Cognitive Styles and Knowledge of Operational Procedures of Electric Appliances

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Abstract. The objective of this research is to investigate the relationship between user's knowledge of operation procedures for some electric appliances and their cognitive styles. First, questionnaires were given to the participants. The participants answered below questions about cognitive styles. Second, to investigate the participants' knowledge of operating procedures of the electric appliances, participants were asked to write free text description on how to use an appliance without actually operating it. We found certain kinds of knowledge about operation procedures were linked to user's cognitive style.

Keywords: cognitive style, mental model, operating procedure, electronic appliance.

1 Introduction

The objective of this research is to investigate the relationship between user's knowledge of operation procedures for some electric appliances and their cognitive styles. The electric appliances investigated were home electric appliances, IT devices, information kiosks, etc., that are used in everyday life.

The first author conducted this study in Wakayama University Graduate School of System Engineering.

2 Methods

2.1 Questionnaires and Experiment

22 of the participants were in their 20s and 30s, 11 were in their 50s, and 22 were in their 65 or older. The studied appliances consisted of automatic teller machines (ATMs), air

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conditioners, copy machines, CD/radio cassette recorders, computerized dictionaries, FAX machines, home video games and electric massagers for household use.

First, questionnaires were given to the participants. The participants answered below questions about cognitive styles.

Q Please select one of A or B.

Q1.

A. I am cautious in my thinking.

B. I am not cautious in my thinking.

Q2.

A. I count my own opinions.

B. I count the many's opinions.

Q3.

A. I am meticulous.

B. I am not meticulous.

Q4.

A. I prefer to play it by ear.

B. I prefer to make a clear decision.

Second, to investigate the participants' knowledge of operating procedures for the electric appliances, an experiment was conducted. The experimental method consisted of the following procedures:

1. An experimenter explained the electric appliance and the goal of job, and showed a picture of it. (Table 1.).
2. The participant wrote out a free description on one card for a step to perform the task, without actually using the device.

The experiment was conducted for each participant and for each appliance.

Table 1. Samples of experimental tasks

Appliance	erse Captio	Job	Start	End	Illustration
Air conditioner	The machine is for controlling temperature .	There is an air conditioner. Now you are before going to bed. Set the air conditioner to turn on the heater automatically	Plug the power cords for the air conditioner into electrical wall outlets.	Power on the air conditioner automatically.	
Fax machine	The machine is to transfer copies of documents.	There are an fax machine and a document. Transfer copies to one of your friends from your fax machine.	Plug the power cords for the fax machine into electrical wall outlets.	Have sent the copy to your friend.	

2.2 Analysis

These cards were classified into about 300 tasks.

The participants were classified according to what tasks they answered using Hayashi's Quantification Theory III and Cluster Analysis. This analysis was conducted with respect to each appliance. The number of the clusters is from five to seven per appliance. The clusters are described as "Knowledge of Operational Procedure Type" in this paper.

We evaluated correlate between the clusters and the answers about cognitive styles (Q1-Q4) by applying Fisher's Exact Test (Extended).

3 Results and Discussion

Table 2 shows the results of the evaluation on Knowledge of Operational Procedure Type -Cognitive Style correlation. Air Conditioners correlate with Q2 (I count my own opinions / I count the many's opinions). FAX Machine correlate with Q3 (I am meticulous / I am not meticulous).

Table 2. Knowledge of Operational Procedure Type -Cognitive Style Correlation

Question / Appliance	Q1 Cautious	Q2 Independence	Q3 Meticulous	Q4 Play it by ear
ATM				
Air Conditioner		*		
Copy Machine				
CD/radio cassette recorder				
Computerized Dictionary				
FAX Machine			*	
Home Video Game				
Electric Massager				

(**: $p<0.01$, *: $p<0.05$)

3.1 Air Conditioners-Q2

The knowledge of operational procedure types about air conditioners correlates with Q2 (I count my own opinions / I count the many's opinions). We think the reason comes from that. An air conditioner is used by several users and its function reflects to other people in a family. Therefore the user uses it with communication at home. So the knowledge correlates with if the user prefers to count others' opinions.

3.2 Fax Machine-Q3

The knowledge of operational procedure types about fax machines correlate with Q3 (I am meticulous / I am not meticulous). We focus on the type B, because the number of the participants that gave "A. I am meticulous" is most on the type.

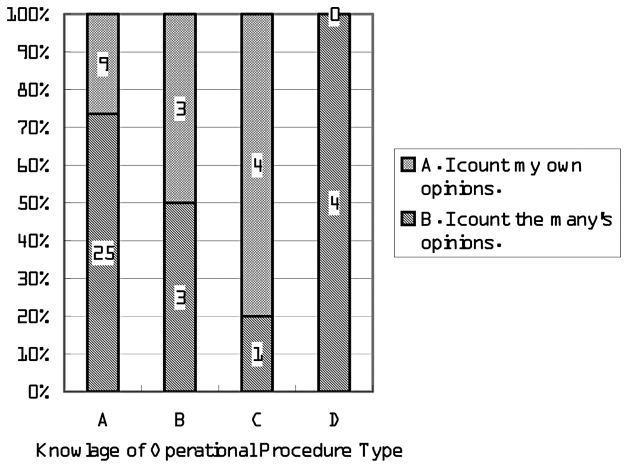

Fig. 1. Rate of Cognitive style (Air Conditioner)

More participants in the type B give "Power on" (63.2% of the type B) and "Put the machine in the fax mode" (73.7% of the type) as the answer than the other types (0%-4.8%). Many participants in the type B think that these procedures should be executed. We think that meticulous users mind upping procedures.

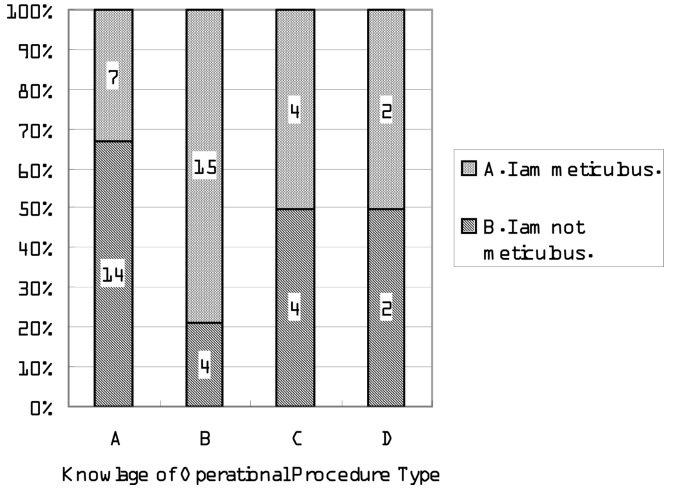

Fig. 2. Rate of Cognitive style (Fax Machine)

4 Conclusion

We found certain kinds of knowledge about operation procedures were linked to user's cognitive style. But it is partly and we cannot explain why the others are not

linked the cognitive styles. We should more study aspect of other cognitive styles, user's experience and their age.

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