceived ease of use, and perceived trust. All these research variables were analyzed simultaneously using Partial Least Squares Structural Equation Modeling (PLS-SEM) software, in which data were obtained from questionnaires given to 280 people working in 20 palm oil mills in North Sumatra Province. The sampling method used is simple random sampling and model estimation is performed using PLS regression algorithm and resampling bootstrapping method. The result shows that perceived usefulness has the biggest effect on the success of the ergonomic program, followed by perceived trust and perceived ease of use, which has a smaller effect. This study focuses on workers' perception that needs to be considered for facing uncertain results in implementing an ergonomic program.

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1. Introduction

The palm oil industry is a strategic sector in Indonesia, which contributes approximately 3.5 percent to the Gross Domestic Product (GDP). Many people depend on their livelihoods in the palm oil industry to improve their family welfare - this is in line with the priority in achieving Sustainable Development Goals (SDGs 2030; Muda et al., 2018 & Purba 2019). In Indonesia, most Palm oil mills use semi-automatic machines and workers only supervise the production process. However, there is still some manual material handling performed by workers, such as sorting fresh fruit bunches. Workers also assist in the process at the boiling station by manually opening the sterilizer door and then attaching a rope to the lorry filled with boiled fresh fruit bunches and pulling them out. Inappropriate manual material handling will cause mild to severe pain complaints (Simoneau et al., 1996). One way to solve the pain complaints problem is by implementing an ergonomic program that is supported by all workers (Bernardes et al., 2012). The ergonomic program can be implemented as changing machines, changing work methods, increasing workforce, or increasing rest time. Its application must be integrated at the organizational level by involving all parties and performed sustainably (De Jong & Vink, 2002; Tullar et al., 2010; van Eerd et al., 2010; Jahangiri et al., 2015; Rasmussen et al., 2017; Muda et al., 2020). Successfully implementing an ergonomic program will reduce complaints of worker pain and thus improve their life quality. The uncertainty of successfully implementing an ergonomic program makes active participation from workers a prerequisite (Zalk, 2001; Loisel et al., 2001). However, workers' active participation only happens if they have a positive attitude and beliefs in the expected behavior. Meanwhile, all this time the implementation of the ergonomic program solely focuses on the physical aspects of the work environment without considering the worker's attitudes (Whysall et al., 2004). Workers' perception regarding the ergonomic program implemented will affect their decision about rejecting or accepting it. In this case, the workers' perception can be further

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divided into perceived usefulness, perceived ease of use, and perceived trust that will affect their intention (Ramos et al., 2018; Saeed Al-Marouf et al., 2020). Perceived usefulness is defined as the extent to which workers believe that using a particular system will improve performance. Perceived ease of use is defined as the extent to which workers believe that the implemented system will be easy to use (requiring less effort) and the technology applied will be easily understood (Davis, 1989). Meanwhile, perceived trust is the level of workers' trust in the success and benefits that will be obtained from the implementation of technology. However, it is necessary to have a match between the problems found and the changes to be made (Skoglund-öhrman, 2004). This will affect workers' trust that the ideas and solutions developed will indeed solve the problems they face at work.

Previous studies on the success of ergonomics programs from the perspective of workers' perceptions towards technology acceptance have never been discussed. More precisely, to date, there is no study about workers' perception towards acceptance of technology in palm oil mills, hence whether workers accept the intervention is still unclear. Thus, understanding the workers' perception of their willingness to be involved and implement the ergonomic program is crucial. Based on this condition, some studies are needed to determine how big the role of workers' perceptions is and which perceptions affect the success of the ergonomic program the most. Hence, this research will provide solutions to increase the success of the ergonomic program implemented in palm oil mills.

2. Literature Review

2.1. *Uncertainty of successfully implementing the ergonomic program*

The ergonomic program is implementing technology in organizational systems, which requires workers as end-users to be actively involved. The ergonomic program has the concept of continuous improvement and decision-making based on the results of joint discussions. Thus, in addition to management commitment, there are few more crucial aspects: work relations, good communication, and active employee involvement (Burgess-Limerick, 2018). The success of the ergonomic program is highly dependent on the cooperative involvement of management and workers; therefore, the dynamics of workers and management groups are important. Employee involvement and good communication with management will lead to effective implementation of the ergonomic program (Dale, et al., 2018). However, the success of an ergonomic program is uncertain, as to how to involve large numbers of workers and to find why workers are willing to participate are still questionable (Dixon & Theberge, 2011). Implementing a program in an organization requires workers' understanding of the changes that will occur (Austin & Claassen, 2008). Consequently, the readiness of workers to accept changes is decisive for the success of the program.

2.2. *Reason Action Theory*

Reason action theory (TRA) states that a person's behavior is based on voluntary behavior and his/her behavior depends on intention. This intention is influenced by subjective attitudes and norms (Fishbein & Ajzen, 1975). Attitudes will affect a person's behavior both positively and negatively. However, if attitudes are not followed by behavior, then the behavior is influenced by subjective norms. Subjective norms contribute to whether a person will perform the behavior and refer to a person's perceptions regarding other people's opinions of the behavior he will do.

2.3. *Technology Acceptance Model*

Technology acceptance model 3 (TAM3) is a strong framework to determine user acceptance of a certain technology (Davis & Venkatesh, 1996). There is a causal relation between beliefs about technology benefits, ease of use, and the behavior that results from it. An early indication of user acceptance is important, since applying technology will have enormous implications for the sustainability of the organization. Perceived usefulness, perceived ease of use, and perceived trust are factors that play a role in technology acceptance behavior (Davis, 1989; Ghazizadeh, et al., 2012; Choi & Ji, 2015, Muda et al., 2019).

2.4. *Perceptions of Workers*

This study uses TRA and TAM3 as their basis to explain that workers' perceptions influence the success of the ergonomic program (Ajzen & Madden, 1986; Venkatesh & Bala, 2008). TRA aims to understand the voluntary behavior of workers who carry out a behavior based on the results to be obtained. This is in line with TAM3, which states that there is a causal relation between workers' perceptions of the technology being applied in the ergonomic program and the action that occurs. It means that it is possible to predict the willingness of workers to be involved in ergonomic programs before the implementation of the technology. Thus, we assume that workers' perceptions of the ergonomic program will increase the likelihood of an action being performed. When workers believe in the benefits of a soon-to-be-applied technology, they will be willing to use it.

3. Methods

This type of research is a correlation study aiming to analyze the various factors influencing the success of the ergonomic program. Correlation analysis is used to determine whether there exists a relationship between variables. This study uses a quantitative approach in collecting and analyzing data and uses a questionnaire as a data collection tool. Participants in this

study are workers on the production floor of the palm oil mill, from the loading ramp station to the kernel station. Participants represent workers from the 3 work shifts that exist in each palm oil mill. The population of this study is workers at 20 palm oil mills in North Sumatra Province. The palm oil mill population is obtained from the website of the Ministry of Industry of the Republic of Indonesia for the commodity type of palm oil (Kementerian Perindustrian RI, 2015). Simple random sampling is chosen as the sampling method, to ensure each element of the population has the same chance of being selected. The exogenous construct is the perception of workers, namely perceived usefulness (X1), perceived ease of use (X2), and perceived trust (X3). The endogenous construct is ergonomic program success (Y). The questionnaire used a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The researcher explained the objectives of the study and the relevant ergonomics terms to the participants. The questionnaire used in this study has constructs that are adapted from previous studies. Perceived Usefulness is measured by indicators of punctuality and results accuracy, which consists of four questions (Baker-Eveleth & Stone, 2015). Perceived Ease of Use is measured by indicators of convenience and suitability, which consists of three questions (Dachyar & Banjarnahor, 2017). Perceived Trust is measured by indicators of experience and satisfaction, which consists of three questions (McKnight et al., 2002). Ergonomic program success is measured by indicators of work safety, work comfort, work quality, and productivity, which consists of 4 questions (Wee et al., 2014; Kalkis & Roja, 2016). Partial Least Squares Structural Equation Modeling (PLS-SEM) with WarpPLS3.0 software was used to analyze the variables of this study simultaneously (Hair et al., 2014). Next was simultaneously performing a measurement model test and structural model test. Measurement model tests will prove the validity and reliability of constructs through convergent validity and discriminant validity.

4. Results and Discussion

4.1. Participant Characteristics

There are 280 people who participate in this study and all participants are male (100%). Characteristics of the participants are presented in Fig. 1 - most of the participants have a high school education background (75%) and some are still educated below (11%). Approximately 44% of participants have worked for more than 10 years, 23% of them have worked for 5-10 years, and 19% of them have only worked for 1-2 years.

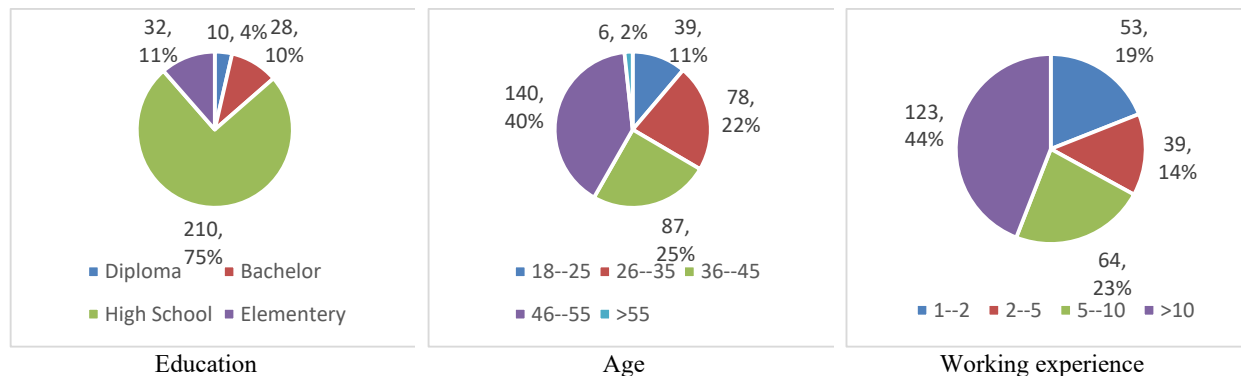


Fig. 1. Characteristics of the participant

4.1.1. Convergent Validity

The measurement model's convergent validity test measurement model is based on the factor loading value of the indicator. Perceived usefulness, perceived ease of use, perceived trust, and ergonomic program success are reflective constructs, so their loading values must be greater than 0.7 and their p-significant value must be less than 0.05 (Hair et al., 2014). The loading factor value of each construct indicator satisfies the validity and reliability requirements as listed in Table 1.

Table 1

Convergent Validity

Constructs	Perceived Usefulness	Perceived Ease of Use	Perceived Trust	Ergonomic Program Success
pu1	0.922			
pu2	0.868			
pu3	0.912			
pu4	0.906			
peou1		0.939		
peou2		0.933		
peou3		0.891		
tst1			0.856	
tst2			0.904	
tst3			0.881	
ergo1				0.918
ergo2				0.881
ergo3				0.918
ergo4				0.913

Source: SmartPLS Result (2021).

4.1.2. Discriminant Validity

The discriminant validity test using the Fornell-Larcker approach shows that the square root of AVE is higher than the correlation between other latent variables. Table 3 shows that the discriminant validity of the perceived usefulness construct is 0.902 greater than 0.505, 0.471, 0.543, and 0.566. Likewise, the discriminant validity for perceived ease of use, perceived trust means that the condition for discriminant validity is met.

Table 2
Discriminant Validity

Constructs	Perceived Usefulness	Perceived Ease of Use	Perceived Trust	Ergonomic Program Success
Perceived Usefulness	(0.902)			
Perceived Ease of Use	0.505	(0.921)		
Perceived Trust	0.471	0.493	(0.880)	
Ergonomic Program Success	0.566	0.598	0.565	(0.908)

Source: SmartPLS Result (2021).

4.1.3. Reliability Test Result

The reliability of the research instruments was tested using Composite Reliability (CR) and Cronbach Alpha (CA) as shown in Table 3. The result of CR and CA tests shows that all values are reliable since all of them are about 0.7.

Table 3
Reliability Test Results

Constructs	Indicators	Cronbach's Alpha (α)	Composite Reliability (CR)
Perceived Usefulness	pu	0.814	0.946
Perceived Ease of Use	peou	0.911	0.944
Perceived Trust	tst	0.855	0.912
Ergonomic Program Success	ergo	0.929	0.949

Source: SmartPLS Result (2021).

4.1.4. Explained Variance (R^2) and Prediction Relevance (Q^2)

The R-squared value to predict the effect of perceived usefulness, perceived ease of use, and perceived trust simultaneously on the success of the ergonomic program is shown in Table 4. Perceived usefulness, perceived ease of use, and perceived trust together can influence the success of the ergonomic program by 55.3%. The remaining percentage is influenced by other variables not studied here. There is also a Q^2 value on the success of the ergonomic program of 0.564 > 0, meaning that the observed value is properly reconstructed, hence the model has predictive relevance.

Table 4
Explained Variance (R^2) and Prediction Relevance (Q^2) Test

	Explained Variance (R^2)	Prediction Relevance (Q^2)
Ergonomic Program Success	0.553	0.564

Source: SmartPLS Result (2021).

4.1.5. Hypotheses Testing Results

The theoretical correlation between exogenous construct and endogenous construct was tested using path analysis. The significance of the direct effect of perceived usefulness, perceived ease of use, and perceived trust on the success of the ergonomic program are shown in Table 5. The result of hypothesis testing shows that all three perceptions significantly support the success of the ergonomic program.

Table 5
Result of Hypothesis Testing

	Path coefficient	P-value	Supported ?
Perceived usefulness → ergonomic program success	0.208	0.002*	Yes
Perceived ease of use → ergonomic program success	0.168	0.008*	Yes
Perceived trust → ergonomic program success	0.180	0.004*	Yes

Note: *Significant at $p < 0.05$.

The coefficient value of each variable is shown in Fig. 2 and shows that perceived usefulness, perceived ease of use, and perceived trust influence the success of the ergonomic program. In comparison, perceived usefulness has the greatest influence among these three perceptions. The increase in perceived usefulness has a direct effect on the success of the ergonomic program by 20.8%. This result is supported by a previous study which states that perceived usefulness affects attitudes more than perceived ease of use and perceived trust (Renny et al., 2013).

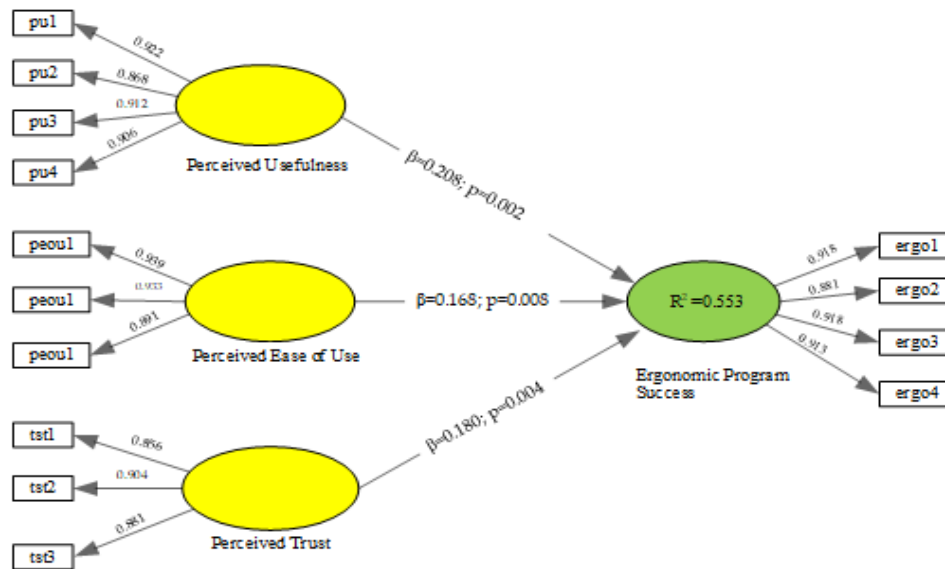


Fig. 2. Full Research Model

5. Discussion

This study explores the influence of workers' perceptions namely perceived usefulness, perceived ease of use, and perceived trust on the success of the ergonomic program in palm oil mills. Ergonomic program is a complex process, as it aims to improve work conditions in palm oil mills, thus affecting the life quality of the workers. Comprehensive implementation of an ergonomic program accompanied by proper monitoring will achieve the desired results. So far, the ergonomic program tends to focus on physical changes and work processes, even though workers are one of the critical success factors (van Eerd et al., 2010). Because workers are an organization's most asset, optimizing workers' actions will improve organization performance (Muda et al., 2018). Therefore, many aspects need to be considered properly before making any change to the system, work processes, work procedures, and work facilities used. Successfully implementing the ergonomic program in palm oil mills will improve workers' performance, since they can work painlessly and more comfortably. Workers will develop their perception during the adoption process, a time when workers can interact with the ergonomic program offered. During this time, they can evaluate initial perceptions, which may change their perceptions altogether and cause intention changes. If the workers perceive that the new technology introduced in this program will benefit themselves, they will be willing to get involved. Workers' involvement is crucial to the success of the program because workers are the ones who understand all processes on the production floor best. Of the three perceptions, it is the perceived usefulness that dominates the success of the ergonomic program since workers can feel the impact of their work directly. The impact is workers can work more quickly and comfortably, provide better results, and have less noticeable pain complaints. The next is perceived trust - workers who believe in the benefits of the ergonomic program in palm oil mills will cause a worker to be actively involved.

Perceived trust is strongly influenced by workers' experience, i.e. ergonomic program done previously. Workers will be willing to implement the program, follow the stated schedule and rules, share their experiences, coordinate in workgroups, etc. Such active participation from workers will contribute to the success of the ergonomic program. Meanwhile, perceived ease of use is the perception of workers that leads to the belief that the technology adopted does not require much effort. Workers who think that an ergonomic program can make their work easier will have the intention to get involved in its activities. However, this perception has a less significant effect compared to the previous two perceptions.

6. Conclusion

Workers' perceptions of perceived usefulness, perceived ease of use, and perceived trust have a significant effect on the success of the ergonomic program. However, perceived usefulness has a bigger effect than the other two perceptions. Thus it can be understood that workers tend to use technology that they believe will help them complete the job. The intensity of use and the interaction of workers with this technology indicates the ease of use. Technology that is used often, implies that the technology is more familiar and easier to use. This can serve as a guideline for the technology that the ergonomic program will introduce.

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