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INVESTIGATING THE ROLE OF ENVIRONMENTAL CONCERN AND THE UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY ON WORKING FROM HOME TECHNOLOGIES ADOPTION DURING COVID-19

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Abstract. Working From Home (WFH) technologies has been used and discussed for a long time. The many positive benefits of WFH technologies, including its potential to create a more sustainable work activity, attracted many studies to gain a better understanding of this subject. This study is interested to understand the different factors, including environmental, influencing WFH technologies acceptance in this current shifting situation stimulated by the Covid-19 pandemic. An extended Unified Theory of Acceptance and Use of Technology (UTAUT) model, employing Environmental Concern, was used. The model was assessed by using the structural equation model. The total of 172 respondents participated in this research. The total of 5 hypotheses was tested. The present study's model is able to predict 57.4% of WFH Technology acceptance. Finally, discussion and recommendations to businesses that are currently taking WFH measures during the Covid-19 pandemic were presented.

Keywords: Covid-19; environmental concerns; technology; UTAUT; working from home

1. Introduction

From a scholarly perspective, entrepreneurship is concerned with understanding the way an entity discovers, creates, and exploits opportunities to create goods and services. However, the question of what consequences this process generates is also an essential part of the whole concept of entrepreneurship (Shane & Venkataraman, 2000), and to answer this question, there is a whole concept that addresses it: sustainable entrepreneurship. Defined as the way to conduct entrepreneurial activities without neglecting environmental consequences (Cohen & Winn, 2007), the concept of sustainable entrepreneurship tackles the various problem of unsustainable entrepreneurship and actions that can be taken to address it (e.g., environmental degradation and sustainable entrepreneurship innovation). The present study is interested in the innovation aspect of sustainable entrepreneurship, and in particular the use of Information System (IS) to achieve sustainable entrepreneurship.

It is well understood that IS can be a primary source of competitive and sustainable advantage alongside other obvious advantages for an enterprise (Brynjolfsson & Hitt, 2000; Feeny & Ives, 1990). By automating, informs, and transforming organizations, IS can be used to achieve sustainability (Standing, Jackson, Chen, Boudreau, & Watson, 2008), this statement by Standing et al. holds true especially today. Right now, due to the Covid-19 outbreak, many governments are forced to impose a lockdown or social distancing policies in their countries (Secon, Frias, & McFall-Johnsen, 2020). These policies are rightly done to minimize the Covid-19 spread. However, it has immobilized many essential human activities; the once 'normal' daily activities such as going to school, commuting to the workplace, and even walking in the park are currently a threat to the people who are at higher risk for severe illness from contacting Covid-19 (Zhang, Jiang, Yuan, & Tao, 2020).

Fortunately, IS enables millions of affected workers to be still able to work from home (WFH). While working for home or telecommuting is not the newest contribution from the IS community, it is currently the most important for this time of emergency. Without working from home initiatives that enable economic activity to continue (Belzunegui-Eraso & Erro-Garcés, 2020), a major economic catastrophe could happen, further amplifying the already severe effect of the Covid-19 outbreak.

The idea of working from home was brought to the discussion as early as 1984. (Salomon & Salomon, 1984) explains that "..reduction of congestion, energy conservation, and a reduction of transportation-related environmental pollution." were some of the major benefits. However, working from home truly flourished together with the technological advancement surrounding it. The increasingly accessible home computing and the shift to an information economy shape the current working from home predominance (Allen, Golden, & Shockley, 2015). Today, this idea is re-evaluated, a new question surfaced as the global community of workers and entrepreneurs have a glimpse into how working from home can be a very efficient and sustainable mode of working: can working from home becomes the new normal? (Amekudzi-Kennedy, Labi, Woodall, Chester, & Singh, 2020). While there is no clear answer right now, one thing is clear about working from home: it promotes sustainability, both economicaly and ecologicaly (Anthony Jr, Majid, & Romli, 2018; Walls & Safirova, 2004; Ye, 2012).

The present study is interested in improving the current understanding of working from home, especially in the technologies it utilized since ICT use is central to working from home activities. We wanted to investigate the acceptance of WFH technologies in the current pandemic crisis using the Unified Theory of Acceptance and Use of Technology and the Environmental Concern factor. Rather than some of the previous research that investigates WFH done by workers who are actually a telecommuter, we studied the new wave of the workforce who has to use WFH technologies in order to keep being productive during the current crisis. Thus, there is a potential for major improvements and, in return, helping enterprises achieve effectiveness and sustainability.

2. Literature Review
2.1. Working From Home (WFH)

Working from home is simply defined as doing organizational works outside the working area provided by an employer (Reshma, Aithal, & Acharya, 2015), other terms that encompass the same meaning include remote working, teleworking, virtual work, or telecommuting (Raffaele & Connell, 2016). A person who works from home can be in isolation or collaboration (by communicating with other team members) (Zenun, Loureiro, & Araujo, 2007). Working from home popularity and prevalence has been increasing in the last few decades. In the US alone, since 2005, there is a 115% growth of working from home. The statistics provided by the Global Workplace Analytics also show that workers who work from home have a $4,000 higher annual income. The ratio of workers by gender is also reported as almost equal (Global Workplace Analytics, 2017). Investigation about this topic has been done in a vast manner, addressing many aspects of working from home, such as the effectivity of working from home, the psychological aspect of a person who works from home, the environmental sustainability and working from home relationship, and the technologies used for working from home (Bloom, Liang, Roberts, & Ying, 2015; Gajendran & Harrison, 2007; Leung & Zhang, 2017; Zhu & Mason, 2014).

2.2. WFH During Covid-19

Many actions were taken to ensure that the Covid-19 pandemic does not spread further and causes many unwanted consequences. One action taken by governments around the world is the recommendations to do working from home for enterprises (Belzunegui-Eraso & Erro-Garcés, 2020). Different than the traditional working from home explained in the previous sub-chapter, the present study will look at working from home in the context of the current pandemic crisis. The sudden spike of people who works from home, together with how companies have to invest massively in working from home facilities, could have a long-lasting effect for the future of working from home practices (Brynjolfsson et al., 2020). Some even speculated that working from home could be the 'new normal' (Mulcahy, 2020; Verbeemen & D'Amico, 2020). A research article also shows that in their survey, the majority of the respondents foresee that working from home would be more common in the future even after the Covid-19 crisis is over (Baert, Lippens, Moens, Sterkens, & Weytjens, 2020). These speculations and surveys could be proven to be accurate. The world could see working from home as the new alternative, and thus, a better understanding of this phenomenon could be imperative.

2.3. WFH Technologies and WFH Technologies Acceptance

Undoubtedly, the primary facilitator for working from home initiatives is technology. WFH technologies enable the essential aspects of WFH: communication, collaboration, and organization (Allen et al., 2015; Lopez-Leon, Forero, & Ruiz-Díaz, 2020). Thus, WFH technologies can be defined as technologies that facilitate the process of working from home, and particularly, in this case, WFH technologies that are commonly used in the Covid-19 stimulated WFHs. The advancement of WFH technologies further pushes forward the opportunity for working from home, and the never-ending growth of these technologies would mean that in the future, working from home will be easier, more accessible, and more effective (Allen et al., 2015).

In understanding practical technology, it is very common and also needed to understand the human-technology interaction that bridges the users and the technology itself. Without a sufficient understanding of technology acceptance, a technology implementation could fail and causing economic and productivity losses (Chuttur, 2009), which is a much more important currency in the current crisis. Investigating technology acceptance of a system could also create more effective utilization of that system by a clearer understanding of the unpredictable part of technology implementation: the human behavior (Persada, Miraja, & Nadlifatin, 2019). Considering that the numbers of research addressing the technology acceptance of WFH are still limited, especially in the current

Covid-19 crisis, this study will try to understand the factors affecting workers' acceptance of WFH technologies during Covid-19-related WFH measures.

2.4. Hypotheses Development

This study will use an extended version of one of the most used and remarked technology acceptance framework, which is the Unified Theory of Acceptance and Use of Technology (UTAUT). This sub-chapter will describe the theoretical ground for the model; we then adopt it as the present study conceptual framework.

UTAUT is a theoretical framework that can explain technology acceptance behaviors. Built with the foundation of many psychological theories related to human motivation, UTAUT is claimed to be able to explain 70% of the variance in users' intention to use a technology (Hoque & Sorwar, 2017). UTAUT is also known for its simplicity (Tarhini, El-Masri, Ali, & Serrano, 2016). There are only four main factors in UTAUT that predict the intention and use of technology. The four factors include Performance Expectancy (PE), Effort Expectancy (EE), Facilitating Conditions (FC), and Social Influence (SI); UTAUT's theoretical framework is presented on Figure 1. (Venkatesh, Morris, Davis, & Davis, 2003).
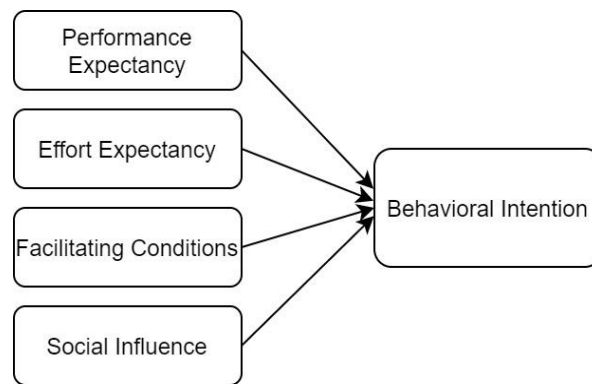
Fig. 1. Theoretical Framework (Venkatesh et al., 2003)

The first factor of UTAUT, Performance Expectancy (PE), is defined as the belief of an individual that uses technology on whether or not the technology will provide advantages for them (Venkatesh et al., 2003). The relationship between PE and Behavioral Intention (BI) which represents technology acceptance has been shown to be positive in many cases of technology use, including work-related technologies and environments (AlAwadhi & Morris, 2008; Zhou, Lu, & Wang, 2010). Consequently, we hypothesized that there is also a significant positive relationship between the Performance Expectancy of WFH technologies and the Behavioral Intention to use WFH technologies during Covid-19-related working from home measures. Thus, we proposed our first hypothesis:
H1: There is a significant positive effect of Performance Expectancy of WFH Technologies on Behavioral Intention to Use WFH Technologies During Covid-19-related WFH Measures

The second factor of UTAUT is the Effort Expectancy (EE), it measures a user's perception of how easy it is the interaction between them and a system (Venkatesh et al., 2003). Past research pieces have proven that there is a significant positive influence of the ease of use of the system (EE) and the intention to use that system (BI), these findings were also proved to be true for technology use in an organizational setting (Mills, 2016; Vatanasakdakul, Aoun, & Li, 2010). Thus we hypothesized that there is a significant positive influence of Effort Expectancy (EE) on Behavioral Intention (BI):

H2: There is a significant positive effect of Effort Expectancy of WFH Technologies on Behavioral Intention to Use WFH Technologies During Covid-19-related WFH Measures

The next factor is Facilitating Conditions (FC). FC is defned as a user's perception of the availability of technical infrastructure and technical supports for the system (Venkatesh et al., 2003). It is also found that FC positively affects Behavioral Intention (BI) of technology use in organizational settings (Chauhan & Jaiswal, 2016; Fillion, Braham, & Ekionea, 2012; Ifinedo, 2012). The sudden shift for the majority of enterprises toward WFH because of Covid-19 also tests the enterprises' ability to provide these technical supports of their WFH measures, making this factor relevant to predict user's intention to use WFH technologies. Thus we proposed our next hypothesis:

H3: There is a significant positive effect of Facilitating Conditions of WFH Technologies on Behavioral Intention to Use WFH Technologies During Covid-19-related WFH Measures

The last factor from UTAUT is Social Influence (SI). It is the belief of an individual that other people who are important to them feels that the system should be used (Venkatesh et al., 2003). The influence of other people perceived as important by an individual (SI) is identified to be affecting Behavioral Intention (BI) significantly in Venkatesh et al. findings. Other research studying the implementation of technology in organizational settings in different field and level of technical complexity have also found this to be true (Alrawashdeh, Muhairat, & Alqatawnah, 2012; Dwivedi, Rana, Jeyaraj, Clement, & Williams, 2019; Kijsanayotin, Pannarunothai, & Speedie, 2009). Thus, our fourth hypothesis is:

H4: There is a significant positive effect of Social Influence of WFH Technologies' Use on Behavioral Intention to Use WFH Technologies During Covid-19-related WFH Measures

Lastly, to extend the already established UTAUT framework, we incorporate another factor that could affect Behavioral Intention (BI) to use WFH technologies: Environmental Concern (EC). EC is defined as the awareness of consequences or affects held by an individual on environmental problems (Fujii, 2006; Schultz et al., 2005). In previous pieces of literature, it is evident that EC can affect behaviors that are environmentally friendly. Furthermore, environmentally friendly behavior has been explored in a broader scope by many other studies, revealing that EC can also affect behavioral intention of a person to do a particular action (Fujii, 2006; Pagiaslis & Krontalis, 2014). It is also apparent that EC could also affect behavioral intention to use a technology that can create positive effect on the environment (environmentally friendly) (Hsu, Lin, Chen, Chang, & Hsieh, 2017). Hence, the intention to accept WFH technologies can also be affected by this variable due to how WFH technologies promote sustainability by reducing gas emission, reducing office space needed, minimizing congestion, and removing the need of more energy on office spaces (Fuhr & Pociask, 2011). Thus, we proposed our last hypothesis:

H5: There is a significant positive effect of Environmental Concern on the Behavioral Intention to Use WFH Technologies During Covid-19-related WFH Measures

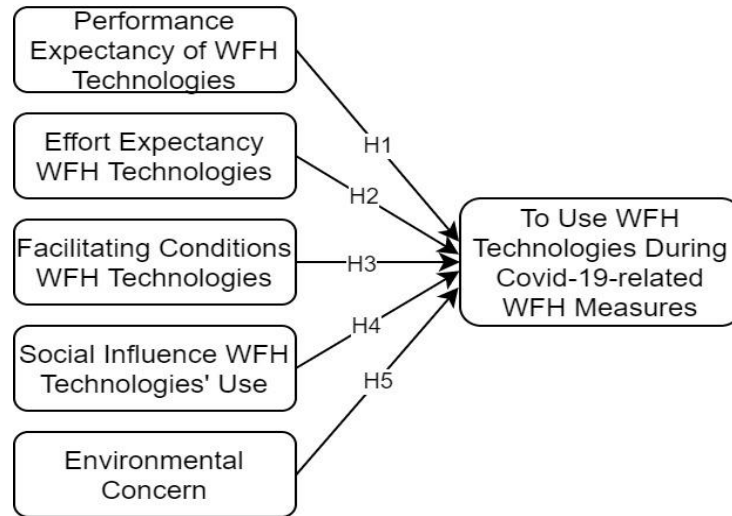Accordingly, the proposed research framework is presented in Figure 2.

Fig. 2. Conceptual Framework

3. Methods

The present study uses Structural Equation Modeling (SEM) to validate our variable indicators, analyze the relationship, and see the overall fitness of the model. A Confirmatory Factor Analysis (CFA) approach was used due to how our theoretical framework has already proven to be a solid foundation for the analysis purpose of this study. An online questionnaire was developed consisted of 6 variables projected by 19 items using a five-point Likert scale. We also asked our respondent demographical questions to illustrate better the sample used in this study. The list of the questionnaire is provided in Table 1. The sampling method used was the purposive sampling method, with people who are doing WFH because of Covid-19 pandemic as the criteria. The instrument was distributed from April 25th to May 10th 2020 in different parts of Indonesia. Indonesia is selected because Covid-19 stimulated WFH is quite predominant, thus able to represent workers interacting with WFH technologies around the world. We first tested the reliability and the validity of our instrument and assessed the fitness of our model before testing the proposed hypotheses.

Table 1. List of questionnaire

Variable	Question	Variable	Question
PE1	I think that WFH technologies are useful for my job.	FC1	I have access to the necessary resources to use WFH technologies.
PE2	Using WFH technologies makes me able to complete tasks quicker.	FC2	I have the knowledge necessary to use WFH technologies.
PE3	Using WFH technologies increases my productivity	FC3	WFH technologies is well-suited with other work technologies I use.
EE1	WFH technologies is understandable and clear for me.	SI1	People who affects my actions perceived that I should use WFH technologies.
EE2	Becoming skillful at using WFH technologies is easy for me	SI2	In my use WFH technologies, the senior management of in my workplace has been supportive.
EE3	I find WFH technologies easy to use.	SI3	WFH technologies use in my workplace is supported by my organizaiton in general.
EE4	WFH technologies is easy to operate for me.	BI1	I intend to use WFH technologies in the next month.
EC1	The environment is severely abused by humans	BI2	I am predicting that I would use WFH technologies in the next month.
EC2	The balance of nature is easily upset by humans	BI3	I am planning to use WFH technologies in the next month.

Source: Adopted from (Coelho, Pereira, Cruz, Simões, & Barata, 2017; Hsu et al., 2017; Venkatesh et al., 2003)

4. Results

4.1. Descriptive Statistics

Before presenting the results of statistical analysis, we first provide the demographical distribution of our sample. With a total of 172 respondents, Table 2 provide a summary of the distribution. From Table 2, it can be seen that the sample used in the present study is diverse and thus able to represent the population of workers around the world. Gender distribution can be considered as relatively equal (46.2% Female, 52% Male, and 1.8% Prefer not to answer). The sample of our study also came from different educational level and different job sectors. We also asked two descriptive questions and revealed that: 1. The majority of the place our respondents worked at (53.8%) is experienced in the utilization of WFH technologies; and 2. The frequency of WFH technologies usage varies between our respondents, with 40.9% using WFH technologies every workday, 33.3% often, and 25.7% rarely.

Table 2. Sample Distribution and Descriptive Statistics

Criteria	Characteristics								
Gender	Male.			Female			Prefer not to answer		
	46.2%			52%			1.8%		
Education	Secondary		Diploma		Graduate or Higher			Others		
	22.2%		59.1%		15.2%			3.5%		
Job Position	Supervisor, Office worker, Administrative	Public sector employee		Middle management position of public sector		Intellectual profession, Executive, Freelancers		Management, Administration, or Intermediate Professionals		Others
	19.3%	28.7%		17.5%		8.8%		8.2%		17.5%
Job Sector	Various Industries	Financial	Consumer goods industry	Basic and chemical industry	Infrastructure, utilities, and transportation		Trade, services and investment	Mining	Agriculture	Property, real estate, and building construction
	3.5%	19.9%	1.2%	2.3%	12.9%		51.5%	0.6%	4.1%	4.1%
Is your workplace experienced with WFH Technologies utilization?	Yes			No			Maybe		
	53.8%			26.3%			19.9%%		
How frequent you use WFH Technologies?	Rarely			Often			Every workdays		
	25.7%			33.3%			40.9%		

Source: Own preparation

4.2. Data Analysis

The result of our analysis of the data using the proposed conceptual framework is presented in this sub-chapter. In order to fulfil the necessary requirement of SEM, few measurements were conducted. These measurements ensure that the data used for this study is valid and reliable and whether or not the model fits the data. To measure reliability or the internal consistency of the variables, we used Cronbach α and Composite Reliability (CR) with the minimum required values of 0.6 and 0.7 respectively (Churchill Jr, 1979; Jani, Sari, Pribadi, Nadlifatin, &

Persada, 2015; Lin, Nadlifatin, Amna, Persada, & Razif, 2017; Mufidah et al., 2018; Nunnally, 1978). To measure the validity of the scale, we used the Factor Loadings and the Average Variance Extracted (AVE) with minimum value required of 0.5 for both scales (Chin, Jiang, Mufidah, Persada, & Noer, 2018; Hair, Anderson, Babin, & Black, 2010; Miraja, Persada, Prasetyo, Belgiawan, & Redi, 2019; Nadlifatin, Lin, Rachmaniati, Persada, & Razif, 2016; Nadlifatin et al., 2020; Persada et al., 2020). The measurements revealed that the data for this study surpasses the required values for every scales. Hence, the data of this study is considered reliable and valid. The summary of these measurements is presented in Table 3.

Table 3. Reliability and Validity

Variable	Item	Cronbach α	CR	Factor Loading	AVE	Variable	Item	Cronbach α	CR	Factor Loading	AVE
Performance Expectancy	PE1	0.90	0.90	0.78	0.7	Facilitating Conditions	FC1	0.81	0.81	0.78	0.6
	PE2			0.90			FC2			0.79	
	PE3			0.90			FC3			0.74	
Effort Expectancy	EE1	0.94	0.94	0.86	0.8	Social Influence	SI1	0.67	0.70	0.51	0.5
	EE2			0.94			SI2			0.59	
	EE3			0.92			SI3			0.87	
	EE4			0.88		Behavioral Intentions	BI1	0.94	0.92	0.84	0.8
Environmental Concern	EC1	0.74	0.75	0.71	0.6		BI2			0.90	
	EC2			0.83			BI3			0.92	

Source: Own preparation

Lastly, to evaluate the fitness of the model, we use the CFI and GFI scale with acceptable value of 0.7 for both scales (Lv & Lv, 2020). It is revealed that the present study model has GFI of 0.729 and CFI of 0.824. Accordingly, we can continue to analyze the hypotheses. Hypothesis analysis was conducted using a bootstrap of 1000 samples with maximum likelihood (ML) approach with a bias-corrected confidence interval of 90 (error tolerance of 10%), this was conducted because there is a multivariate non-normality in the data (Byrne, 2013).

The analysis of the proposed hypotheses is illustrated in Figure 3. It is apparent that only one hypothesis was rejected, meaning four hypotheses were revealed to have positive and significant relationships; PE, FC, SI, and EC all proven to have a significant positive relationship towards BI. The BI variable has a squared multiple correlations of 57.4%, suggesting that the model can explain the majority of workers' intention to use WFH Technologies.
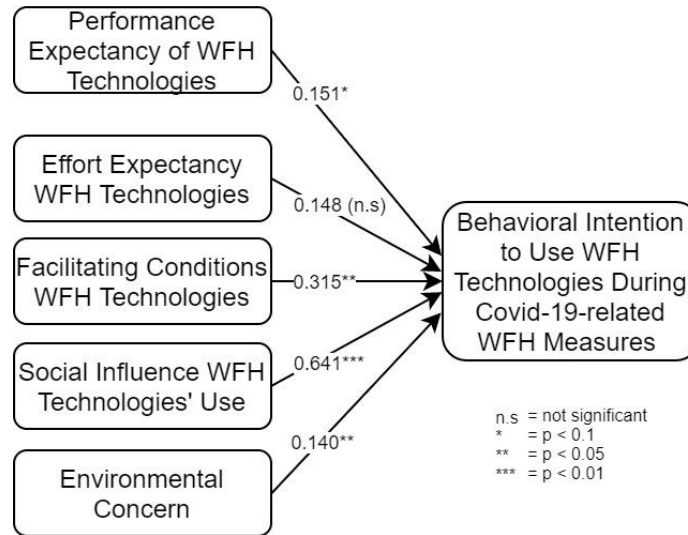
Fig. 3. Analysis Result

4.3. Discussion

After analyzing the hypotheses, we then able to discuss the meaning of the results of this study. Figure 3 shows that in contrast to the second hypothesis, EE does not have a significant positive relationship with BI. This means that employees who are using WFH technologies do not necessarily need the ease of use of using WFH technologies in order for them to have an intention to use it. A very significant relationship, however, is exhibited by the relationship between SI → BI which have a p-value less than 0.01 (0.001) and an effect size of 0.641. This shows that the intention of employees to use WFH technologies is hugely affected by how they perceive their social surroundings opinions regarding the use of the technologies. Facilitating Conditions also show a significant relationship with an effect size of 0.315, suggesting that availability of infrastructure, facility, and technical support is vital for employees before intending to use WFH technologies. Performance Expectancy, though having the lowest effect compared to other accepted UTAUT hypotheses (0.151), still proves to affect BI significantly. Lastly, Environmental Concern, which is an extension to the UTAUT model, is revealed to have a significant effect on BI. This implies that other than the standard variable (such as UTAUT's variables) used to predict technology acceptance, Environmental Concern also played a role in this matter. This is an exciting finding because other than enterprises that need to have a sustainable operation in their business, employees also share the same spirits; with EC → BI proved to be significant, it means that employees' concern about environmental problems and issues affects their intention to use WFH technologies, which can contribute to the sustainability of enterprises. These finding can also be applied in a practical setting. For example, businesses could focus on the variables that significantly affect their employees' intention to use WFH technologies so that their WFH initiative can be more productive. Thus, this study was able to contribute both practically (using the previous example) and theoretically by showing an extension variable (EC) for the UTAUT framework and further validating the use of the UTAUT framework for technology acceptance (Hsu et al., 2017; Saleh, Haris, & Bint Ahmad, 2014).

5. Conclusions and Limitations

The present study analyzes the data of 172 respondents in Indonesia who are currently engaged in Covid-19-related WFH initiatives. We built our conceptual framework using the UTAUT model with an addition of Environmental Concerns as a predictor for employees' intention to use WFH technologies. The result of this

study revealed that four out of the five hypotheses were accepted: Performance Expectancy, Facilitating Conditions, Social Influence, and Environmental Concerns. Accordingly, we described the relationship of the result for each hypotheses and gave an example of potential practical implication. We also described the theoretical contribution of this study. However, there are some limitations, the sample size could be increased, and more diverse and international samples could be used in order to have a greater understanding regarding this subject. Future research could also investigate other variables that could influence the workers' intention to use WFH technologies.

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