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THE ROLE OF UNCERTAINTY, PERCEIVED EASE OF USE, AND PERCEIVED USEFULNESS TOWARDS THE TECHNOLOGY ADOPTION

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ABSTRACT

This research integrated the concept of uncertainty and compatibility into Technology Acceptance Model (TAM). The context of technology adoption is analyzed from the craftsman's side who is also the user. Most of the craftsmen in Micro Small Medium Enterprises (MSME) are elderly who are resistant to new technology. Main objective of this research is to test innovation adoption model on MSME which are affected by uncertainty, perceive usefulness, ease of use, and compatibility.

Respondents in this research are 151 craftsmen. The data is analyzed using two step approach to Structural Equation Modeling (SEM). The result of model measurement shows that the instruments have a good and reliable validity. The result of Structural Equation Model analysis shows a good result because the value of goodness-of-fit is high, thus it can show the ability of model to extract the variance of its empirical data. All of five hypotheses submitted in this research are supported. Technology adoption is affected by uncertainty, perceived ease of use, and perceived usefulness. Compatibility and perceive easy of use are affected on perceived of usefulness.

Keywords: uncertainty (UN), perceived ease of use (PEU) and perceived usefulness (PU), compatibility (Com), and adoption technology (AT).

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1. INTRODUCTION

Technology adoption on MSME which tends to be traditional needs a bigger attention from industry researcher, because MSME has uniqueness and different characteristic with big industries (Sugandini et al., 2017a; 2017b; 2018). MSME are usually home industry and managed individually, also have the important strategic role to national economic development because they are considered to be tougher for facing economic crisis (Muafi et al., 2016). Weaving industry in Daerah Iistimewa Yogyakarta (DIY) as one of the MSME, has three weaving centers which are already well-established and export oriented. Weaving industry in DIY requires a product innovation to fulfill consumer demand which is always changing. The threats faced by weaving MSME are the availability of inadequate technology and the craftsmen are mostly elderly which are resistant to new technology. According to Ram (1989); Sugandini et al (2017a; 2017b; 2018a; 2018b; Gaitán et al., 2015; Diharto et al., 2018), innovation adoption would be slower on community groups which have low level of education, low level of economy, and elderly.

This research focused on innovation adoption on weaving MSME, associated with product innovation (coloring and antifungal technology) and production equipment innovation (loom machine). This technology believed to be able to increase product quality and can be faster in fulfilling consumer demand which is more and more increasing. Norek and Arenhardt (2015), stated that innovation has an important role in shaping company competitiveness and shows innovative potential of the company. The Theory of Innovation is based on concept of company resources. Concept of company resources is developed on early 1990s and assumed that the ability of company to develop all of its operational aspects is very closely related to the resources which are owned (Hall and Rosenberg, 2010; Muafi, 2017a; 2017b). Joshi (1991; Muafi, 2017a; Muafi, 2016) stated that the success of technology implementation and modern innovative management are very important to increase productivity and competitive position of an organization.

Specifically, this research integrated the concept of uncertainty (Wilson, 1999; Wilson et al., 2002), and compatibility (Rogers, 200; Sugandini, 2017a; 2017b; 2018a; 2018b) into Technology Acceptance Model/TAM (Davis et al., 1989). TAM introduced for the first time by Davis on 1989, is the adaptation of *Theory of Reasoned Action/TRA*. TAM assumes that two individual beliefs i.e. perceived usefulness and perceived ease of use affected on behavior

of technology adoption. Roger (2003) stated that innovation adoption is affected by innovation characteristic, which can be shown by compatibility.

This research has three theoretical contributions. *First*, this research extends TAM by adding compatibility (Rogers, 2003) and uncertainty variable (Wilson, 1999, 2002). By adding two factors mentioned above, TAM is expected to be better at explaining adoption behavior in MSME. *Second*, is about uncertainty. Previous researches explain that uncertainty is associated with information and how uncertainty can be reduced by the existence of information (Harris, 1998; Kuhlthau, 1993, 1996); D'Ambra and Wilson, (2004). This research explains the direct role of uncertainty on adoption decision. This is different with previous researches. Previous research shows that uncertainty affects time of adoption (Hovav and Schuff, 2005). As wellas the role of uncertainty as moderating variable (Chen and Zhang, 2016). Abdellaoui et al. (2010); Heath and Tversky (1991), stated that uncertainty is related with someone's competencies and skills in adopting. ***Third***, is about the research's setting. Previous researches about uncertainty are mostly done on the setting of information technology (Wilson et al., 2002). This research took the setting of technology adoption on MSME, so that it is expected to be able to strengthen the findings about innovation adoption on MSME with affection of uncertainty on adoption outside the setting of information technology.

2. LITERATURE REVIEW

2.1. Technology Adoption (TA)

The context of technology on MSME consists of technology available on the market and right now is used in organizations, available on the market but hasn't been adopted yet by the organizations (Gutierrez et al., 2015). MSME must consider and evaluate the organization's change which will be made by adopting new innovation (Baker, 2012; Diharto et al., 2018; Diharto et al., 2017). Context of technology in this research emphasizes on adopting technology from the user/craftsmen's side, because the success of adopting technology by the craftsmen is believed to be able to increase productivity and competitiveness of MSME (Sugandini, et al., 2017a; 2017b; 2018b; Muafi et al., 2017c). Previous researches about innovation highlight the importance of man factor, organization factor, technology factor, and environment factor to the success of adoption and implementation of innovation (Tornatzky and Klein, 1982; Diharto et al., 2017).

Innovation is related with producing, receiving, and implementing new ideas, processes, products, or services which allow the company to fulfill consumer needs (Thompson, 1965). Damanpour (1992) defines company innovation adoption as the initiation, development, and implementation of new ideas or behavior including new systems, policies, programs, devices, and products or services which adopted by the company.

Decision process of innovation adoption can be conceptualized as the sequence of steps passed by an individual in organizations which includes initial knowledge of an innovation, attitude formation, decision to adopt or reject it, using innovation, and finally looking for reinforcement of adoption decision that has been made (Rogers, 1995). Adoption decision is a stage where organization makes decision to use a specific technology (Darmawan, 2001; Agarwal and Prasad, 1998; Rogers, 1995; Frambach and Schillewaert, 2002; Haryono et al., 2017; Muafi, 2017a).

2.2. Uncertainty (UN)

Uncertainty is a concept that has been studied in various probability and decision making theories. Harris (1998) stated that uncertainty is often found when a person makes decision. Uncertainty level is a function of how far a community group feels threaten by an ambiguous situation, uncertain, and unknown (Ford et al, 2003). The higher level of uncertainty, more community groups will avoid taking risk to adopt technology (Hofstede, 2003). Uncertainty also helps explaining why community is willing to adopt technology (Tipurik et al, 2007). Ontologically, uncertainty happens when an individual perceives consequence of an innovation which is more based on their various viewpoints on innovation itself (Lane and Maxfield, 2005).

H1: Uncertainty (UN) affects negatively on technology adoption.

2.3. Perceived Ease of Use (PEU) and Perceived Usefulness (PU)

Perceived usefulness and ease of use determine certain attitude formation towards the use of innovation (Davis et al., 1989). Perceived usefulness defined as how far a person believes that the use of technology is able to increase his/her performance. Perceived ease of use defined as how far a person believes that the use of technology will be free from effort (Davis, 1989).Lederer et al, (2000) stated that there is a relation between perceived ease of use and perceived usefulness in attitude towards the use of technology. King and He (2006); Sugandini et al. (2017a; 2017b; 2018) stated that TAM is quite reliable and can be used in various contexts of technology adoption. Barhoumi (2016) also stated that perceived ease of use can increase perceived usefulness and increase comprehension about technology adoption.

H2: Perceived ease of use (PEU) affects positively on technology adoption

H3: Perceived usefulness (PU) affects positively on technology adoption

H4: Perceived ease of use (PEU) affects positively on Perceived Usefulness (PU)

2.4. Compatibility (Com)

Compatibility is a degree where certain innovation assumed to be consistent with applicable values, past experience, and the adopter's requirements (Rogers dan Shoemaker, 1971). This definition implies two kind of compatibilities, (1) normative or cognitive compatibility which refers to compatibility with what is felt or thought about innovation, and (2) practical or operational compatibility which refers to compatibility to what is done by the consumers. If new technology is the continuation from old technology which has been held, then the speed of innovation adoption's process will be relatively fast (Ram, 1989; Ram and Sheth, 1989). Gahtani (2003), stated that the level of adoption for innovative products will be high if individual feels the existence of same values or beliefs offered by innovative products. Tonartzky dan Klein (1982) added that individual will have a positive attitude towards innovation adoption when that innovation believed to be suitable with values within him/herself. Compatibility perceived by individual is also able to increase the perception of benefits from new technology (Sugandini, 2013 and Rogers, 2003).

Hypothesis 5: Compatibility affects positively towards perceived usefulness.

3. RESEARCH METHODS

This research used data which taken from 151 craftsmen of MSME in DIY. Data obtained using questionares and in-depth interview. 6-points scale is selected to measure instruments used in this research. To test model which connects four main factors and MSME technology adoption in DIY, Structural Equation Modeling analysis is used. Hair et al., (2006) stated that the sample size that suitable for SEM using maximum likelihood estimation technique is

between 100-200 samples. Thus, the sufficient requirement of sample size in this research has been fulfilled. Data analyzed using Two-Step Approach to SEM (Anderson and Gerbing, 1988). First step is done by measurement model analysis that helps evaluating the adequacy of measurement model, then second step is done by structural model analysis that tested by SEM.

3.1. Profile of Respondents

Table 1 descripted that the majority are female, high school educated, earning 1 – 2 millions, Age of 31 – 40 years old and >41 years old, and the length of MSME's operation is >10-15 years.

Table 1 Profile of respondents

Measure	Items	Percentage
Gender of Respondents	Female	92.3
	Male	7.7
Education of Respondents	Elementary	28.2
	JHS	64.1
	SHS	7.7
Income	< 1 million	76.9
	1 - 2 million	15.4
	> 2 million	7.7
Age of Respondents	31- 40 years	50
	> 41 years	50
Age of MSME	1 – 5	1.4
	>5 – 10	14.3
	>10 – 15	84.3

4. RESULTS

Testing validity of the indicators that formed latent variable analyzed from the value of *standardized regression weight* on every indicator. If obtained a very significant testing value, then this indicates that the indicator is good enough to form latent variable. The result of measurement model testing can be seen in Table 2.

Table 2 Measurement model testing

Latent construct	Factor loading/ standardized regression weight	Composite reliability	Variance extracted
un1	0.492		
un2	0.373		
un3	0.409		
un4	0.485		
UNCERTAINTY		0.797	0.50
com1	0.313		
com2	0.361		
com3	0.757		
COMPATIBILITY		0.781	0.57
peou1	0.527		
peou2	0.468		
peou3	0.810		
PERCEIVED EASY OF USE		0.905	0.77
pu1	0.427		

pu2	0.565		
pu3	0.504		
pu4	0.819		
PERCEIVED USEFULNESS		0.951	0.84
adopt1	0.729		
adopt2	0.678		
adopt3	0.585		
TECHNOLOGY ADOPTION		0.847	0.65

The result of measurement model shows that all of instruments used have a good and reliable validity. The next step is analyzing structural model. The result of Structural Equation Model analysis shows a good result because the value of goodness-of-fit is high, thus it can show the ability of model to extract the variance of its empirical data.Table 3 explains goodness-of-fit index of model in this research.

Table 3 The Value of *Goodness of Fit* Model

Type of goodness of fit model	Index of goodness of fit model	Recommended value	Result	Explanation
Absolute fit measures	Chi-Square Statistic (χ^2atau CMIN)	Small	6.545	Good
	P	≥ 0,05	0.257	Good
	GFI	≥ 0,90	0.999	Good
	RMSEA	≤0,08	0.045	Good
Incremental fit measures	TLI	≥ 0,90	0.998	Good
	CFI	≥ 0,94	0.999	Good
Parsimonious fit measures	Normed χ^2 (CMIN/DF)	1≤ Normed χ^2≤ 5	1.309	Good

This research shows that the value of χ^2 is 1.309, p value is 0.257, GFI is 0.999, NFI is 0.998, TLI is 0.998, CFI is 0.999, and RMSEA is 0.045. This research shows that, technology adoption which is developed has been as expected.Technology adoption significantly affected by uncertainty (UN) in the amount of 15.5%,affected directly by Perceived Ease Of Use (PEU) in the amount of 15,8%, affected by perceived usefulness(PU) in the amount of 35.5%. The influence of Perceived Ease Of Use (PEU) through mediation of perceived usefulness(PU) in the amount 21,8%. Indirect influence of Perceived Ease Of Use (PEU) towards technology adoption is bigger than direct influence of Perceived Ease Of Use (PEU) towards technology adoption. The influence of compatibility (Com) towards perceived usefulness(PU) in the amount of 28.3%. The influence of compatibility (Com) towards technology adoption through mediation perceived usefulness(PU) is in the amount of 10%.

5. DISCUSSION

Negative influence from uncertainty towards technology adoption submitted in this research is supported. The result of this research explains that the higher uncertainty of a technology, then the adoption decision will be decreased. This is caused by the individual who deal with high uncertainty is reluctant to take the decision of adoption. The result of this research also supports Harris(1998);(Ford et al., 2003) who stated that uncertainty is an ambiguous situation and unknown which affected the decision of adoption. The higher the uncertainty, then more individuals will avoid taking new technology adoption (Hofstede, 2003); (Tipurik et al., 2007). The influence of Perceived Ease of Use (PEU) and Perceived Usefulness (PU)

towards technology adoption in this research is supported and shows a significant result. The craftsmen in weaving MSME feel that new technology has high benefits and high ease of use, thus technology adoption from the weaving craftsmen become high. This research supports TAM from Davis et al (1989). According to TAM, Perceived Ease of Use (PEU) and Perceived Usefulness (PU) will determine the attitude and adoption level of new technology's user. Findings by Ledereret al., (2000), King andHe (2006); Sugandini et al. (2017a; 2017b; 2018a; 2018b; Barhoumi (2016) stated that there is a relation between Perceived Ease of Use (PEU) and Perceived Usefulness (PU) in the attitude towards the use of technology, and Perceived Ease of Use (PEOU) can increase Perceived Usefulness (PU) is supported. The influence of Compatibility towards Perceived Ease of Use is also supported. The result of this research supports research findings that have been done by (Ram, 1989; Gahtani, 2003; Sugandini, 2013), which stated that adoption level of innovative product will be high if individual feels the existence of same values. More suitable the technology with individual's value and belief, individual will perceive high benefits from that new technology (Tonartzky and Klein, 1982, Rogers, 2003; Sugandini, 2013).

6. LIMITATION AND RECOMMENDATION FOR FURTHER RESEARCH

This research is used by taking setting on MSME in weaving industry by extending TAM from Davis et al (1989) also add compatibility and uncertainty variable. This research is not analyzing the attitude of technology's user. This research analyze technology adoption which is done radically, that means new technology is very different with technology that the MSME previously had. Incremental innovation actually has to be analyzed in predicting technology adoption. Further researches are expected to extend the setting of research which is not only in one industry, but some kind of industries, thus will increase the generalization of result of research. Another variable that can be put in this research including trust (Zhang, 2014), habit (Alalwan et al, 2015), human capital (Muafi et al., 2017c) and self-efficacy (Compeau and Higgins, 1995), because these variables are relevant to be used for technology adoption in MSME. In the other side, it is needed to add adequacy of information variable as the antecedent of uncertainty (Wilson, 2002; Muhsin et al., 2017).

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